CLIENT: LUMCLOON ENERGY LIMITED

PROJECT NAME: LEL CASTLELOST

PROJECT DETAILS: PROPOSED DEVELOPMENT OF THE LEL FLEXGEN CASTLELOST, LEL ESS CASTLELOST, & LEL GIS CASTLELOST PROJECTS AT KILTOTAN & COLLINSTOWN AND OLDTOWN, ROCHFORTBRIDGE, COUNTY WESTMEATH

DOCUMENT: ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) (VOLUME 2)

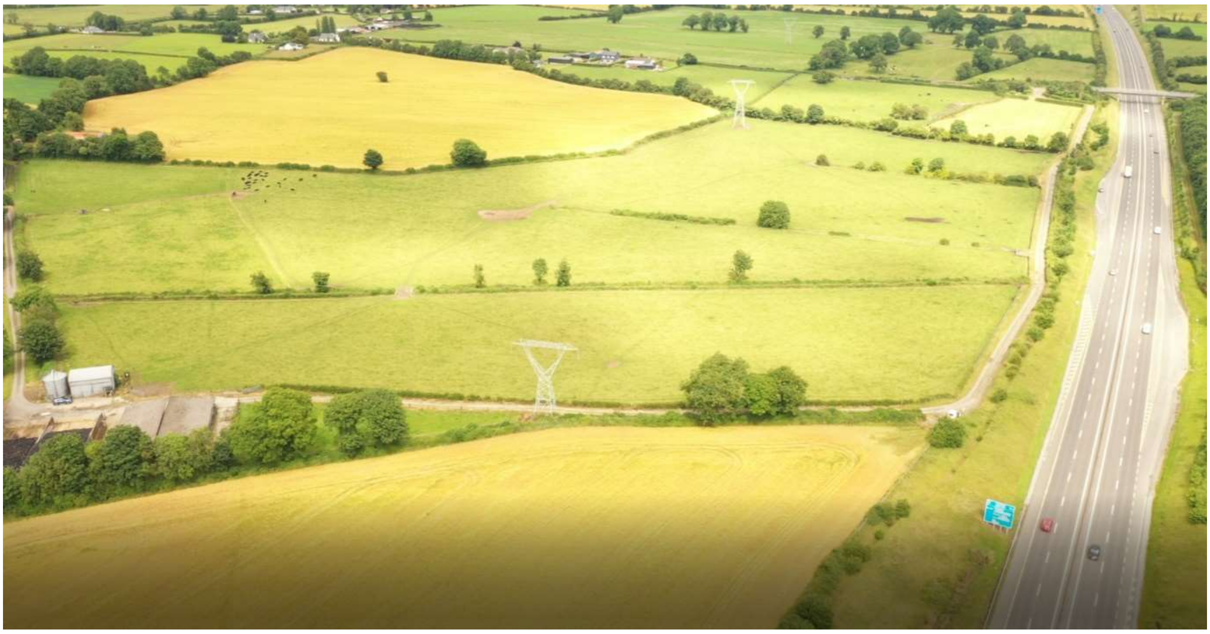

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TABLE OF CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 OVERVIEW

Lumcloon Energy Limited (LEL) proposed to develop a reserve gas-fired generator (referred to as the *LEL Flexgen Castlelost*) and Energy Storage System (ESS) project (referred to as the *LEL ESS Castlelost*) and Gas Insulated Switchgear (GIS) electricity substation (*referred to as LEL GIS Castlelost*) on lands with an area of 21.3ha /52.6 acres in the townlands of Kiltotan & Collinstown and Oldtown, Rochfortbridge, Co. Westmeath.

The three projects include different technologies which were selected to provide a comprehensive range of electricity capacity and ancillary services to the grid and assist with the transition to a low carbon economy.

The LEL Flexgen Castlelost Project is a reserve generator and will provide back-up electricity to the national grid. The plant will comprise five (5no.) open cycle gas turbine (OCGT) electrical generating units, totalling approximately 275MWe (megawatts electrical), ancillary plant, buildings and infrastructure. The LEL Flexgen Castlelost project is designed to operate intermittently and provide generating capacity during periods of high demand or when renewable energy cannot meet demand. An OCGT unit consists of a turbine connected to an electric power generator and the five (5No.) turbines are designed to operate independently of each other. The turbines are designed to burn natural gas as their primary fuel. OCGT units are advantageous due to their operational flexibility and can be turned on quickly to match system demand. The selected turbines are capable of being converted to allow for the combustion of green hydrogen as a fuel in the future, which will allow for carbon free and climate-neutral plant operation.

The LEL ESS Castlelost Project will comprise an open area battery storage system compound, synchronous condenser compound, IPP (customer) building and all ancillary electrical equipment and development works. The LEL ESS Castlelost Project will store surplus renewable energy generated during periods of low demand and release this to the grid with demand is greater, i.e., it will provide load shifting and ancillary services to the electricity grid.

The LEL Flexgen Castlelost and LEL ESS Castlelost projects will connect to a proposed 220kV Gas Insulated Switchgear (GIS) electrical substation, which will be developed on lands adjoining the projects. The LEL GIS Castlelost project consists of a substation building with a maximum height of 17 metres (m). The GIS substation will connect via two 220kV underground cables to the existing Shannonbridge-Maynooth 220kV overhead line, which passes through the project study area on an east-west orientation.

An underground gas pipeline, which will deliver natural gas to an Above Ground Installation (AGI) on site and serving the LEL Flexgen Castlelost Project, will be constructed from the existing natural gas pipeline, which is located approximately 5km north of the development lands. Gas Networks Ireland (GNI), as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI.

The LEL Flexgen Castlelost Project will ensure power supply continuity and assist with transition towards 70% renewable sources by 2030[1]. Owing to the primary fuel type and the projected low number of running hours, the carbon footprint of the reserve gas-fired generator is minimal when compared with existing diesel-fired back up (reserve) generators and the recently retired peat-fired power stations in the country. The proposed LEL Flexgen Castlelost Project is designed to operate during peak demand periods and rather than serving the system as a baseload conventional combined cycle power turbine (CCGT) plant, the proposed LEL Flexgen Castlelost Project will support the generation network which is increasingly centred on renewable energy.

The LEL ESS Castlelost Project will provide a full range of carbon free system services and it will replace the functions of a conventional power plant including black start services. The LEL ESS Castlelost Project will trade electricity at times of high demand aiming to shift and smoothen the demand curve by charging at night and discharging during peak hours (daytime) and during the occurrence of power system event such as a frequency and voltage deviations, faults in the lines, tripping generators, insufficient renewables supply, etc.

Each of the projects are subject to separate planning applications, i.e., the LEL Flexgen Castlelost Project, the LEL ESS Castlelost Project and the LEL GIS Castlelost Electrical Substation. Whilst EIAR is mandatory only in the case of the LEL Flexgen Castlelost development, following consultation with Westmeath County Council and given the scale nature and the proximity of the projects to each other, a single Environmental Impact Assessment Report (EIAR) has been prepared for all projects. The potential environmental impacts from each project are assessed individually and cumulatively (with each other and with any other identified projects) within this EIAR. The planning and development regulatory framework is presented in Section 1.4 below.

[1] Legal obligation as part of Ireland's National Energy and Climate Plan (NECP) 2021-2030, which is Ireland's contribution to the European Union's Clean Energy Package

1.2 APPLICANT COMPANY

Lumcloon Energy Limited (LEL) was established in November 2008 as a project development company focused on flexible power and energy assets. The company is based in Tullamore, Co. Offaly. At an early stage, LEL identified flexibility as a key component to address the changing needs of the evolving power systems which are transitioning from fossil-based generation to renewable-based generation. Since its inception, LEL has focused on the development of flexible generation and energy storage systems in Ireland plant to compliment the integration of renewable energy sources and assist to assist the transition to a decarbonised power source. LEL has developed Ireland's largest portfolio of Energy Storage System plants and is a founding member of the Irish Energy Storage Association (IESA) which was established to promote the benefits of energy storage in Ireland.

1.3 NEED FOR THE DEVELOPMENT

The need for the projects (LEL Flexgen Castlelost, LEL ESS Castlelost and LEL GIS Castlelost) is driven by (a) decarbonisation plans[2] (70% by 2030 and towards zero by 2050), (b) the change to new sources of electricity production and further penetration of renewable energy sources which creates stability, reliability and predictability issues, (c) security of supply issues associated with existing inflexible and inefficient conventional generation, and (d) identified grid reinforcement needs to cater for future economic growth and demand. The projects will support the transition to higher levels of renewables and assist in the provision of a cleaner, more efficient, reliable, economic and secure electricity supply for consumers on the Island.

The three standalone projects are designed and configured to provide economic, reliable, and low emissions power to the electricity grid. The gas-fired reserve generator (LEL Flexgen Castlelost Project) will replace existing older diesel fired generators and peat-fired /coal-fired stations by providing additional low emissions capacity to the electricity system. The LEL ESS Castlelost Project development will provide a wide range of carbon-free system services and is designed to support further integration of variable non-dispatchable renewable generators to the grid. The LEL GIS Castlelost Project will be developed to meet the identified transmission network reinforcement requirements in the Midlands of Ireland as outlined in the recently published *"Shaping our Electricity Future"*[3] report by Eirgrid and SONI. The report details innovative approaches to developing the grid in order to

[2] 70% RES-E target has become a legal obligation as part of Ireland's National Energy and Climate Plan (NECP) 2021-2030, which is Ireland's contribution to the European Union's Clean Energy Package. The Climate Action and Low Carbon Development (Amendment) Act 2021 commits Ireland to 2030 and 2050

[3] Shaping Our Electricity Future (2021); details innovative approaches to developing the grid in order to meet ambitious 2030 renewable energy targets

meet ambitious 2030 renewable energy targets. The report provides details regarding a "Generation-Led approach" which seeks to influence the location of new generators to sites on the transmission system where there is capacity available to accommodate them. This significantly reduces the number of network reinforcements that are needed compared with the other approaches. The report also identifies the need for a new GIS substation for the midlands 220kV line. Construction of the proposed GIS electrical substation within the development lands at Castlelost accords with policy objectives CPO 10.169, CPO 10.173 and CPO 10.174 of the Westmeath CDP 2021-2027 (which deal with electricity infrastructure) and simplifies connection of the LEL Flexgen Castlelost and LEL ESS Castlelost projects to the electricity transmission system. An assessment of the planning policy associated with the development, such as the policy objectives outlined above, is provided in Chapter 3 of this EIAR.

1.4 PLANNING & DEVELOPMENT REGULATORY FRAMEWORK

Each of the three projects are subject to separate planning applications, i.e., the LEL Flexgen Castlelost Project, the LEL ESS Castlelost Project and the LEL GIS Castlelost Project.

The LEL GIS Castlelost Project falls within the remit of Section 182 of the Planning and Development Act 2000, as amended. Accordingly, LEL submitted a Section 182E pre-application consultation request to An Bord Pleanála (ABP) in respect of the LEL GIS Castlelost Project to obtain notice from ABP on whether or not the proposed development is regarded as strategic infrastructure development (refer to ABP acknowledgement letter provided in Appendix 1.2).

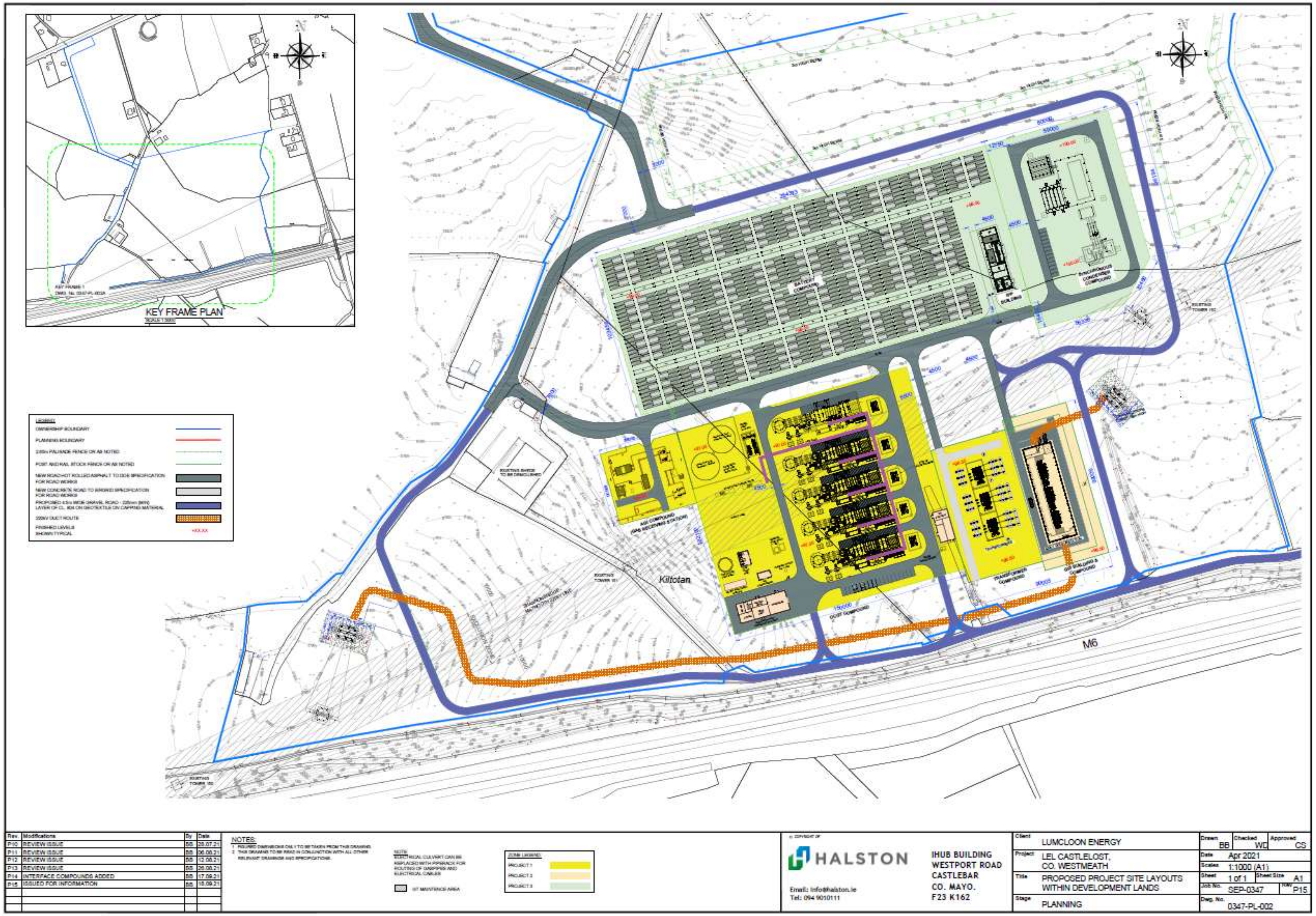
The LEL Flexgen Castlelost and the LEL ESS Castlelost Projects are not within the classes of development prescribed under the Seventh Schedule to the Planning and Development Act 2000, as amended. They also fall below the thresholds at paragraph (1) of that Schedule. The LEL Flexgen Castlelost Project and the LEL ESS Castlelost Project are therefore not considered to be *"strategic infrastructure"* as defined in the Planning and Development Act 2000, as amended.

Consequently, planning consents are being sought for the LEL Flexgen Castlelost Project and the LEL ESS Castlelost Project under Section 34 of the Planning and Development Act 2000, as amended. The LEL Flexgen Castlelost Project and the LEL ESS Castlelost Project are standalone projects and can be constructed, commissioned, and operated in isolation. Therefore, separate planning consents are being sought from Westmeath County Council for these projects. Engineering drawings for the purposes of the planning application are listed in the drawing register provided in Table 1.2 of this EIAR.

A proposed site layout drawing (Halston Ref. 0347-PL-002) showing all three projects within the overall development at Kiltotan & Collinstown and Oldtown, Rochfortbridge, Co. Westmeath is presented in Appendix 1.3 of this EIAR. The planning drawings prepared for each of the three planning applications also include a *"proposed site layout"* drawing (Refer to Table 1.2 below), showing the projects within the proposed development lands. This information was used to inform the EIA process.

In addition, the proposed underground natural gas pipeline, which will serve the LEL Flexgen Castlelost Project is assessed with this EIAR. The underground pipeline will be constructed from the existing natural gas pipeline, which is located approximately 5km north of the development lands. Gas Networks Ireland (GNI), as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI. The work by GNI includes selection of the preferred route. As this work is ongoing, three indicative routes were selected from the existing gas pipeline to the development lands at Kiltotan & Collinstown and Oldtown. An assessment of the potential impacts and effects on the receiving environment is provided within each Chapter of the EIAR.

Figure 1.1 Drawing showing the three proposed LEL Castlelost projects within the development lands (ref Appendix 1.3)



1.5 EIA AND EIAR

The obligations under Irish law EIA and EIAR are derived from obligations incurred as a result of membership of the European Community. Under Irish legislation, the type of development for which an EIAR is required is prescribed by *Part X* of the 2000 Planning and Development Act, as amended and Part 10 of, and Schedule 5 (*'Development for the Purposes of Part 10'*), Schedule 6 (*'Information to be contained in an EIS'*), and Schedule 7 (*'Criteria for determining Whether a Development would or would not be likely to have Significant Effects on the Environment'*) to the Planning and Development Regulations 2001, as amended.

Section 172(1) of the Planning and Development Act, 2000 as amended states that an Environmental Impact Assessment (EIA) shall be carried out in respect of certain applications for consent for proposed development. Specifically, EIA shall be carried out where:

- the proposed development would be of a class specified in Part 1 of Schedule 5 of the Planning and Development Regulations 2001 (as amended), and such development would equal or exceed, as the case may be, any relevant quantity, area or other limit specified in that Part or no quantity, area or other limit is specified in that Part in respect of the development concerned.
- the proposed development would be of a class specified in Part 2 of Schedule 5 of the Planning and Development Regulations 2001 (as amended), and such development would equal or exceed, as the case may be, any relevant quantity, area or other limit specified in that Part or no quantity, area or other limit is specified in that Part in respect of the development concerned.
- the proposed development would be of a class specified in Part 2 of Schedule 5 of the Planning and Development Regulations 2001 (as amended), but does not equal or exceed, as the case may be, the relevant quantity, area or other limit specified in that Part and that the proposed development is likely to have a significant effect on the environment. This is referred to as *"sub threshold development".*

The main objective of an EIA, as set out in Article 3(1) of the 2014 EIA Directive, is to identify, describe and assess the direct and indirect significant impacts of a project on population and human health, biodiversity, land, soils, water, air & climate (including noise), material assets, cultural heritage and the landscape and the interaction between the aforementioned factors. The EIA Report reports on the findings of the EIA process and informs the Planning Authority, statutory consultees, other interested parties and the public in general about the likely effects of the project on the environment.

Whilst EIAR is mandatory only in the case of the LEL Flexgen Castlelost Project, following consultation with Westmeath County Council and given the scale nature and the proximity of the projects to each other, a single Environmental Impact Assessment Report has been prepared for the three projects. The potential environmental impacts and effects from each project are assessed individually and cumulatively (with each other) within the EIAR. This EIAR has been prepared in accordance with the following:

- EU Directive /337/EEC; 2011/92/EU and 2014/52/EU,
- Planning and Development Act 2000 (As amended),
- Planning and Development Regulations 2001 (as amended),
- European Commission (EC) (2017), *"Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report"* (Directive 2011/92/EU as amended by 2014/52/EU),
- Environmental Protection Agency (2017), "*DRAFT Guidelines on the information to be contained in Environmental Impact Assessment Reports",*
- Environmental Protection Agency (2003), "*Advice notes on current Practice (in the preparation of Environmental Impact Statements)"*,
- Environmental Protection Agency (2002), *"Guidelines on the information to be contained in Environmental Impact Statements".*

In accordance with the requirements of the EIA Directive electronic notification was provided to the Department of Housing, Local Government and Heritage about the applications for inclusion on the EIA portal. A copy of the EIA notification receipts is provided in support of each of the applications.

1.6 SCREENING FOR EIA

1.7 FORMAT AND STRUCTURE OF THE EIAR

This EIAR is structured as follows:

- **Volume 1 Non-Technical Summary**
- **Volume 2 Environmental Impact Assessment Report (EIAR)**
  - Chapter 1 Introduction
  - Chapter 2 Description of the Proposed Project
  - Chapter 3 Planning and Policy
  - Chapter 4 Population and Human Health
  - Chapter 5 Biodiversity
  - Chapter 6 Soils and Land
  - Chapter 7 Water Environment

  - Chapter 8 Air Quality and Climate
  - Chapter 9 Material Assets
  - Chapter 10 Noise and Vibration
  - Chapter 11 Landscape and Visual
  - Chapter 12 Traffic and Transport
  - Chapter 13 Archaeology and Cultural Heritage
  - Chapter 14 Interactions
- **Volume 3 Environmental Impact Assessment Report (EIAR) Appendices**
  - Appendix 1.1 Landowner Consent Letters
  - Appendix 1.2 Pre-application *consultation* (SID) acknowledgement Letter from ABP
  - Appendix 1.3 Proposed Project Site Layouts within Development Lands
  - Appendix 4.1 COMAH - Environmental Risk Assessment (ERA)
  - Appendix 7.1 Flood Risk Assessment Report
  - Appendix 8.1 Baseline Air Quality Data
  - Appendix 8.2 Aermod Dispersion Modelling Outputs
  - Appendix 8.3 Construction Dust Assessment
  - Appendix 8.4 Castlelost Dispersion Model
  - Appendix 10.1 Noise Impact Assessment Monitoring Data & Certificates
  - Appendix 11.1 Visual Impact Assessment at Selected Viewpoints
  - Appendix 11.2 Landscape Mitigation Plan (provided in separate booklet)
  - Appendix 11.3 Photomontages (provided in separate booklet)
  - Appendix 12.1 Traffic Counts
  - Appendix 12.2 Trip Generation
  - Appendix 12.3 Traffic Calculations
  - Appendix 12.4 PICADY Analysis
  - Appendix 12.5 Road Safety Audit Report

1.8 EIAR PREPARATION AND CONTRIBUTORS

This EIAR has been prepared by Halston Environmental & Planning Limited (Halston), IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162, on behalf of the applicant. The Planning Application Stage Works were managed and coordinated by Mr Colm Staunton (Halston). Table 1.1 provides details of the author of each EIAR Chapter, and a statement of authority is provided under Section 1.10.

Table 1.1 List of EIAR Contributors

Chapter No.	EIAR Chapter	Contributor
1.	Introduction	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
2	Description of the Proposed Project	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
3	Planning and Policy	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
4	Population and Human Health	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
5	Biodiversity and Appropriate Assessment	Moore Group, 3 Gort na Rí, Athenry, Co. Galway
6	Soils and Geology	Halston Environmental & Planning Ltd, IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
7	Water Environment	Halston Environmental & Planning Ltd. IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
	Flood Risk Assessment	JBA Consulting 24 Grove Island, Corbally, Limerick
8	Air Quality and Climate	TMS Environment Ltd 53 Broomhill Drive, Tallaght, Dublin 24
9	Material Assets	Halston Environmental & Planning Ltd IHub Building, Westport Road, Castlebar, Co. Mayo Ireland, F23 K162
10	Noise and Vibration	Redkite Environmental Huntersmoon, Ballykeane Road, Redcross Co. Wicklow
11	Landscape and Visual	Macroworks Hibernia House, Cherrywood Business Park, Loughlinstown, Dublin 18
12	Traffic and Transport	Traffic Transport and Road Safety Associates Barran, Blacklion, Co. Cavan
13	Archaeology and Cultural Heritage	Moore Group 3 Gort na Rí, Athenry, Co. Galway
14	Interactions	All Specialist Consultants inputted into this Chapter and was coordinated by Halston.

1.9 SCOPING AND CONSULTATION

Pre-planning consultation meetings in relation to development proposals were undertaken with Westmeath County Council on 6th May 2021. Consultation was also undertaken with Eirgrid during the project design stage in respect of grid connection. A Section 182E pre-application consultation request was submitted to An Bord Pleanála (ABP) in respect of the LEL GIS Castlelost Project to obtain notice from ABP on whether or not the proposed development is regarded as strategic infrastructure development (refer to ABP acknowledgement letter provided in Appendix 1.2). Consultation, where appropriate, with relevant private and public agencies was undertaken by the various EIA specialists preparing each of the EIAR Chapters. Details of this consultation is provided within each Chapter of the EIAR.

1.10 EIA PROJECT TEAM & STATEMENT OF AUTHORITY

Article 5(3)(a) of amended Directive requires that the developer (applicant) shall ensure that the environmental impact assessment report (EIAR) is prepared by competent experts and that sufficient expertise, in the relevant field of the project concerned, is required for the purpose of its examination by the competent authorities in order to ensure that the information provided by the developer is complete and of a high level of quality.

The applicant considers that each of the experts involved in the preparation of this EIAR possess sufficient experience, knowledge and expertise appropriate to the nature of work and roles within the overall EIA team.

The EIA team was led and managed by Mr Colm Staunton, MSc. BSc., Director of Halston Environmental & Planning Limited. Colm is a member and Certified Project Management Associate with the International Project Management Association (IPMA®), a qualified Practitioner Member of the Institute of Environmental Management & Assessment (PIEMA) and a member of the Irish Bioenergy Association (IrBEA) and Occupational Hygiene Society of Ireland (OHSI). Colm's experience predominantly relates to Project Management of Environmental Impact Assessments (EIA), ground investigations, environmental licensing /compliance work and Environmental Due Diligence (EDD). Colm has a long track record of ensuring projects are delivered to a high quality and he has worked as an environmental consultant in Ireland for over 18 years. Through his professional career, Colm has gained the required expertise and project specific technical knowledge from working as lead consultant and a specialist within multidisciplinary teams, dealing with high profile planning applications and providing expert witness testimony at public enquiries, oral hearings, planning appeals and under oath in courts of law.

Colm has prepared and project managed environmental planning and licensing components for various types of related energy developments, including, Powergen projects, Power-to-Gas (P2G) projects, Biogas and Anaerobic Digestions (AD) projects, Biomass fuelled power plants, and grid connected energy storage system (ESS) projects. His academic and professional qualifications and his ongoing studies and involvement in small and large complex projects requiring environmental planning and licensing ensures that he has sufficient; (a) knowledge of the specific tasks to be undertaken, (b) understanding of the project type and impacts which may arise, and (c) the experience and ability to fulfil the role and responsibilities required in carrying out duties and actions under the EIA Directive.

1.10.1.1 Biodiversity

This Chapter of the EIAR was undertaken by Mr Ger O'Donohoe of Moore Group providing information on habitats in the survey area. Ger is the principal ecologist with Moore Group and has over 25 years' experience in ecological impact assessment. He graduated from GMIT in 1993 with a B.Sc. in Applied Freshwater & Marine Biology and subsequently worked in environmental consultancy while completing an M.Sc. in Environmental Sciences, graduating from Trinity College, Dublin in 1999. His primary role in Moore Group is as Principal Ecologist in the management and compilation of Environmental Impact Statements and undertaking Ecological Impact Assessments of the terrestrial and aquatic environments of any particular development.

1.10.1.2 Soils & Geology, Water Environment and Material Assets

This Chapter of the EIAR was undertaken by Colm Staunton. Details are provided above. The Flood Risk Assessment report was undertaken by Mr Ross Bryant BSc MSc CEnv MCIWEM C.WEM. Ross has 17 years' experience within the field of flood risk modelling, mapping and management. He has been involved in a wide variety of projects that range from asset management to national scale flood mapping and risk assessment. His particular areas of expertise are River scour estimation and assessment, flood hazard mapping, river modelling, hydrological assessments. The drainage design for the projects was undertaken by ECC Design and Engineering.

1.10.1.3 Air Quality and Climate

This Chapter of the EIAR was undertaken by Dr Imelda Shanahan, BSc. (Chemistry), PhD (Physical Chemistry) who is the owner and Managing Director of TMS Environment Ltd and has over 30 years' experience in environmental monitoring and consultancy. She is a Chartered Chemist and a Fellow of the Institute of Chemistry of Ireland and a Fellow of the Royal Society of Chemistry. Imelda specialises in Air Quality Impact Assessment and works in Compliance Assessment, Environmental Risk Assessment and Waste Management. Imelda provides consultancy services to both public and private sector clients and has provided expert witness evidence at oral hearings, court hearings and planning.

1.10.1.4 Noise and Vibration

This Chapter of the EIAR was undertaken by Ms. Siobhán Maher whose qualifications include a B.Sc. in Analytical Science, M.Tech. in Environmental Management and a post graduate Diploma in Acoustics and Noise Control Engineering. Siobhán is a full Member of the Institute of Acoustics (MIOA) since 2002, is a committee member since 2020 and is also a Member of the Association of Acoustic Consultants Ireland (AACI). Siobhán is the Managing Director of Redkite Environmental with over 20 years of experience providing environmental consultancy and environmental assessment services to business, industry and public sectors. In the area of acoustics, she has experience in a range of areas, primarily being specialist in noise and vibration impact assessment for new and proposed developments, environmental noise monitoring and prediction modelling and development of mitigation measures for noise abatement and control.

1.10.1.5 Landscape and Visual

This Chapter of the EIAR was undertaken by Mr Richard Barker, MLA, PG Dip, BA. During his professional career to date, Richard has worked as a Town Planner in New Zealand, London and Dublin before moving into the field of Landscape Architecture. He has spent the last 14 years working as a Landscape Architect in Ireland and has considerable experience in the fields of both Landscape and Visual Impact Assessment (LVIA) and landscape design, covering all stages from project feasibility through to construction. This cross-over of expertise is invaluable in determining and designing the most appropriate and effective form of landscape and visual mitigation for infrastructural development projects. Richard manages the LVIA department in Macro Works undertaking assessment work on a broad spectrum of projects in areas such as renewable energy, roads and large scale industrial and infrastructural development. Richard has also delivered guest lectures to the University College Dublin professional course in EIA Management in relation to LVIA.

1.10.1.6 Traffic and Transport

This Chapter of the EIAR was undertaken by Mr Matthew Steele, company director and an established specialist traffic and transportation consultancy based in Ireland. Matthew: graduated from the University of Westminster in 1998, with a master’s degree in Transport Planning and Management; is a Chartered Fellow of the Chartered Institute of Logistics and Transport; a fellow of the Royal Geographical Society; and a member of the Chartered Institution of Highways and Transportation. Matthew has extensive national and international experience, working on numerous traffic, transport and development related projects in the public and private sectors, including access studies; specialist input into Strategic Environmental Assessments; and preparation of traffic and transportation related sections of Environmental Impact Assessments for specific schemes including extractive industries and energy related developments.

1.10.1.7 Cultural Heritage and Archaeology

This Chapter of the EIAR was undertaken by Mr Declan Moore, studied Archaeology and English at University College Galway, graduating in 1991. He obtained a Certificate in Management Studies in 1994 and became a Licence eligible archaeologist in 1999. Since graduating he has gained 30 years' experience as a field archaeologist and consultant. Declan is a Member of the Institute of Archaeologists of Ireland and the European Association of Archaeologists. As Managing Director of Moore Group, Declan has managed large-scale excavations as well as the cultural heritage elements of numerous urban and rural housing and industrial developments. He has project managed the cultural heritage sections of EIAR's for over 300km of powerlines throughout Ireland, including the 400kV North South Interconnector, the Grid West scheme, the North Kerry Transmission Line Project and, more recently, the Eirgrid North Connacht project, the Cloon – Lanesboro scheme and the Great Island to Kilkenny uprate scheme. Most recently he has overseen the cultural heritage assessments of housing developments in Galway, Dublin and Mayo and water schemes and gas pipeline schemes nationwide. He also recently completed project management of the N52 Grange to Clontail Scheme Route Assessment report, Route Selection reporting for the N25 Waterford to Glenmore Road scheme, Route Selection for the Mallow Bypass Road project and is currently overseeing archaeological work on the N5 Westport to Turlough road.

1.11 APPROPRIATE ASSESSMENT

Appropriate Assessment (AA) is an assessment carried out under Article 6(3) of the Habitats Directive. Article 6(3) of the Habitats Directive states:

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

Stage 1 AA screening of the projects was completed. A single AA Stage 1 Screening Report has been completed for the three projects and is provided under separate cover in support of each planning application.

1.12 CONTROL OF MAJOR ACCIDENT HAZARDS

The Health and Safety Authority (HSA) is the competent authority responsible for administration and enforcement of the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) (the COMAH Regulations).

The aim of the Regulations is to prevent and mitigate the effects of major accidents involving dangerous substances which can cause serious harm to people and/or the environment, with the overall objective of providing a high level of protection in a consistent and effective manner. The LEL Flexgen Castlelost Project qualifies as a *"lower tier"* site under the COMAH Regulations 2015 as it holds quantities of dangerous substances above threshold quantities specified in Schedule 1 of the COMAH Regulations 2015. An Environmental Risk Assessment (ERA) of the development proposals was carried out by DNV Services UK Limited. The report is provided under separate cover in support of the planning applications.

1.13 ENGINEERING DRAWINGS

This schedule of engineering drawings prepared by Halston in support of each of the three planning applications and on which this EIAR is based is as follows:

Table 1.2 Engineering Drawing Register

LEL Flexgen Castlelost Project	
Drawing Ref.	**Title**
0347-PL-1000	Site Locations
0347-PL-1001	Existing Site Layout
0347-PL-1002A	Proposed Site Layout 1 of 3
0347-PL-1002B	Proposed Site Layout 2 of 3
0347-PL-1002C	Proposed Site Layout 3 of 3
0347-PL-1003	Site Entrance Junction & Sight Lines
0347-PL-1004A	Surface Water Drainage Layout
0347-PL-1004B	Surface Water Drainage Layout
0347-PL-1005	Foul Water Drainage Layout
0347-PL-1006	Watermain Layout
0347-PL-1007	Drainage Details
0347-PL-1010	OCGT Layout Section & Elevations
0347-PL-1011	OCGT Compound Elevations
0347-PL-1020	Maintenance Building - Plan & Section
0347-PL-1021	Maintenance Building - Elevations
0347-PL-1022	IPP Building - Plan, Elevations & Section

0347-PL-1030	Fuel Tank & Bund Details
0347-PL-1040	Black Start Generator, Air Compressor & Fire Pump Skid Building Details
0347-PL-1041	Step Up Transformers and Raw Water Tank Details
0347-PL-1042	Ammonia Tank & Purified Water Tank
0347-PL-1043	Fuel Pump and Water Treatment Module Details
0347-PL-1050	AGI Instrument, Regulator, Boiler House and Analyser Kiosk Details
0347-PL-1051	AGI Compound Layout & Elevations
0347-PL-1060	Main Transformer Compound Details
0347-PL-1070	Fencing and Lighting Details
LEL GIS Castlelost Project	
Drawing Ref.	**Title**
0347-PL-2001	Site Location Map
0347-PL-2002	Existing Site Layout
0347-PL-2003A	Proposed Site Layout (1 of 3)
0347-PL-2003B	Proposed Site Layout (2 of 3)
0347-PL-2003C	Proposed Site Layout (3 of 3)
0347-PL-2004A	Surface Water Drainage Layout (1 of 2)
0347-PL-2004B	Surface Water Drainage Layout (2 of 2)
0347-PL-2005	Foul Water Drainage Layout
0347-PL-2006	Watermain Layout
0347-PL-2007	Drainage Details
0347-PL-2008	Site Entrance Junction & Sight Lines
0347-PL-2020	GIS Building Floor Plans & Section
0347-PL-2021	GIS Building Elevations
0347-PL-2022	GIS Compound Layout & Elevations
0347-PL-2030	Proposed Western Interface Mini Tower Compound Details
0347-PL-2031	Proposed Eastern Interface Mini Tower Compound Layout
0347-PL-2032	Proposed Eastern Interface Mini Tower Compound Elevations
0347-PL-2033	Proposed Western Interface Mini Tower Compound Layout
0347-PL-2034	Proposed Eastern Interface Mini Tower Compound Elevations
0347-PL-2040	Fencing and Lighting Details
LEL ESS Castlelost Project	
Drawing Ref.	**Title**
0347-PL-3001	Site Location
0347-PL-3002	Existing Site Layout
0347-PL-3003A	Proposed Site Layout 1 of 3
0347-PL-3003B	Proposed Site Layout 2 of 3
0347-PL-3003C	Proposed Site Layout 3 of 3
0347-PL-3004A	Surface Water Drainage Layout 1 of 2
0347-PL-3004B	Surface Water Drainage Layout 2 of 2

0347-PL-3005	Foul Water Drainage Layout
0347-PL-3006	Watermain Layout
0347-PL-3007	Drainage Details
0347-PL-3008	Site entrance Junction & Sight Lines
0347-PL-3300	SynCon Compound Layout
0347-PL-3301	SynCon Compound Elevations
0347-PL-3302	SynCon Building Layout, Elevations & Section
0347-PL-3303	SynCon Control Modules Layout, Elevations & Section
0347-PL-3400	Battery Compound Layout
0347-PL-3401	Battery & PCS Details
0347-PL-3402	Battery Compound Elevations
0347-PL-3500	IPP Building Layout, Elevations & Section
0347-PL-3600	Fence and Light details

1.14 AUTHORISATIONS AND LICENSES

1.14.1 CRU AUTHORISATIONS AND LICENCES

The Electricity Regulation Act, 1999 as amended (the Act) gives Commission for Regulation of Utilities (CRU) the necessary powers to licence and regulate the generation, distribution, transmission, and supply of electricity in Ireland. One of the functions of CRU under the Act is to grant or refuse Authorisations to Construct or Reconstruct generating stations and issue generation licences. Therefore, LEL will, will in due course, apply to the CRU for the necessary authorisations and licences for the LEL Flexgen Castlelost and the LEL ESS Castlelost Projects.

1.14.2 EPA INDUSTRIAL EMISSIONS LICENSING

In accordance paragraph 2.1[4] of the First Schedule to the EPA Act 1992 as amended, the LEL Flexgen Project will require an Industrial Emissions Licence. When applying to the Environmental Protection Agency (EPA) for an Industrial Emissions licence a number of legislative requirements must be fulfilled. These are largely set out in:

- EPA (Industrial Emissions) (Licensing) Regulations, 2013 (S.I. No. 137 of 2013),
- European Union (Industrial Emissions) Regulations 2013 (S.I. 138 of 2013),
- The EPA Act 1992, as amended.

LEL will apply to the EPA for an Industrial Emissions (IE) licence for the LEL Flexgen Castlelost Project should the planning application for consent be successful.

[4] Combustion of fuels in installations with a total rated thermal input of 50 MW or more.

1.15 GREENHOUSE GAS PERMIT

The EU emissions trading system applies to certain types of activity which produce greenhouse gases. These activities are listed in Annex 1 of the EU ETS Directive. Annex 1 includes activities which involve combustion of fuels in installations with a total rated thermal input exceeding 20MW. Therefore, LEL will apply to the EPA for a greenhouse gas permit for the LEL Flexgen Castlelost Project should the planning application for consent be successful.

1.16 AVAILABILITY OF INFORMATION & DIFFICULTIES ENCOUNTERED

A copy of the EIAR may be viewed on-line on the planning application section of the Westmeath County Council website. A paper copy of the EIAR may be viewed at the offices of the Planning Authority at the Planning Office, Westmeath County Council, Áras an Chontae, Mount Street, Mullingar, Co. Westmeath during office hours 9.30am to 4.00pm Monday to Friday.

There were no significant difficulties encountered in the preparation of the EIAR.

2 PROJECT DESCRIPTION

2.1 INTRODUCTION

Lumcloon Energy Limited (LEL) propose to develop a backup generator (referred to as the *LEL Flexgen Castlelost Project*) and an Energy Storage System (ESS) Plant (referred to as the *LEL ESS Castlelost Project*) on lands at Kiltotan & Collinstown and Oldtown, Rochfortbridge, Co. Westmeath. The LEL Flexgen Castlelost and LEL ESS Castlelost projects will connect to a proposed 220kV Gas Insulated Switchgear (GIS) electrical substation (hereafter referred to as the *LEL GIS Castlelost Project*), which will be located adjacent to the *LEL Flexgen Castlelost and* LEL ESS Castlelost Projects.

The LEL Flexgen Castlelost and LEL ESS Castlelost projects include different technologies which were chosen to provide a comprehensive range of electricity grid products and assist with the transition to a low carbon economy. The projects can be constructed, commissioned, and operated in isolation. The contract to supply and construct the LEL Flexgen Castlelost and LEL ESS Castlelost will be by open international competition. The final and precise plant output and scheme layout therefore cannot be specified at this stage without bias to a particular manufacturer or supplier. It is envisaged at this stage that the LEL GIS Castlelost Project will be constructed as a contestable substation. As part of detailed design, LEL (or their appointed representative) will engage and issue the planning stage drawings to Eirgrid's technical teams for review to incorporate further technical detail. Once detailed design is complete the project can proceed to the construction stage. Upon completion, the substation will be transferred to ESB Network in their role as Transmission Asset Owner (TSO) and Eirgrid will operate it in their as Transmission System Operator (TSO).

The LEL Flexgen Project will ensure power supply continuity and assist with transition towards 70% renewable sources by 2030. Owing to the primary fuel type and the projected low number of running hours, the carbon footprint of the project is minimal when compared with existing diesel fired back up (reserve) generators and the recently retired peat-fired power stations in the country.

The LEL ESS Castlelost Project will provide a full range of carbon free system services and it will replace the functions of a conventional power plant including black start services. The LEL ESS Castlelost Project will trade electricity at times of high demand aiming to shift and smoothen the demand curve by charging at night and discharging during peak hours (daytime) and during the occurrence of power system event such as a frequency drop, voltage deviation, faults in the lines, tripping generator, insufficient renewables supply, etc.

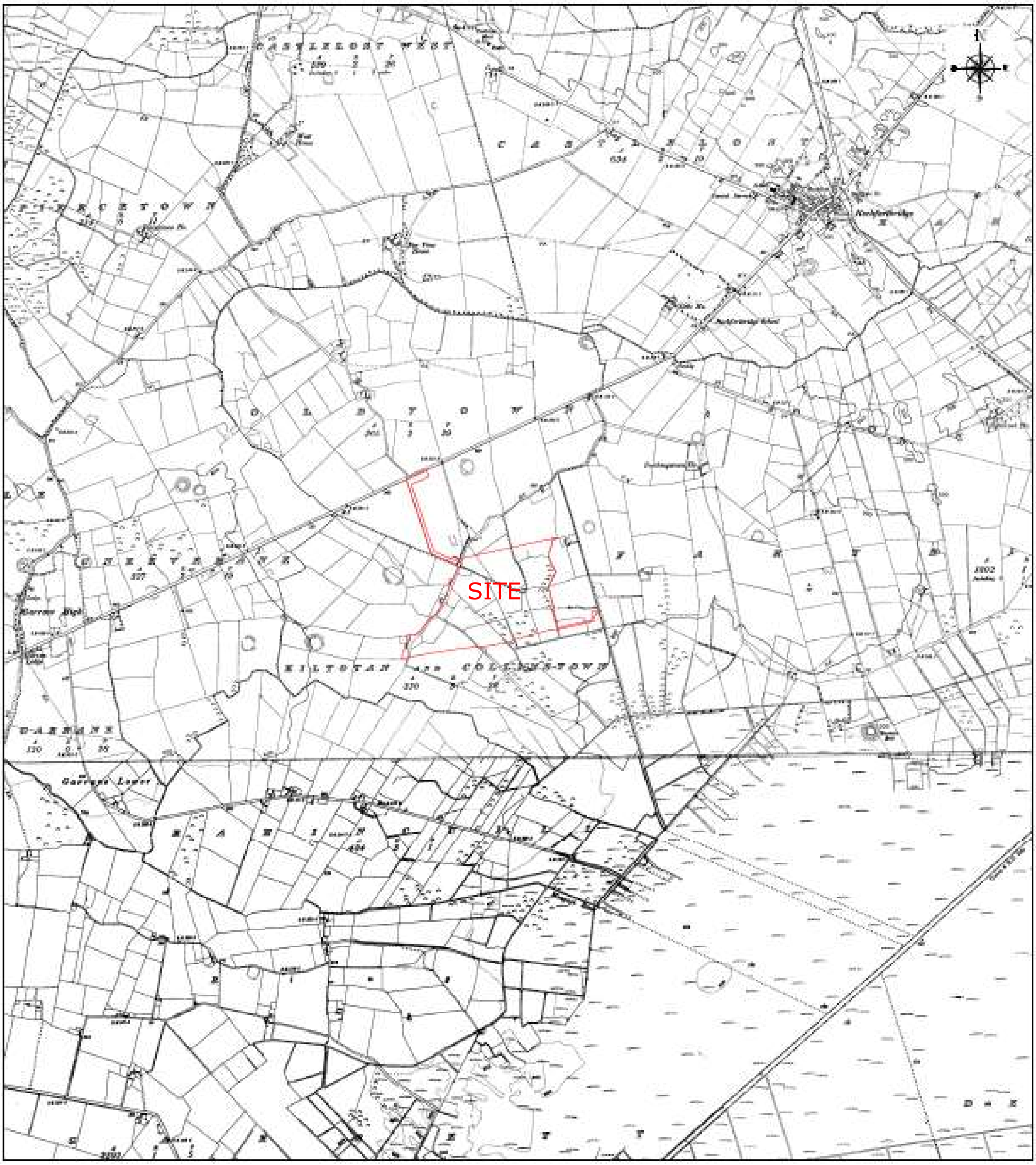
Each of the projects are subject to separate planning applications, i.e., the LEL Flexgen Project, the LEL ESS Castlelost Project and the LEL GIS Castlelost Project. Whilst EIAR is mandatory only in the case of the LEL Flexgen Project, following consultation with Westmeath County Council and given the scale nature and the proximity of the projects to each other, a single Environmental Impact Assessment Report has been prepared for the projects. The potential environmental impacts from each project are assessed individually and cumulatively (with each other and other projects) within the EIAR.

2.2 EXISTING SITE LOCATION

The three projects will be located on a 54-acre site at Kiltotan and Collinstown, Oldtown, Co. Westmeath, which is under the control of the applicant. The proposed development lands are located approximately 2km southwest of Rochfortbridge and 3.5km northeast of Tyrrellspass. The M6 motorway defines the southern boundary of the proposed site and the R446 (N6) provides the proposed main access point to the site and defines part of the northern site boundary. The lands within the development boundary gently rise from the lowest point of 93.5m OD in the southeast close to the boundary with the M6 motorway to 107.1m OD in the west of the site and 105m OD and 107m OD at the position where the lands border the R446. There are areas of extensive cutaway bogs, quarries and forestry located to the south and beyond the M6 motorway. Lands in the general area of the site are predominantly agricultural pastures with some arable lands. A map showing the location of the development lands on which the projects are proposed is presented in Figures 2.1 and 2.2 below.

Figure 2.1 Site Location Map – Development Lands (aerial view)

Figure 2.2 Site Location Map – Development Lands



2.3 PROPOSED DEVELOPMENT

As outlined above, this EIAR provides an assessment of three projects within the development lands at Kiltotan and Collinstown, Oldtown, Co. Westmeath. The EIAR also includes a cumulative assessment of a proposed underground gas pipeline, which will deliver natural gas to serve the LEL Flexgen Castlelost Project. A description of the proposed projects is provided below.

2.3.1 LEL FLEXGEN CASTLELOST PROJECT (PROJECT 1)

The LEL Flexgen Castlelost Project will comprise five (5no.) open cycle gas turbine (OCGT) electrical generating units, totalling approximately 275MWe (megawatts electrical), ancillary plant, buildings and infrastructure. The LEL Flexgen Castlelost project is designed to operate intermittently and provide generating capacity during periods of high demand or when renewable energy cannot meet demand. An OCGT unit consists of a turbine connected to an electric power generator and the five (5No.) turbines are designed to operate independently of each other. The turbines are designed to burn natural gas as their primary fuel. OCGT units are advantageous due to their operational flexibility and can be turned on quickly to provide peak load. Two bunded tanks will be provided on site for the storage of diesel as a secondary fuel in accordance with the Commission for Regulation of Utilities (CRU) requirements. The turbines will be capable of being converted to the combustion of green hydrogen as a fuel in the future which will allow for carbon free and climate-neutral plant operation.

2.3.2 LEL GIS CASTLELOST PROJECT (PROJECT 2)

The LEL Flexgen Castlelost and LEL ESS Castlelost projects will connect to a proposed 220kV Gas Insulated Switchgear (GIS) electrical substation, which will be developed on lands adjoining the projects. The LEL GIS Castlelost Project will involve installation of two (2No.) 220 kV underground circuits forming a connection to the existing Shannonbridge-Maynooth 220 kV overhead line (located within the development boundary) via two (2No.) new mini-interface electrical compounds (each being 19.5m (w) x 29.0m (l)) and two single circuit 23m high towers. The GIS substation itself includes a two storey (17m high) building which will contain electrical switchgear, a battery room, a workshop room and WC. A 36m high communication tower, new entrance, access roadway and all ancillary site development works.

2.3.3 LEL ESS CASTLELOST PROJECT (PROJECT 3)

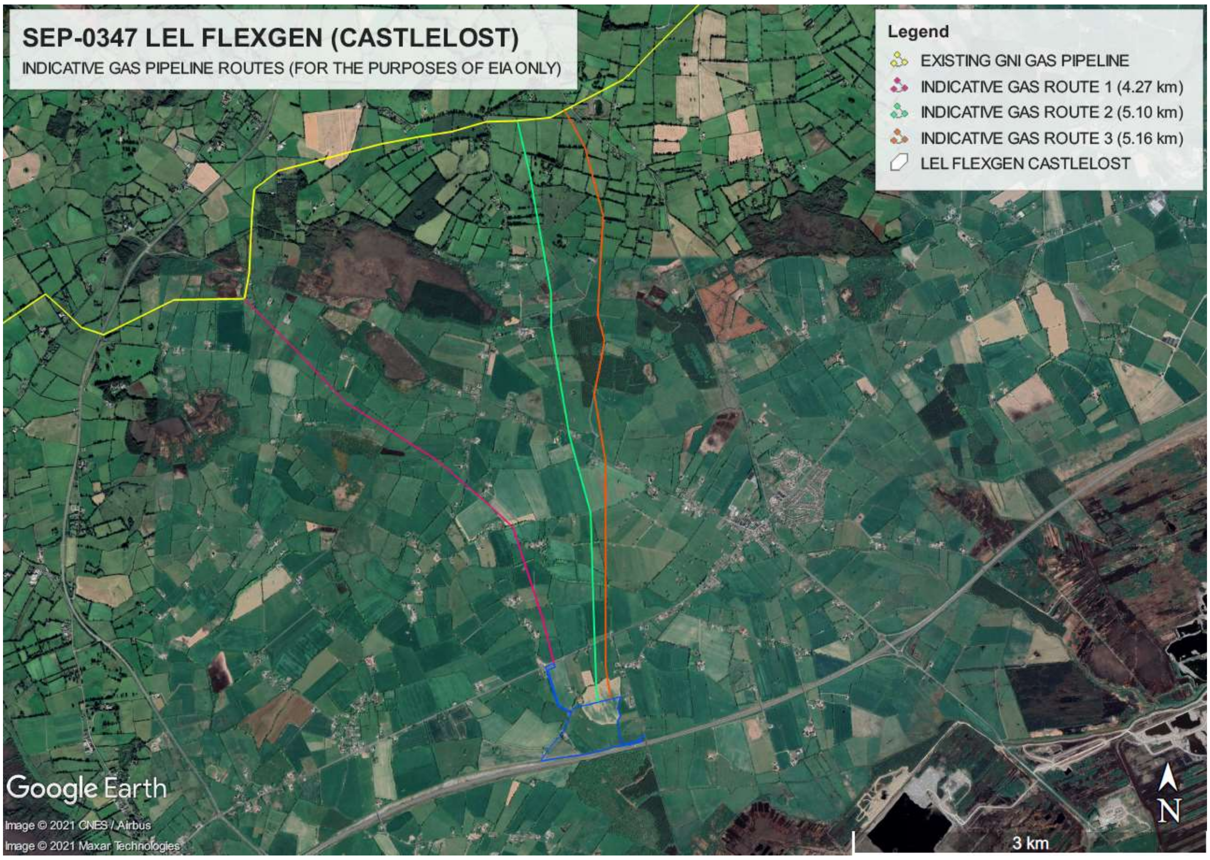
The LEL ESS Castlelost Project plant will comprise an open area battery storage system compound, synchronous condenser compound, IPP (customer) building and all ancillary electrical equipment and development works. The LEL ESS Castlelost Project will store surplus renewable energy generated during periods of low demand and release this to the grid with demand is greater, i.e., it will provide load shifting and ancillary services to the electricity grid.

2.3.4 ASSOCIATED PROJECT – (UNDERGROUND GAS PIPELINE)

An underground gas pipeline, which will deliver natural gas to the AGI within the LEL Flexgen Castlelost Project, will be constructed from the existing transmission pipeline which is located approximately 5km north of the development lands. Gas Networks Ireland (GNI), as the designated competent authority, will separately manage the process of delivering the underground gas transmission pipeline to the proposed AGI (including route selection). As part of this GNI will ensure provision of all necessary rights of way over the working width and access to the works from the public highway.

In terms of the pipeline, it is expected that construction of the underground gas pipeline from the existing transmissions system to the development lands will take approximately 10 months. Depending on the exact route, the pipeline construction route will be approximately 30m in width (subject to final route selection localised constraints). The working width of the selected route provide for installation of a 250mm nominal diameter steel pipe in a trench width of 1.5m and approximate depth of 2.0m (soil cover above the pipe being a minimum of 1.2m). For the purposes of the assessment of all aspects of the project, three indicative gas pipeline routes were selected and assessed as part of EIA works. The three routes are illustrated in Figure 2.3 below

Figure 2.3 Indicative Gas Pipeline Routes



2.4 PROCESS DESCRIPTION(S)

2.4.1 LEL FLEXGEN CASTLELOST

The main components of the LEL Flexgen Castlelost project are as follows:

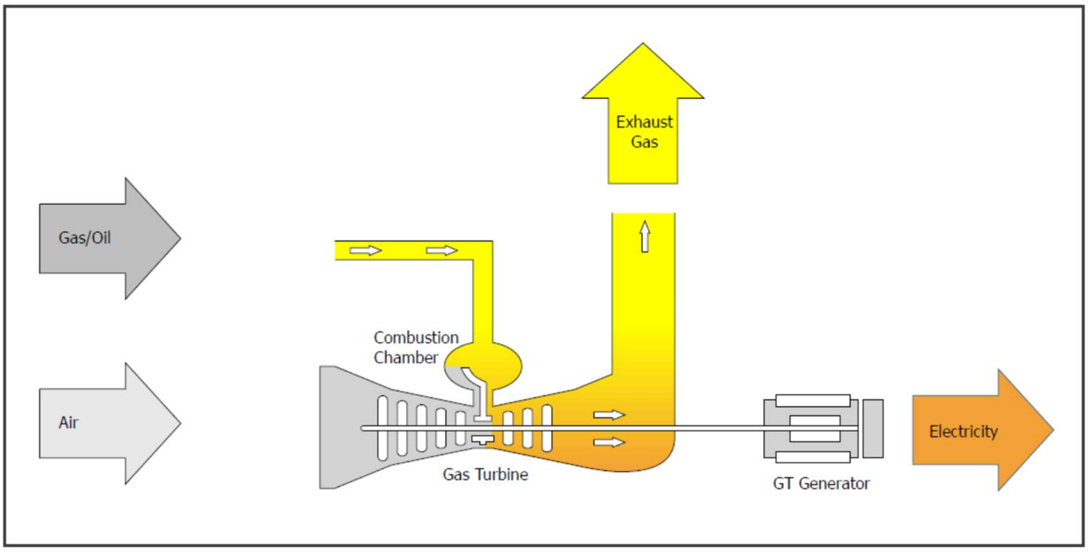
- 5no. open cycle gas turbine (OCGT) modules (each module being c. 1,042sq.m) - complete with lube oil coolers, generators, air intake vents, continuous emissions monitoring technology, selective catalytic reduction units, and c.30m high stacks,
- 1no. two-storey administration building (32.615m long x 13m wide x 9.33m high) which contains a control room, offices, storage, meeting room workshop and double height warehouse,
- 2no. 2,400m^3 capacity bunded secondary fuel storage tanks (each with a diameter of 17.6m and height of 10m),
- a fenced Above Ground Installation (AGI) compound containing gas pipework, a regulator house enclosure, instrument kiosk, boiler house enclosure and analyser kiosk,
- 1no. fuel pump and filter unit,
- 1no. containerised water treatment module (12.192m long x 2.438m wide x 2.896m high),
- 1no. 10m^3 purified water storage tank (2.75m high and 2.27m diameter),
- 2no. containerised black start diesel generators (2.438m wide x 12.192m long x 2.896m high) with integrated stacks (4.755m high),
- 1no. 50m^3 ammonia storage tank (9.360m high and 3.16m diameter),
- Fire pump skid building (9.23m long x 6.98m wide x 4.6m high),
- 1no. 500m^3 capacity water tank (7.597m high x 10m diameter),
- 1no. single storey IPP building (20m long x 10m wide and 6.853m high),
- 1 no. low voltage (LV) bunded house transformer (1.914m high),
- 5no. medium voltage (MV) bunded step-up transformers (6.287m high),
- 1no. high voltage (HV) customer compound containing 2no. bunded transformers (9m high) connected to electrical equipment,
- 1no. air compressor building (8.33m long x 4.73m wide x 4.517m high), and
- all ancillary development including new access road, internal roads, 2.65m high fencing and gates securing the main reserve generator site, and associated engineering works to provide for the connection of site services and for the treatment and disposal of foul wastewater and surface water.

The development includes for construction of a new entrance to the site from the R446 with associated signage and an access road from the new entrance to the reserve gas-fired generator. The development also includes for the demolition and removal of a farm shed, farm workshop, feed silo and a silage clamp.

2.4.1.1 OCGT units

Combustion turbines in open cycle (or simple cycle) configuration utilise a single thermodynamic cycle called the Brayton cycle. In the Brayton cycle, the working fluid (e.g., air) is compressed, heated, expanded through a turbine to turn the shaft (rotor) and then be discharged. The shaft drives the generator to produce electricity and the compressor to provide a continuous source of compressed air to the combustor. The combustion turbine exhaust gas, at slightly above atmospheric pressure, flows through an emissions control system before discharging into the atmosphere.

Figure 2.4 Open Cycle Process



OCGT units are advantageous due to their operational flexibility and can be turned on quickly to provide peak load. The LEL Flexgen Castlelost reserve generator is designed to get to full load in less than 10 minutes. OCGTs exhaust residual heat to atmosphere at a temperature of approximately 544°C, i.e., unlike combined cycle gas turbines (CCGTs) where exhausted heat is recycled to generate steam and ultimately additional electricity. The OCGT units have a typical energy efficiency of 38-41%.

The main emissions from the combustion of natural gas in the OCGT units are oxides of nitrogen (NO and NO_2, collectively referred to as NOx), carbon monoxide (CO), and particulate matter (PM). The proposed OCGT units are fitted with dry low NOx combustion (DLN), a technology that uses staged combustion and lean-premixed fuel-air mixtures. Each OCGT unit is also fitted with "back-end" exhaust gas clean-up technology in the form of a selective catalytic reduction (SCR) unit. In the SCR process, ammonia is injected into the gas turbine exhaust gas stream. It reacts with nitrogen oxides (NOx) in the presence of a catalyst to form molecular nitrogen and water. Particulate emissions (PM_{10} and $PM_{2.5}$) is controlled through the use of best combustion practices and the sole use of natural gas fuel. Best available control technology for particulate emissions from combustion sources is the use of natural gas. In addition, particulate emissions would be further limited by the use of a high-efficiency inlet air filtration system, which would remove particulates in the ambient air prior to entering the combustion turbine generator processes. The exhaust stacks will be fitted with continuous emissions monitoring systems which continuously sample the stack concentrations of controlled emissions to assure that the exhaust parameters remain within permitted parameters (EPA licence). Following air dispersion modelling it was determined that these should be c.30m in height to facilitate emissions dispersion. Further details on the heights of structures at the site are presented in Chapter 6 Landscape and Visual Impact Assessment.

2.4.1.2 Secondary Fuel (gas oil)

The proposed OCGT units are dual fuel units which, in accordance with CRU requirements, are capable of also operating on gas oil (diesel). In the highly unlikely event of an outage to the natural gas supply and its availability on site, the LEL Flexgen Castlelost plant needs to be able to run for 72 hours continuously on secondary fuel. Therefore, the project design includes for storage of secondary fuel in two above ground tanks (capacity of 4,800m^3) within a bunded structure enabling the plant to run on at least 90% of rated capacity for three days.

2.4.1.3 Black Start Generators

The secondary fuel store will also be used to serve two black start generators. The black start generators are provided to mitigate a system wide electricity outage. In this instance the black start generators are provided to serve house load so that the OCGT units can be started-up and fired and quickly provide electricity to the transmission system. One OCGT unit would be fired first (on gas) and this would then provide electrical output (including house load or parasitic load) and assist with starting the other 4no, OCGT units, if required.

The plant itself will consume approximately 10-15MW of the total output (house load) depending on operating configuration. Power is required to power auxiliaries such as gas compressors, pumps and fans, cooling units, control systems, and general facility loads including lighting, heating, and air conditioning.

2.4.1.4 Above Ground Installation (AGI)

Natural gas will be supplied from Bord Gáis Network's (BGN) at a minimum guaranteed pressure of 19 bar gauge (bar(g)) and 15°C. The design maximum pressure of the BGN gas pipeline is 70 bar(g). The pressure of the gas will be conditioned and regulated to approximately 35 bar(g) in the proposed on-site AGI.

2.4.1.5 Transformers

Transformers will be located outdoors and will be the oil immersed design type. All transformers will be bunded and the high voltage (HV) transformers will be blast protected. It is proposed to install five medium voltage (MV) step-up transformers, one for each turbine generator, as part of the proposed development. A low voltage (LV) house transformer will be located adjacent to the customer switchgear building (IPP building).

2.4.1.6 Administration /Control Room

From the control room, the plant operator monitors and operate the facility, via the plant's 'Distributed Control System'. The system gives operators both audible and visual signals to keep them informed of plant conditions at all times and to determine when preventative maintenance is required.

The main internal road serving the development from the R446 to the LEL Flexgen Castlost project will be tarmac paved and the ground around external plant components such as the AGI, gas receiving, stock yard and HV transformer compound will be covered with stone chippings to facilitate natural drainage.

2.4.1.7 Process Wastewater

No significant process wastewater will be generated during the operational stage of the LEL Flexgen Castlelost Project. Any process effluent arising will be minimal (e.g. waste oils during maintenance activities) and will therefore be contained locally prior to be disposed of at an appropriately licensed facility.

2.4.1.8 Chemicals Storage

Small volumes of chemicals (other than ammonia and secondary fuel) will be stored on site during the operational stage of the project. These chemicals (stored in volumes of less than 1,000 litres) will be secured and stored in a designated bunded area within the administration /warehouse building (e.g., lubricants, coolant oils for transformers and chemicals for the water treatment (demineralisation plant). Depending on the technology type used (e.g., reverse osmosis or ion exchange) water demineralisation, the type of chemicals will vary. However, given the technology (DLE) and low demand requirements of demineralised process water required, it is expected that <1,000 litres of each of sulphuric acid (96%) and sodium hydroxide (30%) volumes will be stored within the administration /warehouse building.

2.4.1.9 Fire Fighting Water

In case of fire the firefighting water will be supplied to the system (ring main) via the above-ground water storage tank (500m^3 capacity). In the event of a fire, firefighting wastewater will drain and be held in below ground tank. The contaminated water will be subsequently tested and appropriately disposed of.

2.4.1.10 Surface Water Treatment

Large external areas/compounds at the site will be surfaced with stone to allow rainwater to percolate to the underlying soils (e.g., HV transformer compound, stock yard and AGI).

Surface water collected from impermeable areas will be delivered to the site stormwater drainage system. Surface water will be routed via the fire wastewater retention tank and an oil/water interceptor which provides for attenuation before being infiltrated to ground. During times when chemicals are handled, isolation valves will be closed. This is to assure that accidently spilled chemicals do not enter the storm water drain. The isolation valves will only be opened again once it has been assured that contamination of the downstream system can be excluded. The drainage system on site will be further developed as part of detailed design stage works.

2.4.1.11 Demin Water Treatment Unit

A package solution for the treatment of water to produce demineralised water will be located on site. The OCGT technology proposed is dry low emission (DLE) and therefore process water requirements are very low. A limited volume of demineralised water will be required.

2.4.1.12 Foul Wastewater

Foul wastewater, which comprises wastewater other than process wastewater and surface water, will be treated in a proprietary package treatment system and infiltrated to ground.

2.4.2 LEL ESS CASTLELOST

The LEL ESS Castlelost Project comprises two storage technologies which are designed to provide a complete suite of electricity grid system services. An electrochemical battery (vanadium redox flow battery) positioned within a secure outdoor compound and synchronous condenser positioned within a building and within a secure compound. The LEL ESS Castlelost technologies will be electrically connected to the electricity transmission system via an IPP building (containing medium voltage (MV) switchgear) and high voltage (HV) transformer.

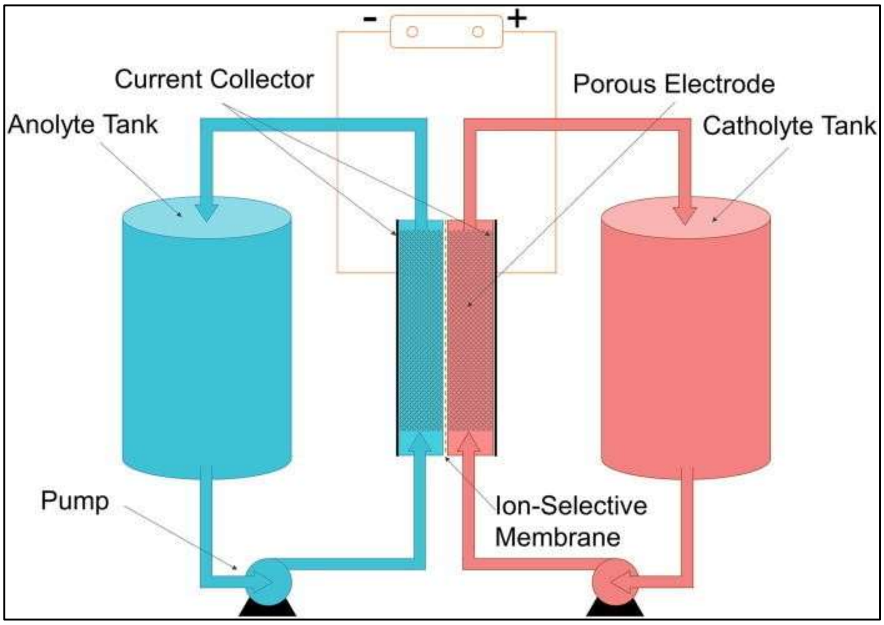
The main components of the LEL Flexgen Castlelost project are as follows:

- An outdoor battery storage system compound containing a series of battery clusters and power control system (PCS) enclosures (or medium voltage power station (MVPS)). A single battery cluster (or module) comprises
- A synchronous condenser compound containing a horizontal synchronous generator positioned within a building (30.0m long x 18.0m wide x 12.150m high), control modules (12.192m long x 12.486m wide), bunded transformer, and an air-cooling module.
- 1no. IPP (customer) building containing MV switchgear (40m long x 10m wide x 6.853m high).
- 1no. high voltage (HV) customer compound containing 1no. transformers (9.0m high) within a bund and connected to associated outdoor equipment.

Vanadium Redox Flow Batteries (VRFB) are a form of electrochemical storage which release energy through a reaction between two chemical compounds dissolved in electrolytes. Unlike conventional batteries, VRFB batteries store the electrolytes in separate tanks which flow into a cell and the ion-exchange occurs through a membrane. The energy capacity of the battery is a function of the volume of electrolyte, therefore, by changing the size of the tanks the energy capacity of the system can be increased or decreased. The proposal includes for the placement of 264 modules each holding 136 tonnes of vanadium electrolyte solution. The electrolyte solution is not a surface water pollutant. Each tank module has secondary containment and is fitted with leak detection equipment in three position which provides information to the battery management system. The leak detection alarm system notifies the operator automatically ceases pumping of liquid electrolyte in the module.

The power rating of the system depends on the number of modules and corresponding power converters. As the power and energy capacity of a VRFB are decoupled, there is an advantage over lithium ion (Li-ion) systems regarding the flexibility of the power to energy ratio. This flexibility allows for a modular design which can be scaled and adapted as required for a range of operating requirements. Additionally, VRFB have advantages over Li-ion particularly with regard to energy capacity degradation and lifetime. Flow batteries are typically based on two aqueous electrolytes serving as either the anolyte or catholyte, with different charges that are pumped from separate storage tanks across a membrane in a fuel cell.

Figure 2.5 Vanadium Redox Flow Battery



Synchronous condensers are synchronous electrical machines attached to the electricity grid. The machine will be brought up to speed with an electrical motor attached or via a frequency convertor. When the machine is synchronised with the electricity grid it will act as a motor, turned by the energy taken from the grid. Because of the nature of the synchronous machine, reactive power can be consumed and generated by controlling the excitation of the rotor. The synchronous condenser compound includes a hall which will contain the condenser unit. This building will be portal steel frame structure. The compound includes an air-cooling unit and power control modules which will arrive to site preassembled for immediate placement on site.

2.4.3 LEL GIS CASTLELOST

The proposed development will comprise:

- A two storey (17m high) GIS building secured within a palisade fenced compound,
- Two new single circuit 23m high towers along the existing 220kV single circuit overhead lines which traverses the site,
- Two new mini electrical interface compounds, which will facilitate connection of the overhead 220kV single circuit overhead lines to the GIS substation via two undergrounds circuit transmission lines,
- Communications tower (36m high) and lightening masts
- Construction of a new entrance to the proposed GIS substation and associated site works.

The proposed construction of the LEL GIS Castlelost electrical substation conforms with the identified need[5] for reinforcement of the 220kV transmission infrastructure in the Midlands. The GIS substation will allow for the connection of the LEL Flexgen Castlelost and LEL ESS Castlelost Projects to the electricity transmission system.

2.4.4 UNDERGROUND GAS PIPELINE (ASSOCIATED PROJECT)

Following selection of the preferred route, the main stages associated with construction of the pipelines are as follows:

- Setting out the route,
- Surface stripping
- Excavation
- Pipelaying
- Reinstatement of the working width

The construction phase of the project will incorporate all necessary precautions to secure the efficient protection of all land, streams, waterways, watersheds and reservoirs, against pollution which may have a detrimental impact to persons, flora or fauna. The water flow in all open drains, streams and other watercourses which may be affected by the works shall be fully maintained throughout the Construction period. Banks of open drains, streams, rivers and canals disturbed by the works will be reinforced and stabilised as required and to the satisfaction of the project engineer. Where the pipeline crosses below an open drain, ditch or stream, it will be protected, and the pipeline will be placed at such a depth as will provide a cover of 1.6 metres from the true clean bottom of the drain, ditch or stream to the top of the pipe. In areas of high-water table, marsh or bog it may be deemed necessary to employ anti-buoyancy means to prevent flotation of the pipeline after backfilling.

The works will be designed to ensure that all catchment areas, springs, wells, streams etc. which provide a water supply to local habitations and animal water supplies, etc. are safeguarded and protected from pollution or obstruction during all pipeline construction works and operations.

Depending on the design and particular requirements associated with location, GNI will employ either open cut and /or trenchless techniques for the pipeline project. Should selected pipeline route encounter rock-like material, the construction project will remove the material using pneumatic or hydraulic hand tools or ripping /wedging techniques.

[5] Refer to Eirgrid Report "Shaping our Electricity Future".

In terms of the pipeline, it is expected that construction of the underground gas pipeline from the existing transmissions system to the development lands will take approximately 10 months. Depending on the exact route, the pipeline construction route will be approximately 30m in width (subject to final route selection localised constraints), which will provide for installation of a 250mm nominal diameter steel pipe in a trench width of 1.5m and approximate depth of 2.0 (soil cover above the pipe being a minimum of 1.2m). The overall width of the construction route allows for safe the passage of two construction vehicles and material storage sites. The working width may be increased at river or stream crossing and may be reduced at tree lines. Mature trees will be preserved and protected and will only be removed where absolutely necessitated and approved by the scheme engineer. The route of the pipeline will be fenced for the construction phase to prevent straying livestock onto or along or across the construction site.

The type of construction machinery which will be used for the pipeline project will include.

- Excavators
- Grading plant /equipment
- Tractor /tipping trailers
- Dump trucks
- Cranage
- Steel cutting tools
- Welding equipment and apparatus
- Non-destructive testing equipment -for the testing of welds in accordance with EN 12732

2.5 DESCRIPTION OF CONSTRUCTION AND COMMISSION STAGES

This section details the construction works associated with the LEL Flexgen Castlelost Project, LEL ESS Castlelost Project and the LEL GIS Castlelost Project. The section outlines general construction associated mitigation measures to be implemented to ensure that potential environmental impacts are minimised. The design and undertaking of construction work associated with the connection of the LEL Flexgen Castlelost Project to the gas network will be managed by Gas Networks Ireland (GNI). It is envisaged that construction works associated with the gas pipeline will be undertaken over an estimated 10-month period.

Subject to obtaining planning permission, it is envisaged that the LEL GIS Castlelost Project and the LEL Flexgen Castlelost Project will be constructed over an 18–25-month period commencing October 2022. Commencement of construction of the LEL ESS Castlelost Project would commence in March 2023 and would occur over an estimated 23-

month period. Therefore, development of the three projects at the site is likely to occur over an estimated 28-month period.

After the estimated 28 month-month construction period, it is expected that all projects will be fully constructed, commissioned and capable of operating as designed. The specific details of the construction programme are not currently known as such this programme will be developed under EPC contract as part of the detailed design phase. It is therefore difficult to assess the staffing and delivery levels for the development. However, it is considered that the design and proposed layout of projects has developed sufficiently to discuss the potential environmental impacts of proposed construction methods. An estimate of construction traffic volumes has been made for a site of this size and typical works associated with a development of this type are described.

The timing of the commencement of construction is subject to planning, design, tendering and ecological constraints. Any works associated with site clearance and removal of soils and internal hedging would be seasonally limited to mitigate against any adverse ecological affects. The impact of construction activities on Biodiversity and Roads and Traffic are assessed in Chapters 5 and 12, respectively. A construction environmental management plan will be developed and implemented for the construction phase of the development. This document will provide a framework under which construction activities, which have potential for environmental impact (e.g., generation of dust, ecological impacts, surface water discharge, etc.), will be managed. Mitigation measures as outlined in the EIAR shall be included within this plan. An indicative construction schedule for each project relative to each other is outlined below subject to the granting of statutory consent for each development separately. It should be noted that the timing and phasing of projects and activities are approximate and are indicative rather than a definitive programme of works.

Table 2.1 Indicative Construction Programme

Year	2022			2023												2024												2025	
Month	**10**	**11**	**12**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**01**	**02**
LEL GIS Castlelost	**E&P**			**C&S**						**M&E**						**C&T**													
LEL Flexgen Castlelost	**E&P**					**C&S**							**M&E**								**C&T**								
LEL ESS Castlelost						**E&P**			**C&S**							**M&E**									**C&T**				

Notes:

1. The construction timelines are for each project are indicative and will be finalised at detailed design stage of the projects.
2. In relation to LEL GIS Castlelost Project, timings of certain tasks /works will be subject to system outage planning by Eirgrid and EBS Networks.
3. Construction of the gas pipeline is non-contestable works and will be carried out by GNI.
4. E&P = Site Evaluation and Preparation (Works)

   C&S = Civil & Structural (Works)

   M&E = Mechanical & Electrical (Works)

   C&T = Commissioning and Testing (Works)

Equipment to be used during the construction of the facility will be typical for a project of this scale. In general, the following machinery will be used:

- Tracked excavators
- Vibrators Rollers
- Trucks
- Mobile Crane
- Backhoe
- Grader
- Breakers
- Generators /pumps
- Dump trucks /dumpers
- Hoists
- Concrete pump – lorry mounted
- Loaders
- Compressors
- Rollers
- Road surfacing plant
- Delivery vehicles for concrete, steel and other construction materials

Heavy vehicle movements to the site are expected to consist predominantly of plant and material deliveries. The majority of machinery associated with the construction phase is likely to remain onsite for the duration of the construction process. Therefore, the traffic associated with heavy plant will be limited to their delivery and removal, with the intervening period comprising internal movements within the site.

The intensity of traffic will vary over the course of the construction programme. The values referenced are only anticipated during peak periods and therefore representative of the worse-case scenario

It has been estimated that during the course of an average day during construction, approximately 30 trucks will access the site to deliver materials. These will be spread over the course of the working day.

2.5.1 DURATION AND PHASING

2.5.1.1 Phase 1: Site Evaluation and Preparation

Prior to commencement of construction, geotechnical investigations such as trial pits and C.B.R. tests will be conducted to verify foundation designs and road construction. All investigations required prior to enabling works shall be carried out in accordance with BS 5930 (Code of Practice for Site Investigations).

There are no areas of land to be acquired prior to construction, as the applicant has put in place agreements with the relevant landowners with respect to the entire development lands. This phase of construction will not commence until the main construction contract is awarded and will initially comprise, fencing, excavation, re-grading and berming /soil deposition. The site clearance works will be undertaken in accordance with best practice. Removal of any bird habitats will be undertaken outside the bird breeding season to mitigate disturbance to birds. Mitigation measures to avoid and limit impact to biodiversity include implementation of an environmental management plan which will address water run-off, noise and dust generation, implementation of a suitable landscaping strategy to compensate for habitat loss and to benefit the wildlife of the local area, retention of hedgerows and treelines along the boundary of the site, etc. Also, site clearance will proceed only after cognisance is made to the ecological mitigation measures as detailed in Chapter 5 of the EIAR (Biodiversity).

Where cutting or excavation is carried out, this material will then be reused in areas of the site where fill is needed or in areas requiring landscaping. If any additional material is required this will be imported into the site in a safe and controlled manner, so as to minimise the potential for nuisance and disturbance.

LEL are committed to ensuring that all the mitigation measures are implemented in full. Haul roads, internal construction site roads, construction compound, main drainage runs, temporary car-parking and staff facilities will also be constructed during this phase. Such site preparation works are expected to be carried out within the first 6 months of the projects commencing.

Site preparation and enabling works will also involve the site set up by the building contractor, which will include provision of a site construction compound which will include the following:

- Site Office,
- Site Facilities (canteen, toilets etc.),
- Office for Resident Engineer,
- Secure compound for the storage of all on site machinery and materials,
- Carparking,
- Permanent/temporary fencing,
- Site Security.

Construction traffic will enter the site via the proposed access road which routes south from the R446 to the development lands. A site compound will be installed in the south-eastern area of the site. Traffic related issues are further discussed in Chapter 12 of the EIAR.

2.5.1.2 Phase 2: Civil and Structural Works

This phase will comprise the construction of the foundations and buildings (e.g., IPP buildings, administration building, GIS building), below ground pipework and conduits for services, bunds, internal roads, drainage works, and infrastructural works completion. Large items of plant /equipment will be installed during this phase.

2.5.1.3 Phase 3: Mechanical and Electrical Works

Mechanical and electrical works include placement of plant and machinery, transformers, tanks, skid mounted structures and enclosures, above ground pipework, wring and cabling, etc. The individual project plant components will be delivered to the site by the preferred supplier and will be installed in accordance with manufacturer requirements. All pipework and ducting will be assembled on site.

2.5.1.4 Phase 4 Installations and Commissioning

This phase will comprise the installation and testing of mechanical and electrical equipment. During this phase final completion and finishing works will be carried out in anticipation of handover of the projects to the project owner /client. It should be noted that the above is indicative only and may be subject to variations on consent from the planning authority and also to final schedule agreement with the main contractor.

2.5.2 EMPLOYMENT

Employment levels across the project will vary depending on the construction programme and the extent of activities occurring on the site. It is expected that during peak activities, there will be up to 150 construction workers at the site for the LEL Flexgen Castlelost Project, 100 construction workers for the LEL ESS Castlelost project and 50 construction workers for the LEL GIS Castlelost Project. It is anticipated that during peak construction periods, approximately 180 vehicles will enter the site in the morning and leave the site in the evening. This is based on vehicle occupancy of two. An assessment of the likely traffic volumes which may arise during the construction and operational phase are discussed in Chapter 12 of the EIAR.

2.5.3 ACCOMMODATION/FACILITIES

The relevant statutory requirements will be provided for all workers on the construction site including:

- Canteen facilities and drinking water supply
- Toilet, wash up and locker facilities and hot water
- Drying room
- Car parking for workers
- First Aid Office
- Site Engineers & Resident Engineers offices
- Site offices for Contractors
- Secure site compounds

2.5.4 CONSTRUCTION OPERATION HOURS

Subject to agreement with the planning authority, it is anticipated that the following times will constitute the standard working hours on the construction site.

- Monday to Friday 07:00 to 19:00
- Saturdays 08:00 to 16:00 pm
- Site closed on Sundays
- Site open on Bank Holidays as per Saturdays

Working hours may vary slightly depending on weather conditions and daylight hours during winter months. Heavy construction activities will be avoided where possible outside the normal working hours outlined above.

2.5.5 CONSTRUCTION TECHNIQUES

The construction techniques used will be standard and similar to those that would normally be associated with large industrial projects of this nature with both building and technology installation elements and a large civil engineering element.

2.5.6 MATERIALS

In so far as possible, construction materials will be from local sources to support the local economy and minimise environmental impact associated with vehicle emissions. All imported material that will be used on site will be retrieved from approved sources.

The construction of surface water systems will be an important element of the project. Temporary localised settlement ponds and interceptors (where necessary) will be constructed during the initial stages of the contract mitigating against adverse impacts on existing receivers.

2.5.7 EXTENSION OF INFRASTRUCTURE

Services such as ESB and Telecom will be brought to the dedicated construction compound from the nearest available point. Potable water for the development will be supplied from the on-site well which is currently serving the farm and farm residence. Temporary sanitary accommodation will be provided on site until proposed foul effluent management packages are installed. All domestic effluent generated on site will be discharged to temporary sewage containment facilities prior to transport and treatment off site.

2.5.8 WASTE MANAGEMENT

During the construction phase both solid and liquid waste will be produced at the facility. Waste oils, solvents and paints will be stored in a temporary bunded area prior to transport off site by a licensed contractor. All wastes arising from construction of the proposed development will be managed in accordance with the Waste Management Acts 1996, as amended.

The onsite farm outbuilding, farm sheds, feed silo and silage clamp will be demolished and removed from site in accordance with best practice. Works will involve careful decommission and removal of all farm structures at the site. Anticipated wastes which will be generated include soils, bricks and blocks; concrete and reinforced concrete; timber; metal sheeting and steel. Materials arising from this process will be recycled /disposed of at authorised waste management facilities.

Designated skips and receptacles will be provided on site for all recyclable wastes. The appointed waste contractor will collect and transfer the recyclable wastes as skips are filled. The non-recyclable waste will be transferred by an authorised waste collector to licensed facilities (e.g., canteen waste, general waste). Numerous licensed waste contractors are available in the area and will be obtained from the waste management authority listing.

It is not envisaged that there will be any spoil materials arising from construction, as all the excavated soil will be re-used as part of the construction process (formation of berms and landscaping). All other solid waste generated during the construction phase will be adequately segregated and stored prior to transfer to an authorised facility for recovery/recycling/disposal.

2.5.9 FENCING AND SECURITY

Secure fencing will be erected around the development sites and temporary fencing will be erected around the construction compound. All on site machinery and materials will also be stored within the fenced compound.

2.5.10 NOISE, VIBRATION AND DUST

Dust emissions during the construction period have been detailed under temporary environmental protection measures. A detailed construction environmental management plan (CEMP) will be prepared and put in place for the construction of the development. This will be developed by the appointed contractor and will incorporate all mitigation measures detailed in the EIAR and conditions (in the event of successfully obtaining planning consent) which may be specified in the interests of proper planning, sustainable development and environmental protection. This will include measures and trigger values to mitigate any potential impacts to nearby receptors.

2.5.11 TEMPORARY ENVIRONMENTAL PROTECTION MEASURES

During the construction stage site construction roads will be sprayed with water during dry periods to mitigate against the formation of dry dust particles. Excavated materials stored or moved on site could lead to the formation of airborne dust particles during dry weather periods. Water suppressants will be used during these dry weather conditions.

The landscaping areas proposed for the facility will be constructed and planted at the earliest opportunity thus limiting the potential for off-site migration of airborne dust. Where temporary stockpiles are required, the material will be stored in designated areas and will be covered with tarpaulins and/ or regularly dampened during dry weather periods.

All potentially polluting substances such as oils, chemicals and paints used during construction will be stored in designated storage areas. These will be bunded to a volume of 110% capacity of the largest tank/container within the bunded area with all filling and draw-off points fully located within the bunded area. Drainage for the bunded area will be diverted for dedicated collection and safe disposal.

As stated above all domestic effluent generated on site will be discharged to temporary sewage containment facilities prior to transport and treatment off site.

Temporary settlement ponds and interceptors will be constructed as necessary during the early stages of construction mitigating against silt laden run-off to the existing drainage network.

Prior to commencement of development a construction quality assurance plan (CQA) will be jointly prepared by the contractor and developer. Written approval of the CQA will be sought from the planning authority prior to site development.

Good housekeeping and facility management during the construction period will ensure that there will be no negative environmental impacts from the construction of the proposed facility.

As stated previously in this section, the majority of machinery associated with the construction phase is likely to be onsite for extended periods of time. The traffic associated with these will therefore be limited to their delivery and removal, with the intervening period involving internal movements within the site. The impact of these on the surrounding road network is therefore expected to be minimal and infrequent.

2.6 DECOMMISSIONING

The proposed projects are expected to be operational for at least 25 years or as long as is required by grid infrastructure. Given that the LEL GIS Castlelost Project and the GNI AGI will become grid assets, these elements are not considered the utility operator will take ownership when constructed.

In terms of the LEL Flexgen Castlelost Project, once operational the site will be subject to the requirements of an EPA Industrial Emissions (IE) Licence. At the end of the useful life of the facility, the IE Licence will require that the site be returned to its pre-development status. In line with implementing the Environmental Liability Directive (2004/35/EC), which provides a framework of environmental liability based on the *"polluter pays"* principle, the proposed development will include a condition under a *"Statement of Measures"* condition as outlined below:

> *"The licensee shall as part of the AER provide an annual statement as to the measures taken or adopted at the site in relation to the prevention of environmental damage, and the measures in place in relation to the underwriting of costs for remedial actions following anticipated events (including closure) or accidents/incidents, as may be associated with the carrying on of the activity."*

Given the modular nature of the LEL Flexgen Castlelost and the LEL ESS Castlelost Projects, it is expected that decommissioning will occur in accordance with the following main steps:

- An audit will be conducted to assess and provide for preparation of a decommissioning management plan. This will include the assessment and evaluation of plant and equipment which may have resale value or that which should be scrapped or recycled.
- All services connected to the site will be terminated. These will include electricity water, storm and foul, communications, and gas.
- All waste will be removed by a permitted contractors to suitably licensed facility.
- All plant and equipment will be dismantled.
- All electrical cabling and pipework will be removed and recycled.
- Battery modules will be decommissioned.
- Foundations will be broken down to ground levels and any surplus material will be removed from site.
- Depending on the future use of the sites, the internal hardstands and roadways may or may not be demolished. If required, all internal hardstanding's and roadways will be broken up with concrete and hardcore material recovered for onsite crushing and recover for further use as filling material elsewhere. Any steel within these areas will be recovered for recycling.
- Again, depending on the future use of the site, the site fencing and gates may or may not be removed. If they are removed, they will be removed carefully and depending on condition will be reused elsewhere.
- Ground levels will be graded and left level.
- On completion of full demolition, the site will be re-profiled and contoured to match the surround areas. Grass will be sown to return the area back to grassland as per its original use prior to completion.

2.7 DESCRIPTION OF OPERATIONAL STAGE

The LEL Flexgen Castlelost Project will operate as a reserve gas-fired generate. This means that the plant will only run during periods of high demand or system instability. The plant will be operated remotely. However weekly engineering and maintenance inspection visits to the plant will be carried out. When called upon, it is expected that the plant will respond and reach full load within 10 minutes and generate electricity for export to the grid. The LEL Flexgen Castlelost Project will require an industrial emissions licence from the EPA (i.e., it falls under a class of activity (*"Combustion of fuels in installations* *with a total rated thermal input of 50 MW or more*") as outlined in the first schedule of the EPA Act 1992, as amended.

The LEL ESS Castlelost Project will operate unmanned and controlled remotely. The storage systems will respond to system demand and provide up to 8 hours of electricity daily along with a wide range of system services. The LEL ESS Castlelost Project is not a class of activity under the First Schedule of the EPA Act 1992, as amended.

Upon handover after the Commissioning and Testing Phase, the plant operators will serve the LEL Flexgen Castlelost and LEL ESS Castlelost Projects with suitably qualified and technically competent staff who will be responsible for maintenance of the plant. Employees will cover a broad range of services including safety, engineering, technical, security, maintenance and administrative support staff. Subcontracted maintenance staff will also be required at critical times such as an annual shutdown period.

The plant will be operated in accordance with procedures which will be prescribed in management systems associated with the site operations, i.e., quality, health and safety, energy and environmental.

2.8 CONSIDERATION OF ALTERNATIVES

2.8.1 DO NOTHING

Recently, the CRU and Eirgrid has issued warnings to Government about the risk of blackouts. Ongoing system analysis shows that the all-Ireland capacity margin is insufficient, particularly when renewable generation is at a low output and support is not available. This has been exacerbated in recent times due to the closure of the peat-fired power stations and increases in system demand. In the event of system emergency conditions or imminent shortfall of MW capacity, the Single Electricity Market Operator (SEMO) issues colour-coded alerts. Depending on seriousness of events, alerts are issued to informing stakeholders of the possibilities of failure in meeting the power system demand, frequency or voltage departing significantly from normal, shutdown of users, or shutdown of the power system (partial or full). As of early September 2021, SEMO has issued seven system alerts to warn of capacity shortages on the electricity grid, compared with just 11 alerts over the previous 10 years[6].

The proposed energy projects at Castlelost provide a mix of technology solutions designed to provide a wide range of grid support services and to assist with the transition to a low carbon economy. In the absence of the proposed LEL Flexgen Castlelost and LEL ESS

[6] https://www.businesspost.ie/energy/electricity-system-amber-alert-issued-this-morning-f772c7e6

Castlelost Projects, integration of renewable energy generators will be constrained, and decarbonisation of the generation portfolio will be inhibited, thereby impeding Ireland's commitment to meet its EU and national emissions targets. In the absence of the proposed LEL GIS Castlelost Project, the LEL Flexgen Castlelost and LEL ESS Castlelost Projects once constructed would not be able to directly connect to the electricity transmission system and export power to the grid within the overall development lands boundary at Castlelost.

2.8.2 ALTERNATIVE TECHNOLOGIES

A mix of technologies were chosen for the LEL Castlelost projects to provide a comprehensive range of grid products and to assist with the transition to a low carbon economy. This EIAR assess the three projects proposed. An assessment of the alternative technologies considered to satisfy system requirement is provided below.

2.8.2.1 LEL Flexgen Castlelost

Open cycle gas turbine (OCGT) technology, also referred to as simple cycle gas turbine technology, was chosen for the LEL Flexgen Castlelost Project to address the current emergent needs for support generation capacity reflected by the T-3 Capacity Auction, and the closure of peat and coal plants in Ireland. The chosen technology type will be capable of providing predicable dispatchable power and a range of "on-state" and "off-state" electricity system services which will support and complement the growing mix and integration of renewable (non-dispatchable) generators (e.g., solar and wind).

In Ireland, electricity system reserve generators (or peaking plants) are run only when there is a high demand for electricity. Unlike baseload power plants (such as combined cycle gas turbines), peaking plants operate in standby mode when not in use and are called to run by the grid operator when there is a high demand to supply electricity. Historically the portfolio of peaking plants which exist in Ireland are fuelled on diesel (gasoil) only. However due to the shift and transition to a low carbon and sustainable economy, the technology is not considered suitable as emissions from diesel only engines do not comply with the Clean Energy Package limits.

Therefore, in terms of designing a suitable peaking plant to serve the capacity market, the assessment of technology options recommended open cycle gas turbine as the preferred technology solution. The OCGT option also needed to be commercially proven, capable of operating on distillate oil as a secondary fuel, comply with environmental requirements and ramp up to full load from cold start in less than 10 minutes. The technology is proven and widely used to generate electric power. A gas turbine is an internal combustion engine that operates with rotary rather than reciprocating motion. It consists of three main sections mounted on the same shaft: the compressor, the combustion chamber and the turbine. Ambient air is drawn in and compressed up to 30 times ambient pressure and directed to the combustor section where fuel is introduced, ignited and burned at temperatures between 1,000°C and 1,600°C. After combustion, the hot gas expands through the turbine section. In the turbine the thermal energy is converted into mechanical energy. As the predicted annual operating hours on a reserve generator are low, gas turbines provide an economical

2.8.2.2 LEL ESS Castlelost

In the context of the All-Ireland system, energy storage system technologies are becoming increasing important as they have no air emissions and are considered carbon neutral. The LEL ESS Castlelost technologies considered were again evaluated in terms of the market requirements, i.e., the scope was to design a carbon free solution to provide a full range of products in the system services market replacing the functions historically served by conventional power plants.

In terms of the electrochemical energy storage element of the LEL ESS Castlelost project, a number of battery types were considered. This included lead acid, lithium ion and NaS batteries. Criteria which informed selection of the preferred technology included, proven technology, long life cycle requirements and positive environmental and safety attributes (zero emissions, fire risk and reusable material).

The technologies chosen for the LEL ESS Castlelost Project were a vanadium redox flow battery (VRFB) storage system and a synchronous condenser. Both technologies will trade electricity at high demand aiming to shift and smoothen the demand curve by charging at night and discharging during peak demand hours and during grid events such as frequency and voltage drop. The chosen technologies are designed to provide up to 8 hours of electricity daily with 97% availability. The VRFB is capable of providing a wide range of system services[7] which support the integration and further growth of nonsynchronous renewable generation. The synchronous condenser provides reactive power consumption and generation resulting in voltage control, short circuit power capacity and inertia response.

2.8.2.3 LEL GIS Castlelost

As part of the assessment of the electricity substation option, a gas insulated switchgear (GIS) substation and an air insulated switchgear (AIS) substation were considered. In general GIS substations are positioned indoor and AIS substations are installed outdoors.

[7] SIR, FFR, POR, SOR, TOR1, TOR2, SSRP, RRS, RRD, RM1, RM3, and RM8

The main advantage of the GIS substation is that the phase to phase spacing is reduced significantly resulting in a substation with a much smaller compound footprint and visual impact than its AIS counterpart. The selection of a GIS substation over an AIS substation offered more scope in the site selection process due to the smaller size of compound (approximately 4-5 times less than the minimum take for an AIS) and it resulting in a lesser impact on the receiving environment.

2.8.3 ALTERNATIVE LOCATIONS

During the concept development phase of the projects, a site selection and options appraisal study was undertaken. A summary of the study is presented as part of the consideration of alternative locations. The study was informed by high-level criteria and potential project type related constraints. During the project concept phase, a number of sites across the country were examined and evaluated to establish suitability. Consultations were then undertaken with several landowners in respect of the identified sites.

A simple rating system was used for the multi-criteria analysis - one of three categories of impact were applied to locational criteria under consideration; colour coded for ready identification.

Unsuitable /Constrained	1
Potential Constraints	3
Suitable /Unconstrained	5

Table 2.2 presents a summary of the ranking outcome from the site selection and options appraisal study undertaken. It was determined that Site 6, located at in the townlands of Kiltotan and Collinstown and Oldtown was the preferred site for locating the development proposals. In terms of the consideration of alternative locations for the LEL GIS Castlelost Project, during the study, the proposers identified the opportunity of providing symbiotic benefit to both the overall transmission system and the LEL Flexgen and LEL ESS projects. The identified need for a reinforcement (specifically a GIS) on the Midlands 220kV transmission line is detailed in the March 2021 Eirgrid and SONI Report "Shaping our Electricity Future"[8].

[8] Eirgrid and SONI: Shaping our Electricity Future, Appendix C: Table C-1, Reinforcements for Generation-Led Approach.

Table 2.2 Site Selection and Options Appraisal Summary

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6
Townland	Srabragan /Tawlaght,	Lumcloon,	Coolcor	Ballybeg	Pass of Kilbride	Kiltotan and Collinstown and Oldtown
ED	Aghafin	Gallen	Ballyburly	Wicklow Rural	Enniscoffey	Castlelost
County	Leitrim	Offaly	Offaly	Wicklow	Westmeath	Westmeath
Criteria	Summary Comment					
Electrical transmission system	110kV OHL & substation	Four 110kV OHL and substation	Three 110kV OHL and substation	220kV & 110kV OHL and substation	220kV OHL	220kV OHL
Natural gas transmission system	>20km	5-20km	5-20km	<5km	<5km	<5km
Access /Roads	Site accessible from Regional Road	Site accessible from Regional Road	Site accessible from Regional Road	Site accessible from local road	Site accessible from Regional Road	Site accessible from Regional Road
Zoning	Not Zoned – white lands	Not Zoned – white lands	Not Zoned – white lands	Not Zoned – white lands	Not Zoned – white lands	Not Zoned – white lands
Ground Conditions	Brownfield – subject to assessment	Brownfield – subject to assessment	Brownfield – subject to assessment	Greenfield	Greenfield	Greenfield
Designations /Env Constraints	Adjacent to L. Allen – Natura 2000 sites <5km	Natura 2000 sites >5km	Natura 2000 sites >5km	SPA & SAC sites <5km /Potential LVIA	Natura 2000 sites >5km	Natura 2000 sites >5km
Availability of suitably sized lands	Potential size constraint	Yes	Yes	No	No	Yes
RANKING	**25**	**31**	**31**	**27**	**31**	**35**

2.8.4 ALTERNATIVE LAYOUTS

Once the preferred site was selected, the design team focused on suitably positioning a proposal within the site that is sympathetic and one which integrates into the landscape and surrounding environment. The final design has sought, as far as practicable, to minimise visual intrusion and accordingly the proposed finished compound levels were determined following careful consideration of cut and fill requirements and existing local topographical conditions. Project compound finished levels were set to reduce the overall height of the development within its setting whilst carefully considering other potential knock-on effects. The design uses the naturally more elevated lands to the north for positioning of lower low-rise components (LEL ESS Castlelost Project). A planted berm is also provided in the northern and north-eastern areas of the development lands to minimise potential visual and noise impacts on receivers. The Administration (LEL Flexgen Castlelost Project) and GIS substation (LEL GIS Castlelost Project) buildings are placed to provide some degree of visual screening of proposed structures from the M6 motorway.

During the EIA process baseline surveys were carried out and suggested design mitigation measures were incorporated into the scheme. An example of early iterations of development proposals in the design process are presented in Figures 2.6 and 2.9 below. The various design layout options were developed to minimise potential impact on sensitive receivers) and accord with the natural features of the site (e.g., topography). Extensive consideration was also given in relation to devising suitable access to the proposed development and mitigating potential impacts to nearby receivers.

Figure 2.6 Proposed Development Iteration 1

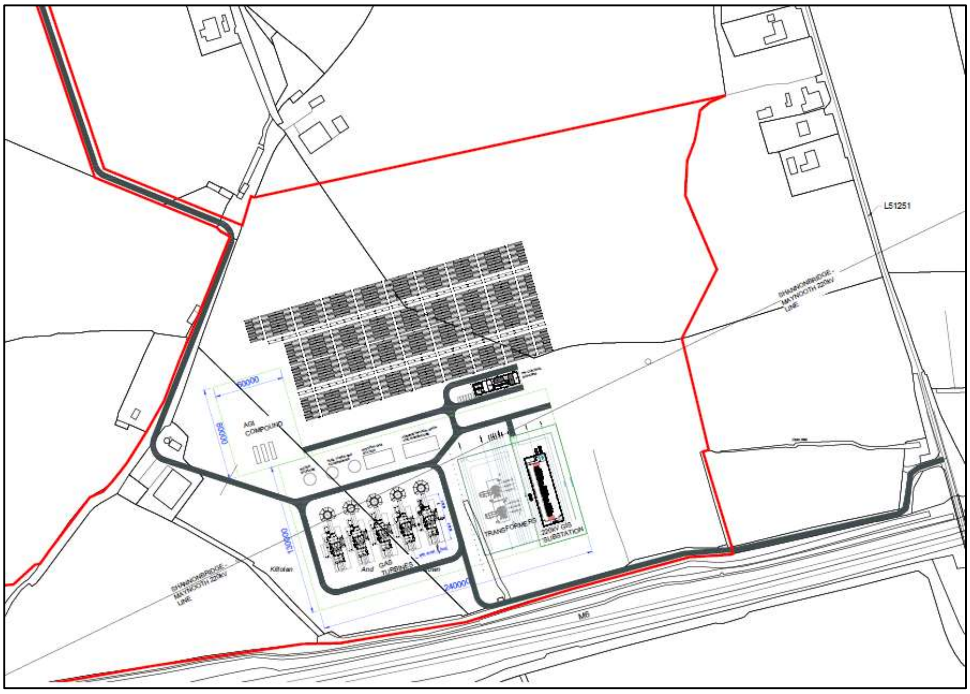


Figure 2.7 Proposed Development Iteration 2

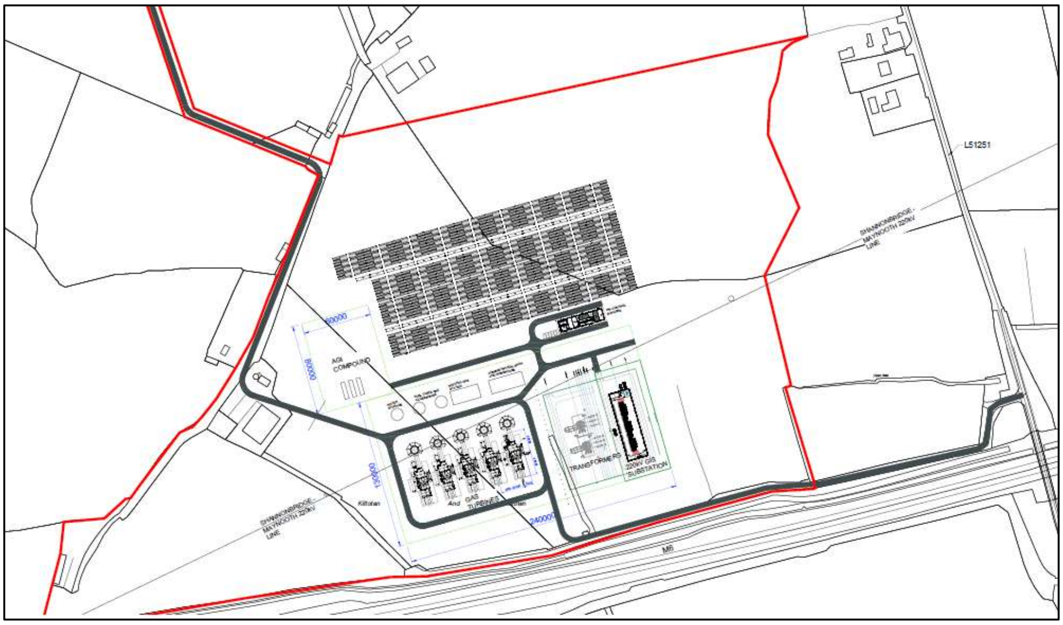


Figure 2.8 Proposed Development Iteration 3

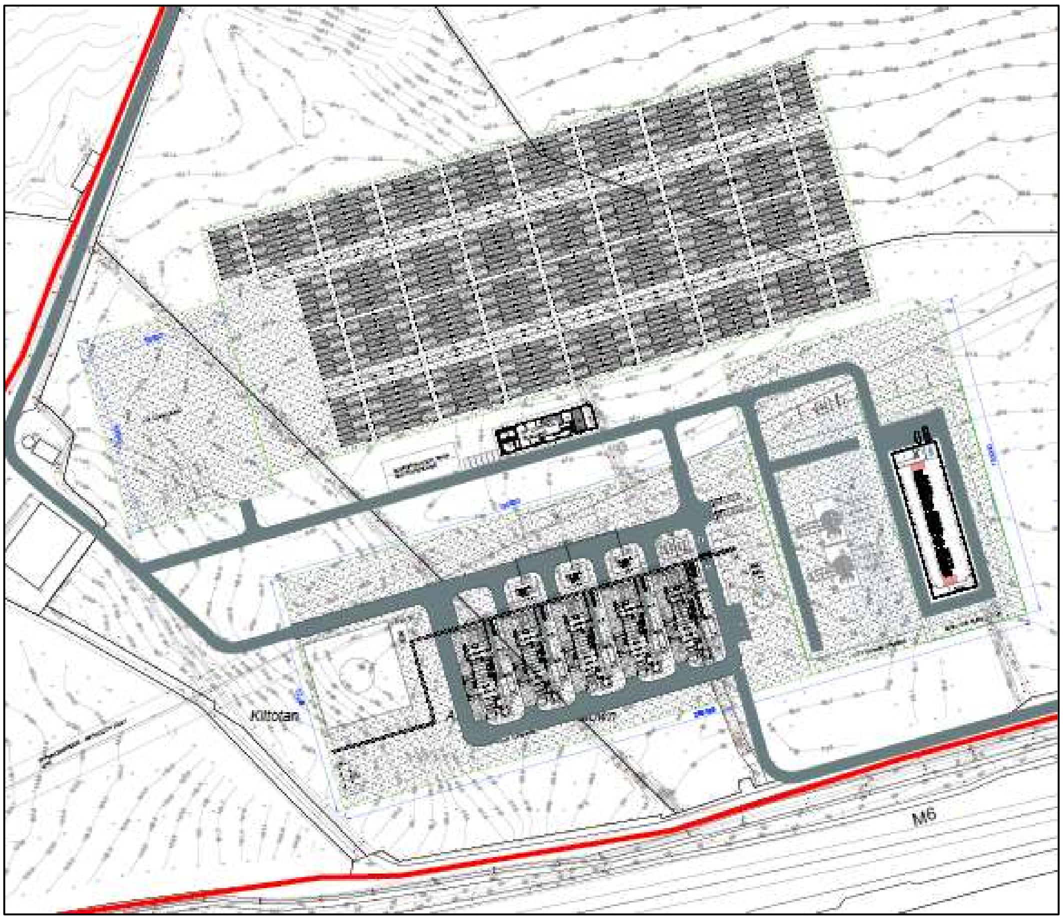


Figure 2.9 Proposed Development Iteration 4

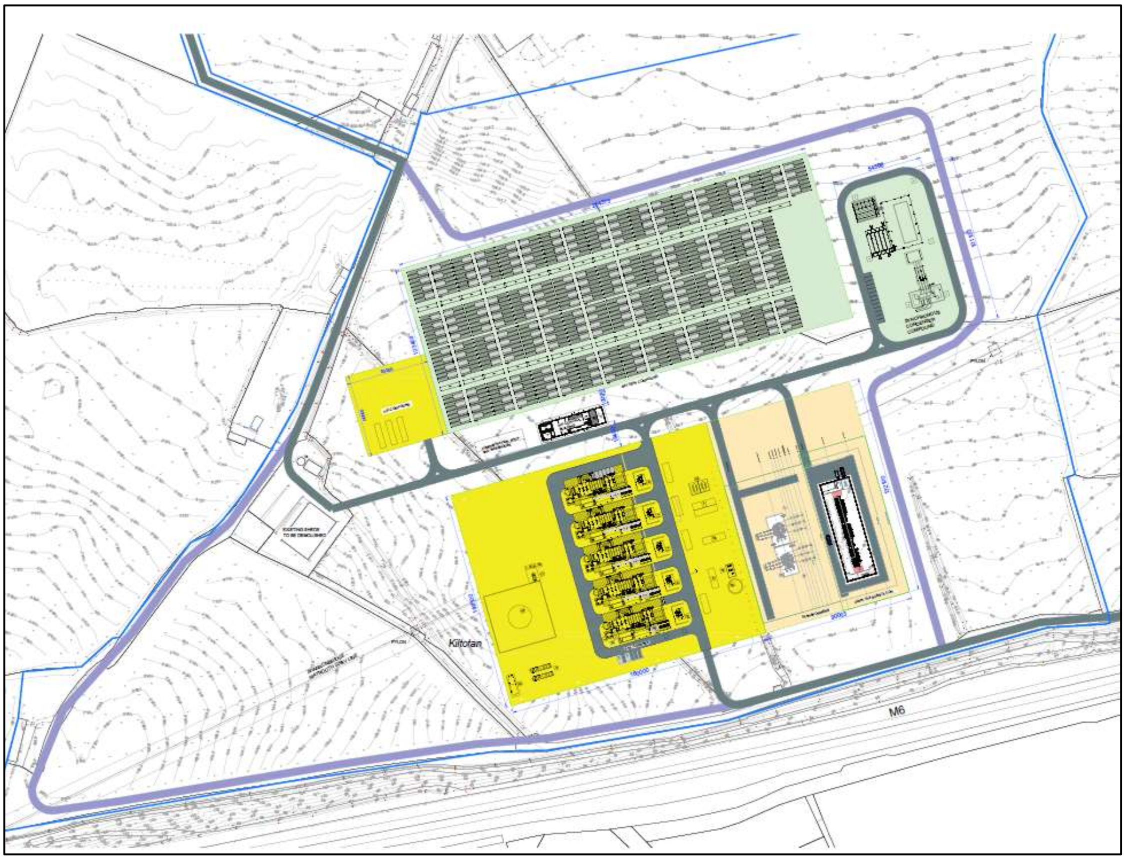
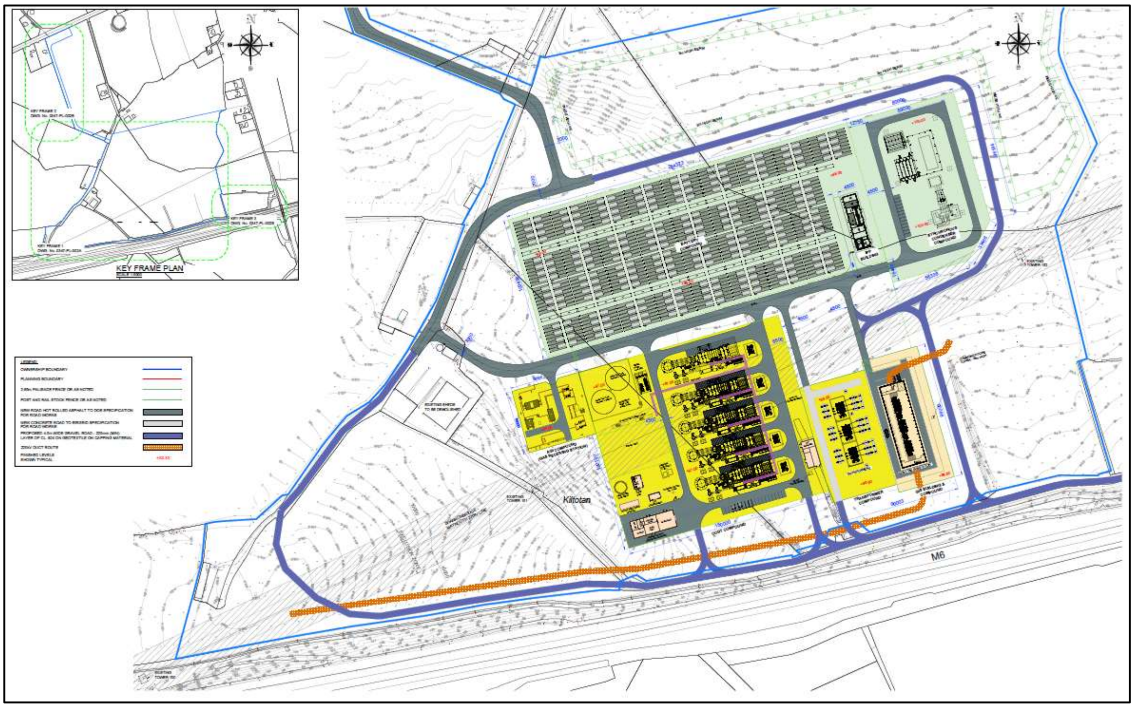


Figure 2.10 Proposed Development Layout



Connection of the LEL GIS Castlelost Project to the existing transmission system involved consideration of numerous layout options. These included (i) new in-line towers and transition from overhead line (OHL) to an underground cable (UGC) routing to the GIS substation (Option 1), (ii) off-line towers and transition from OHL to an UGC routing to the GIS substation (Option 2), and (iii) new angle towers with mini-interface compounds providing for the transition from OHL to UGC routing to the GIS substation (Option 3).

Following extensive consultations with stakeholders and design considerations it was decided to proceed with Option 3. This reduces project risks and offers the project a number of benefits including; (a) reducing the overall visual impact by bringing equipment down to ground level and (b) reducing the duration of the outage of the existing 220 kV circuit that will be required in order to build the two new towers into the existing line and to loop-into the new GIS substation. This approach allows for the construction and installation of the equipment in the two mini compounds and the 220 kV UGCs between the new substation and the two mini compounds in advance of the outage.

3 PLANNING & POLICY

3.1 INTRODUCTION

This Chapter provides an overview of national, regional, and local policy associated with the proposed projects at Kiltotan & Collinstown and Oldtown, Rochfortbridge, Co. Westmeath. The proposed projects are examined in the context of the policies and objectives set out within each of these plans.

The development is reviewed in the context of the following:

- National Policy; including the National Development Plan 2018-2027 and Energy, and Climate Change Policy.
- Regional Policy; Regional Spatial and Economic Strategy (RSES) Eastern & Midland Regional Assembly (EMRA) 2019
- County and Local Policy; Westmeath County Development Plan 2021-2027
- Planning History of the Site

3.2 ENERGY AND CLIMATE CHANGE POLICY

The United Nations Framework Convention on Climate Change (UNFCCC), agreed in 1992, is the main international treaty on fighting climate change. Its objective is to prevent dangerous man-made interference with the global climate system. The Paris Agreement (COP 21[9]) adopted by all UNFCCC Parties in December 2015 is the first-ever universal, legally binding global climate agreement. Before 2020, the world's only legally binding instrument for cutting greenhouse gas emissions is the 1997 Kyoto Protocol. The Protocol has been ratified by 192 of the UNFCCC Parties, including the EU and its member countries.

The development of EU climate policy was first discussed by the European Council in 1990. At this time, EU leaders agreed to implement the first European climate target, namely to stabilise greenhouse gas (GHG) emissions of the European Community (EC) at 1990 levels by 2000. At the climate summit in Kyoto in 1997, the EC committed to 8% reductions of six GHGs during the first commitment period 2008-2012 (compared to 1990 levels). Specific internal arrangements were agreed in 1998 and the approved burden sharing agreement became binding on Member States in 2004.

[9] "Conference of the Parties" – referring to the countries that signed up to the 1992 UNFCCC. The COP in Paris is the 21st such conference. COP 24 was held in Katowice (Poland) in December 2018.

This was followed by the second commitment period (2013-2020) and introduction of the EU's first package of Climate and Energy measures, which were adopted in 2008. The Climate and Energy Package 2020 includes a set of three binding targets for Member States including the requirement to reduce greenhouse gas (GHG) emissions by 20% by 2020 (compared with 1990 levels). One of the four constituent parts[10] of the package was the Renewable Energy Directive (RED I)[11]. RED I is a central element in EU policy and a key driver for meeting renewable energy targets; 20% consumption to come from renewable sources by 2020. Under RED I (2009/28/EC) Ireland is committed to producing from renewable sources at least 16% of all energy consumed by 2020. Ireland has committed to meeting this national target through 40% renewable electricity, 12% renewable heat and 10% renewable transport.

The 2012 Energy Efficiency Directive (EED) (2012/27/EU) establishes a set of binding measures to help the EU reach its 20% energy efficiency target by 2020. Under the 2012 EED, all EU countries are required to use energy more efficiently at all stages of the energy chain, including energy generation, transmission, distribution and end-use consumption. Article 7 of the EED obliges Members to deliver savings of 1.5% of annual energy sales to final customers. In Ireland, the Energy Efficiency Obligation Scheme (EEOS) is projected to deliver half of the required 1.5% target.

In October 2014 the European Council agreed on a new target framework for 2030 that continues the triple target approach of 2020 (the 2030 Climate and Energy Framework). The 2030 Climate and Energy Framework includes targets and policy objectives for the period 2021-2030. The targets for renewables and energy efficiency were revised upwards in 2018 following agreement on a recast of RED I. The recast directive, RED II (Directive 2018/2001), provides a framework towards meeting the binding Union target of at least 32% renewable energy in gross final energy consumption by 2030 and a cut in GHG emissions by at least 40%[12].

Under the new 2030 Climate and Energy Framework, which is also part of the *Clean Energy for all Europeans Package*[13], EU countries are required to draft 10-year National Climate and Energy Plans (NECPs) for 2021-2030, outlining how they will meet the new 2030 targets for renewable energy and for energy efficiency.

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[10] The other three parts being a reviewed Directive on Emissions Trading (ETS Directive), the Effort Sharing Decision (ESD) and a Directive on Carbon Capture and Storage

[11] European Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

[12] Requirement for the ETS sector to cut emissions by 43% and the non-ETS sector by 30% (compared to 2005).

[13]This addresses the 5 dimensions of the Energy Union (1) energy security; 2) the internal energy market; 3) energy efficiency; 4) decarbonisation of the economy; and 5) research, innovation and competitiveness.

In 2018, the Directive on Energy Efficiency (2018/2002/EC) was agreed (amending 2012/27/EU) to update the policy framework to 2030 and beyond. Article 7 of the amending EDD sets a binding target for Member States to make new annual energy savings equivalent to 0.8% of their final energy consumption each year to meet a cumulative target by 2030. To meet these requirements Government has to put policies and measures in place that will result in energy savings.

In light of the Intergovernmental Panel on Climate Change (IPCC) Special Report in 2018 on the "*Impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways"*, the EC presented its strategic long-term vision for a climate-neutral (net zero target) economy by 2050 in November 2018. The purpose of the Strategy (*A Clean Planet for all),* isn't to set targets. Rather it creates a vision and plan and provides a portfolio of pathways to stakeholders in line with the Sustainable Development Goals[14] to help achieve a climate neutral net zero target by 2050.

3.3 NATIONAL POLICY CONTEXT

3.3.1 NATIONAL DEVELOPMENT PLAN 2018-2027 (PROJECT IRELAND 2040)

The National Development Plan (NDP) sets out the investment priorities that will underpin the successful implementation of the new National Planning Framework (NPF). The plan was prepared to guide national, regional and local planning and investment decisions in Ireland over the next two decades, to cater for an expected population increase of over 1 million people.

The National Development Plan commits a total investment estimated at €116 billion over the period by Government. This represents a very substantial commitment of resources and is expected to move Ireland close to the top of the international league table for public investment.

This level of capital spending will ensure ongoing employment maintenance and creation with appropriate regional development. It will also provide clarity to the construction sector, allowing the industry to provide the capacity and capability required to deliver Government's long-term investment plans.

The NDP prescribes 10 National Strategic Outcomes and Public Investment Priorities. Of particular relevance to development of the proposed plant is *National Strategic Outcome 8 - Transition to a Low-Carbon and Climate-Resilient Society*.

[14] https://www.un.org/sustainabledevelopment/sustainable-development-goals/

National Strategic Outcome 8 sets out detail in relation to the need to change the existing power generation assets to lower carbon fuel sources and details relating to decarbonising energy. The NDP states that Ireland's energy system requires a radical transformation in order to achieve its 2030 and 2050 energy and climate objectives. This means that how we generate energy, and how we use it, must fundamentally change. It states that Ireland has the opportunity to comprehensively decarbonise energy generation and that by 2030, peat and coal will no longer have a role in electricity generation in Ireland.

National Policy Objective 54

> *"Reduce our carbon footprint by integrating climate action into the planning system in support of national targets for climate policy mitigation and adaptation objectives, as well as targets for greenhouse gas emissions reductions."*

3.3.2 NATIONAL CLIMATE & ENERGY PLAN 2021-2030 (NCEP)

Under the new 2030 Climate and Energy Framework, which is also part of the Clean Energy for all Europeans Package, EU countries are required to draft 10-year National Climate and Energy Plans (NECPs) for 2021-2030, outlining how they will meet the new 2030 targets for renewable energy and for energy efficiency. In June 2019, the government agreed to support the adoption of a net zero target by 2050 at EU level, and to pursue a trajectory of emissions reduction nationally which is in line with reaching net zero in Ireland by 2050.

The national plan released in 2019 centres around the five dimensions of the Energy Union:

1. Decarbonisation – GHG Emissions and Removals
2. Decarbonisation – Renewable Energy
3. Energy Efficiency
4. Energy Security
5. Internal Energy Market
6. Research, Innovation & Competitiveness

3.4 REGIONAL POLICY CONTEXT

The *Eastern & Midlands Regional Assembly Regional Spatial & Economic Strategy (RSES) 2019-2031* provides a high-level development framework for the region, which supports the implementation of the National Planning Framework (NPF) and economic policies and objectives of Government. It provides a 12-year strategy with a vision to 2040 and it provides a solid foundation to deliver transformational change that is necessary to achieve the objectives of the NPF. It provides a framework for investment to better manage regional planning and economic development throughout the Region.

The RSES recognises that one of the key challenges facing the region is the transition to a low carbon society. To expedite this transition, the RSES sets out 16 Regional Strategic Outcomes which are broken down into Economic Opportunity, Healthy Placemaking and Climate Action. There are six Strategic Outcomes specific to Climate action which can be summarised as follows:

1. **Integrated Transport & Land Use** - Promote best use of Transport Infrastructure, existing and planned, and promote sustainable and active modes of travel to ensure the proper integration of transportation and land use planning.
2. **Sustainable Management of Water, Waste & other Environmental Resources** - Conserve and enhance our water resources to ensure clean water supply, adequate wastewater treatment and greater resource efficiency to realise the benefits of the circular economy.
3. **Build Climate Resilience -** Ensure the long-term management of flood risk and build resilience to increased risks of extreme weather events, changes in sea level and patterns of coastal erosion to protect property, critical infrastructure and food security in the Region.
4. **Support the Transition to Low Carbon and Clean Energy** - Pursue climate mitigation in line with global and national targets and harness the potential for a more distributed renewables-focussed energy system to support the transition to a low carbon economy by 2050.
5. **Enhanced Green Infrastructure -** Identify, protect and enhance Green Infrastructure and ecosystem services in the Region and promote the sustainable management of strategic natural assets such as our coastlines, farmlands, peatlands, uplands woodlands and wetlands.
6. **Biodiversity and Natural Heritage -** Promote co-ordinated spatial planning to conserve and enhance the biodiversity of our protected habitats and species including landscape and heritage protection.

The RSES recognises the established tradition of energy production in the midland's region through the operation of peat fired power plants and the need for these facilities to be reimagined in order to reduce their carbon footprint.

3.5 COUNTY AND LOCAL POLICY CONTEXT

The Westmeath County Development Plan (CDP) 2021-2027 sets out the Council's proposed policies (CPO's) and objectives for the development of the County over the Plan period. In this regard the CPO's listed in the Plan constitute the policies and objectives of the Plan. The Development Plan seeks to develop and improve, in a sustainable manner, the social, economic, environmental and cultural assets of the County.

Chapter 10 of the CDP 2021-2027 presents energy policy objectives for the county, reinforcing national and regional policies. The plan states that new energy systems and transmission grids will be necessary for a more distributed, renewables-focused energy generation system, harnessing both the considerable onshore and off-shore potential from energy sources and connecting the richest sources of that energy to the major sources of demand. In terms of renewable energy, the CDP outlines the following:

- CPO 10.139 Support local, regional, national and international initiatives for limiting emissions of greenhouse gases through energy efficiency and the development of renewable energy sources which make use of the natural resources in an environmentally acceptable manner and having particular regard to the requirements of the Habitats Directive.
- CPO 10.140 Facilitate measures which seek to reduce emissions of greenhouse gases and support the implementation of actions identified in the Westmeath County Council Climate Change Adaptation Strategy 2019-2024 and any future amendments.
- CPO 10.141 Promote and support the use of renewable forms of energy as a contribution to the energy demand of all new buildings where it is consistent with the proper planning and sustainable development of an area.

The CDP acknowledges the importance of the existence of the 220kV grid and the natural gas pipelines which passes through the southern part of the County. The plan states that key investments are planned by Eirgrid for the upgrading of the transmission network and new circuit build /reinforcement, to cater for continued demand. The upgrading of the transmission network will facilitate power flows from both renewable and conventional sources to maximise the use of existing power corridors. The Government Policy Statement on the Strategic Importance of Transmission and Other Energy Infrastructure (July 2012) acknowledges the strategic and economic importance of investment in networks and energy infrastructure. The Government endorses the major investment underway in the high voltage electricity system under EirGrid's Grid 25 Programme. The Planning Authority recognises the need for development and renewal of energy networks, in order to meet both economic and social policy goals and where appropriate, will consider the impact of proposed developments on the electricity grid network. According to EirGrid’s grid development strategy, GRID25 the demand for electricity in the midland’s region is expected to increase by over 40% by 2025.

The CDP states that Westmeath County Council will support EirGrid's Implementation Plan 2017 – 2022 and Transmission Development Plan (TDP) 2016 and any subsequent plans prepared during the lifetime of the RSES that facilitate the timely delivery of major investment projects subject to appropriate environmental assessment and the outcome of the planning process. The Council will continue to support the infrastructural renewal and development of electricity and gas networks. A balanced progressive approach will be adopted to minimise the impact on the environment while providing for the County's energy needs. The sustainable provision of energy networks is therefore encouraged provided that it can be demonstrated that:

- The development is required in order to facilitate the provision or retention of significant economic or social infrastructure.
- The route proposed has been identified with due consideration for social, economic, environmental and cultural impacts.
- Where impacts are inevitable mitigation features have been included.
- Where it can be shown the proposed development is consistent with international best practice.

The electricity and gas policy objectives prescribed in the CDP are presented below:

- CPO 10.169 Support and promote the sustainable improvement and expansion of the electricity transmission and distribution network that supply the County, subject to landscape, residential, amenity and environmental considerations.
- CPO 10.170 Support the provision of electricity and gas transmission networks to Athlone and Mullingar to provide for the medium to long-term future needs of these towns, subject to landscape, residential, amenity and environmental considerations.
- CPO 10.171 Support and promote the improvement and extension of gas infrastructure to serve the County,
- CPO 10.172 Co-operate and liaise with statutory and other energy providers in relation to power generation, in order to ensure adequate power capacity for the existing and future needs of the County.
- CPO 10.173 Support the implementation of EirGrid's Grid 25 Investment Programme, subject to landscape, residential, amenity and environmental considerations
- CPO 10.174 Support and facilitate the development of enhanced electricity and gas supplies, which do not negatively impact on environmental quality, landscape, wildlife, habitats or residential amenity and which are critical to the economic development of the County.

- CPO 10.175 Support roll-out of the Smart Grids and Smart Cities Action Plan enabling new connections, grid balancing, energy management and micro grid development.
- CPO 10.176 Support and facilitate the development of enhanced electricity and gas supplies, and associated networks, to serve the existing and future needs of the Region and facilitate new transmission infrastructure projects that might be brought forward in the lifetime of this Strategy including the delivery of the necessary integration of transmission network requirements to facilitate linkages of renewable energy proposals to the electricity and gas transmission grid in a sustainable and timely manner subject to appropriate environmental assessment and the planning process

Chapter 11 of the CDP sets out details with regard to Climate Action. The aim is *"To transition to a low carbon and climate resilient County, with an emphasis on reduction in energy demand and greenhouse gas emissions, through a combination of effective mitigation and adaptation responses to climate change".* The Westmeath County Council Climate Adaptation Strategy 2019-2024 is assigned the role as the primary instrument at local level to:

i. ensure a proper comprehension of the key risks and vulnerabilities of climate change.
ii. bring forward the implementation of climate resilient actions in a planned and proactive manner and,
iii. ensure that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of Westmeath County Council.

The CDP sets out 12 climate action policy objectives and it is noted that the Council is open to new and innovative renewable energy sources and technological solutions to addressing climate change. As is evidenced from the above policies in the CDP, the proposed projects conform with policy objectives and support and promote sustainable improvements and the transition to a net zero and climate neutral economy. Given the location of the development in respect of the electricity and gas transmission systems, siting of the projects conforms with the principles of proper planning and sustainable development and is compatible with the overarching framework of plans and policies.

3.6 OTHER PLANNED PERMITTED PROJECTS

A review of other projects /development in the general area of the site was undertaken using the Westmeath Planning Search Portal[15]. The recent valid planning permission consents in the immediate vicinity of the site (1 km radius) relate to once off residential development and agricultural sheds. The projects are mainly positioned along public roads (R446 and L51251) in the vicinity of the site and are deemed to be not significant in terms of cumulative impacts with the proposed projects. It was also noted that some projects which were consented were not subsequently constructed (e.g., PL001590 which relates to a house which was granted planning permission in 2001).

15 https://westmeathcoco.maps.arcgis.com/apps/webappviewer/index.html?id=f114217b26f348ea95660cad27e42ef6

4 POPULATION AND HUMAN HEALTH

4.1 INTRODUCTION

This Chapter presents an assessment of impacts on Population & Human Health. The recitals to the 1985 and 2011 Directives refer to *'Human Health'* and include 'Human Beings' as the corresponding environmental factor. The 2014 Directive changes the title of this factor to "Population and Human Health".

While there are a range of issues which may impact on human beings many of these have been considered within other disciplines within this EIAR, including Planning Policy (Chapter 3), Water Environment (Chapter 7), Air Quality (Chapter 8), Noise and Vibration (Chapter 10), Landscape and Visual (Chapter 11), and Traffic and Transport (Chapter 12). This Chapter is therefore focused on potential impacts which have not been assessed elsewhere within the EIAR.

4.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

4.2.1 ASSESSMENT METHODOLOGY

4.2.1.1 Desktop Study

A desk study was undertaken to assess the baseline environment. The desk study involved the assessment and review of data from the Central Statistics Office (CSO) and a review of the Westmeath County Development Plan (CDP) 2021-2027. Information was also obtained from the following sources:

- Environmental Protection Agency (www.epa.ie);
- Westmeath County Council (http://www.westmeathcoco.ie/en/);
- Central Statistics Office (http://www.cso.ie);
- Geohive (http://map.geohive.ie/mapviewer.html);
- Health and Safety Authority (http://www.hsa.ie/eng/);
- Pobal (https://maps.pobal.ie/WebApps/DeprivationIndices/index.html)
- All-Island Research Observatory (AIRO) (https://airo.maynoothuniversity.ie/).

As there is no loss of residential or community lands as a result of the proposed developments, the impacts from the loss of private property are not further considered. Similarly, the development of either or all of the proposed projects will not result in negative adverse impact to the local economy. Positive effects on the local economy, supply chains, and employment opportunities (particularly) during construction is anticipated.

4.2.1.2 Field Work

A site walkover of the proposed development lands and windscreen survey of the wider study area (primarily the Castlelost ED, Ballykilmore ED (in the area of Tyrrellspass) and further north along the R400 towards Gaybrook (AGI)) was undertaken on the 22nd ofJuly 2017 as part of this assessment.

4.2.2 SIGNIFICANCE CRITERIA

The purpose of the population assessment is to identify the likely significant impacts as they might affect users of the proposed development and the local community. It usually follows that impacts of a population and human health nature are a function of:

- The location and character of the local environment,
- The sensitivity of the local population and its capacity to absorb change,
- The nature of the environmental effect,
- The scale or extent of the effect in terms of area or population affected,
- The duration and frequency of an effect, and,
- The probability of an impact's occurrence and possibility of effectively reducing the effects through mitigation.

Impacts result from direct, indirect, secondary and cumulative effects on existing environmental conditions. Effects can be positive, neutral or negative. The significance of an effect depends on, among other considerations, the nature of the environmental effect, the timing and duration of an effect and the probability of the occurrence of an effect. The significance of an effect is described as imperceptible, slight, moderate, significant, very significant or profound. The impacts may be short term, medium-term or long-term. The duration of an effect may be momentary, brief, temporary, short-term, medium-term, long-term, permanent or reversible in accordance with the timescales. The frequency of that effect can also influence significance i.e., if the effect will occur once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually

The population and human health assessment addresses impacts at a community level rather than for individuals or identifiable properties, although impacts for individual properties are discussed where these are significant or located within proximity to the proposed development, as appropriate.

This EIAR is focused on providing a clear documentary trail of analysis used to arrive at conclusions. The criteria used to describe the predicted effects across land use and social considerations including journey characteristics, journey amenity, general amenity and economic impacts is outlined in Table 4.1 in accordance with the EPA Guidelines[16].

Table 4.1 Description of Effects

Effect Characteristic	Description
Quality	
Positive	A change which improves the quality of the environment
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
Negative	A change which reduces the quality of the environment
Duration of Effect	
Brief	Effects lasting <1 day
Temporary	Effects lasting <1 year
Short-term	Effects lasting 1-7 years
Medium-term	Effects lasting 7-15 years
Long-term	Effects lasting 15-60 years
Permanent	Effects lasting over 60 years
Reversible	Effects that can be undone, e.g., through remediation or restoration
Probability of Effects	
Likely	The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented
Unlikely	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented
Significance	
Profound	An impact which obliterates all previous sensitive characteristics.
Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Moderate	An impact that alters the character of the environment in a manner that is consistent with existing or emerging trends
Slight	An impact that alters the character of the environment without affecting its sensitivities
Imperceptible /Negligible	An impact capable of measurement but without noticeable consequences

[16] EPA, EIAR Draft Guidelines 2017

4.3 DESCRIPTION OF RECEIVING ENVIRONMENT

4.3.1 POPULATION AND SETTLEMENT PATTERNS

The subject site is located in the townlands of Kiltotan and Collinstown and Oldtown, and the electoral division (ED) of Castlelost as shown in Figures 4.1 and 4.2.

Figure 4.1 Setting - Townlands

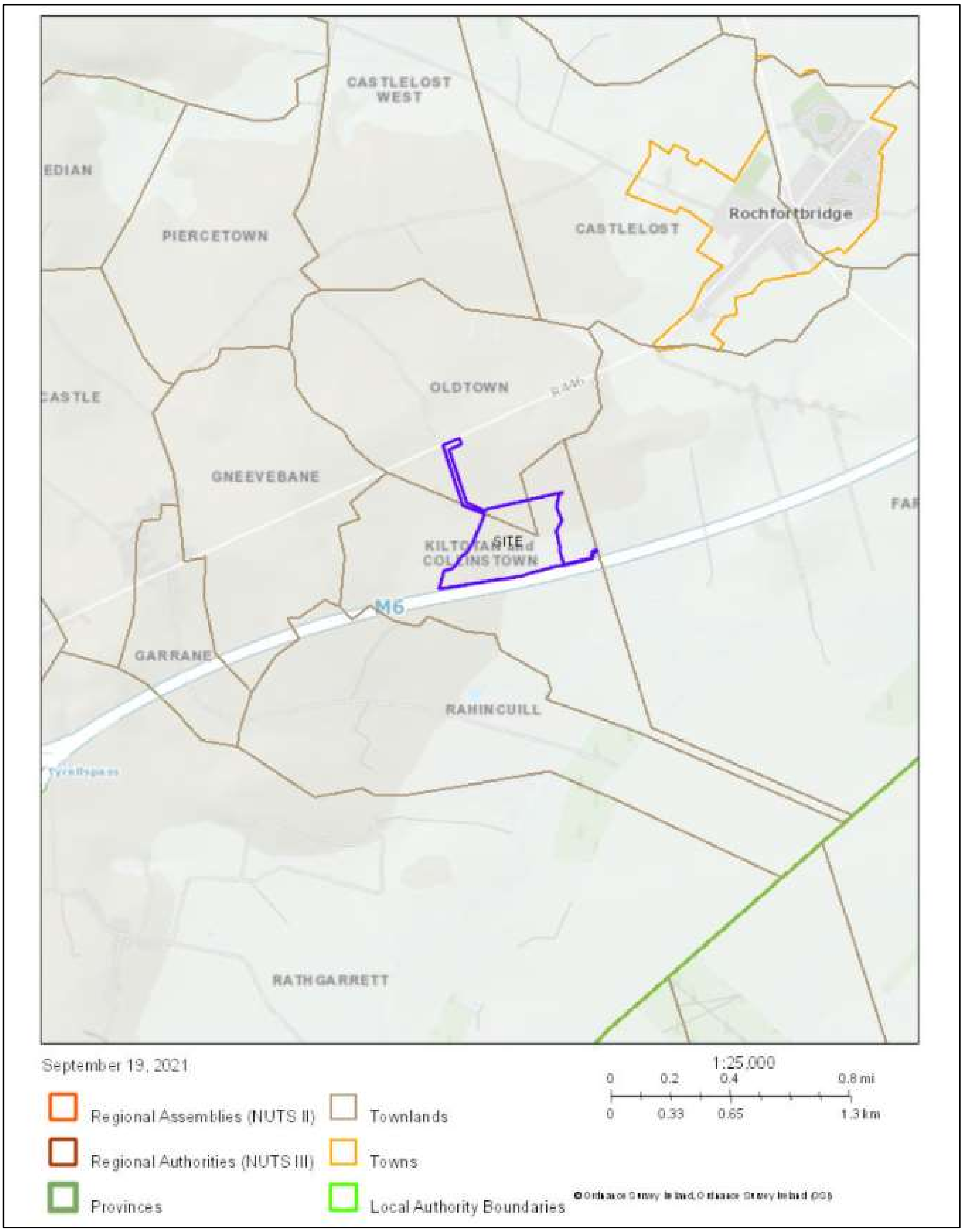
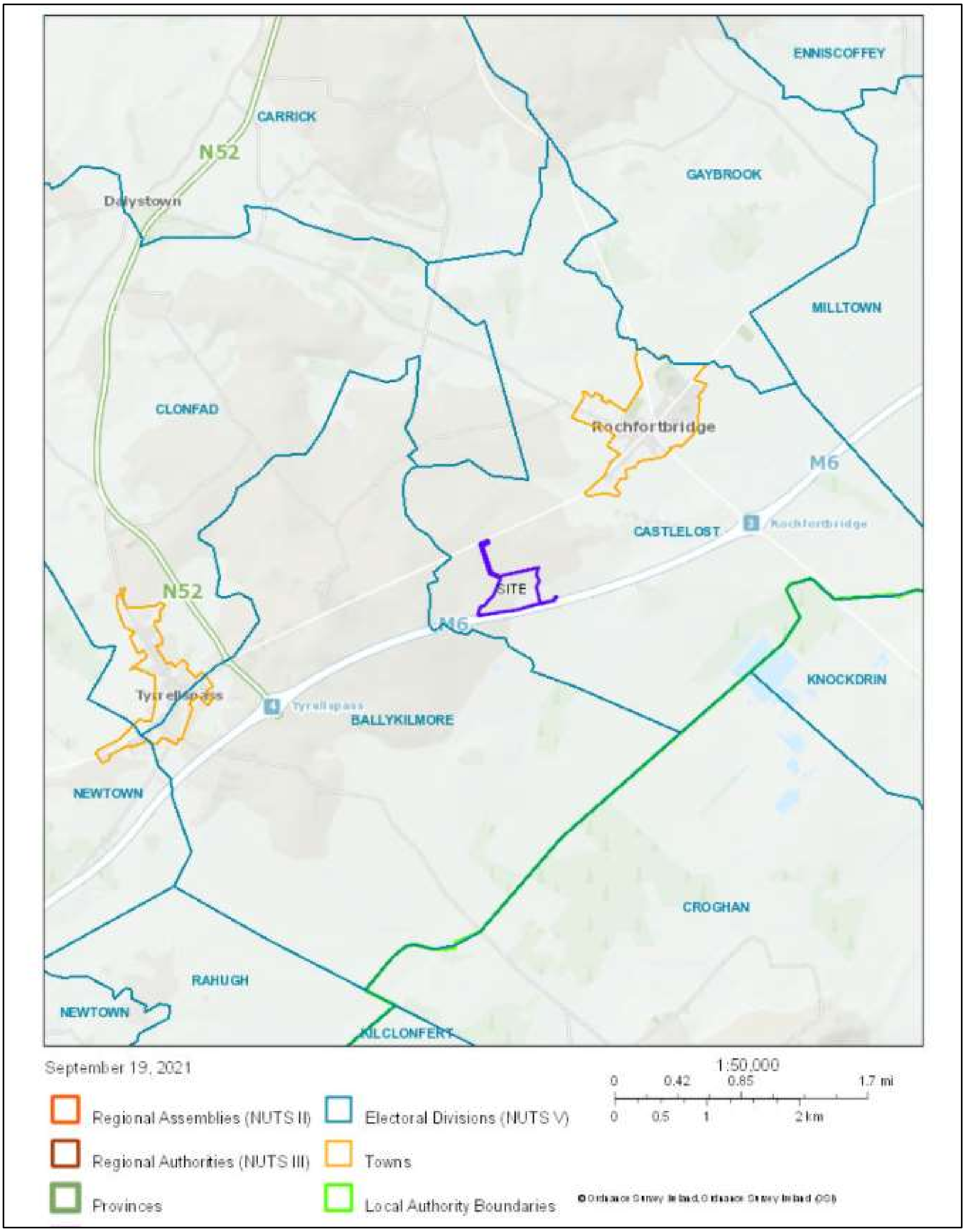


Figure 4.2 Setting - Electoral Division (ED)



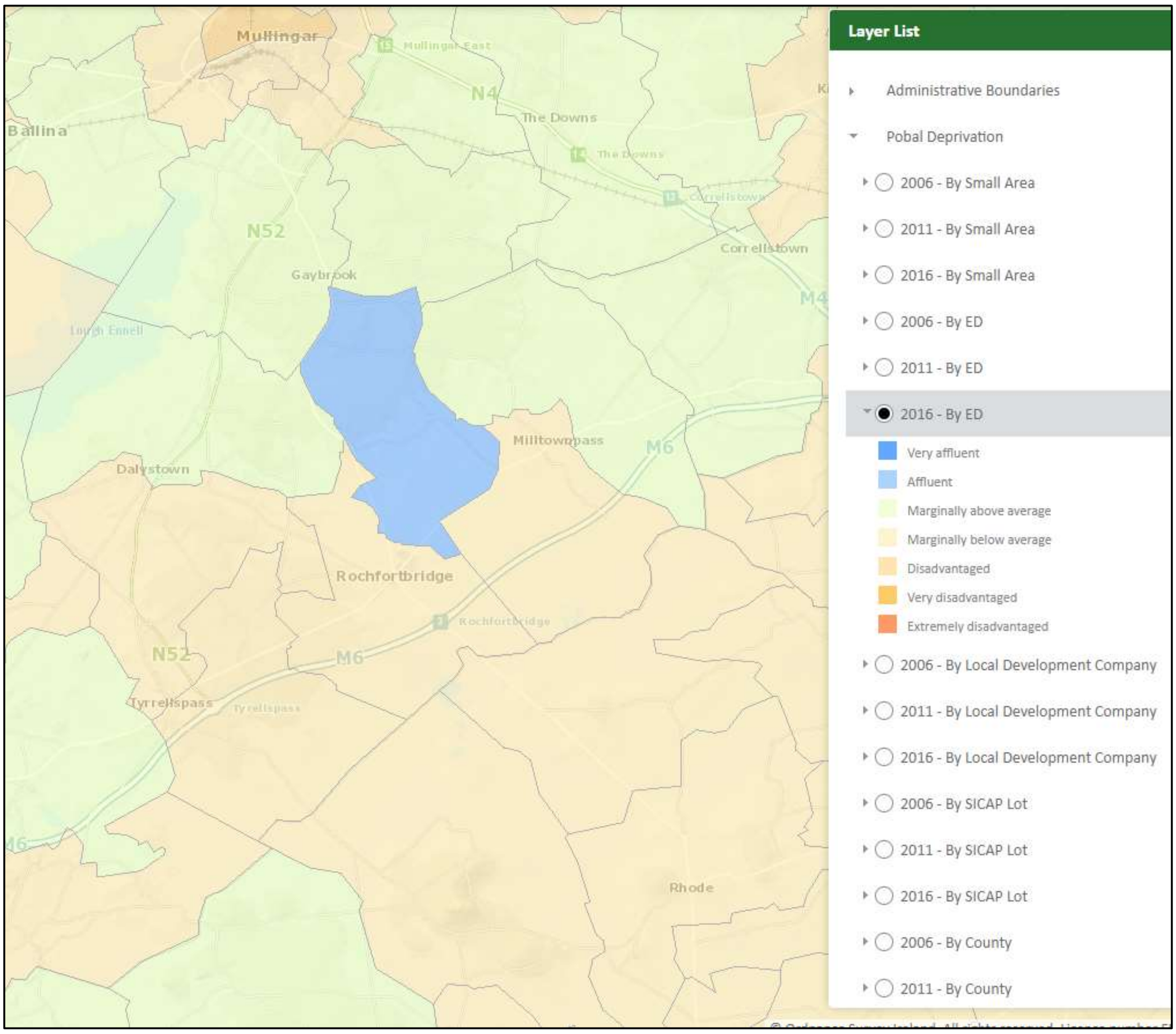
The townland of Kiltotan and Collinstown lies south and southeast of the old mail coach road from Tyrrellspass to Dublin (out of use by 1837) and borders part of the County of Offaly. The number of persons enumerated in the townland of Kiltotan and Collinstown was 19 and 29 persons were enumerated in the townland of Oldtown in 2016. Other than the two townlands of Kiltotan and Collinstown and Oldtown, there are six other townlands within the ED of Castlelost. According to the CSO 2016 census, the total population of the

Castlelost ED is 1,692 (838 males and 854 females). Of the 617 total permanent dwelling recorded, 576 were recorded as being occupied permanent dwellings. The ED of Castlelost has an area of 17.01km^2. The largest settlement in the ED is Rochfortbridge.

4.3.1.1 Rochfortbridge

In 2016 there were 1,473 persons living in the settlement of Rochfortbridge, noted to be a minor decline (-1.4%) between 2011-2016. In contrast, during the period 1996-2002 the population of Rochfortbridge grew by 90%. Census data from 2016 indicates that Rochfortbridge has a younger population than the county average, with 11.7% of the population are over 65 compared to the county average of 19.7%. The Pobal[17] deprivation indices describe the Castlelost ED as being marginally below average. Further details are presented in Figure 4.3 and Table 4.2.

Figure 4.3 ED Deprivation Indices



[17] https://maps.pobal.ie/WebApps/DeprivationIndices/index.html

Table 4.2 Castlelost ED Deprivation Indices

Electoral Division	Castlelost
ED ID	13,061.00
County	13.00
Pobal HP Index 2016	-7.45
Pobal HP Description 2016	marginally below average
Population 1981	889.00
Population 1986	976.00
Population 1991	892.00
Population 1996	920.00
Population 2002	1,594.00
Population 2006	1,690.00
Population 2011	1,718.00
Population 2016	1,692.00
Population change % (2011-16)	-0.01
Age Dependency Ratio (%)	35.92
Lone parent ratio (%)	26.83
Prop. primary education only (%)	15.50
Prop. third level education (%)	19.96
Prop. local authority rented (%)	11.27
Unemployment rate - male (%)	20.52
Unemployment rate - female (%)	18.40

According to the CSO, in 2016 the unemployment rate within the ED was above the national average employment rate of 12.9 per cent

Within the Westmeath CDP, Rochfortbridge is classed as a "Self-Sustaining Town" under the Settlement Hierarchy for Westmeath. According to the RSES, self-sustaining towns are towns with high levels of population growth and a weak employment base which are reliant on other areas for employment and/or services and which require targeted 'catch up' investment to become more self-sustaining.

Rochfortbridge performs important local level residential, retailing and community functions to residents and the wider rural hinterland. The town is located just off the M6 motorway and has excellent connectivity to both Dublin and the wider Midlands. The settlement form of Rochfortbridge is largely dictated by the existing road network, in particular the old N6 Primary Road, now the R446 Regional route. The R446, which forms the Main Street of Rochfortbridge, amasses a wide streetscape on both ends of the town, whilst the traditional town centre is characterised by a finer urban grain.

Rochfortbridge possesses a range of services including retailing, Post Office, Garda Station, Health Centre, Crèche and Childcare Facilities, Churches and Parish Hall. There are two schools located within the town, Scoil Chroi Naofa National School with 242 children enrolled in 2019 and St Joseph's Secondary School which currently caters for 850 post-primary students. There are also a number of sporting clubs including soccer, GAA Club with a grass pitch, walking track and 3 all-weather astro-turf pitches, boxing club and martial arts. In recent years, there has been a number of positive developments in the town including, enhancement of the amenity area, traffic and pedestrian improvement works in the vicinity of the Primary School which serve to enhance the attractiveness of the town. In 2016, 38.5% of the population aged 5 years and over in Rochfortbridge undertook journeys to work, school or college of less than 15 minutes. 32.3% undertook journeys of more than 30 minutes. Rochfortbridge secondary school is an educational hub for the surrounding hinterlands and beyond. Approximately 55% of all students in the town walk to school.

Rochfortbridge is served by an existing wastewater treatment plant located to the southeast of the town. Potable water is sourced from the Mullingar High Level Water Supply Scheme. The town is strategically located on a major inter-urban transport route and has good quality public transport and road links to Dublin. Rochfortbridge to Dublin is served numerous times daily by several public and private bus operators.

4.3.1.2 Tyrrellspass

Tyrrellspass is located approximately 3km west of the proposed development lands and in the ED of Clonfad. Tyrrellspass is situated on the R446 (formerly N6) road. The village has two distinct features, which differentiate it from other villages of linear layout, the green to the centre and the castle to the west. The layout of the village is pleasant with a mature green occupying the prominent central space and many fine late 18th century buildings that front onto the green. According to the Census of Population 2016 Tyrrellspass village had a population of 483 people, which represents a marginal decrease in the population from the previous census

Tyrrellspass has considerable social and community assets including a School, Churches, Nursing Home, Childcare Facilities, Health Centre, Chemist and Post Office. In addition, there are Community groups and activities including Active Retired, Youth Club, Community Alert, GAA, Tidy Towns, Art Club, Bowling Club, IFA, Golf Society, Gun Club, Athletic Club and Gardening Club. The latest enrolment statistics from the Department of Education and Skills indicate that the local primary school, St Anne's National School had 134 pupils enrolled in 2019.

Tyrrellspass is served by an existing wastewater treatment plant located to the north of the town. Water supply is provided by the Mullingar High Level Water Supply Scheme. The village is strategically located on a major inter-urban transport route and has good quality public transport and road links to Dublin. Tyrrellspass to Dublin is served numerous times daily by several public and private bus operators.

4.3.2 LANDUSE CHANGE

A description of the existing site is presented in Chapter 2 and assessed in the context of planning policy and material assets in Chapter 3 and Chapter 9 respectively. Land use changes can affect populations in different ways. Planning policy plays an important role in guiding and facilitating approximate changes in land use which can influence settlement as well as transportation patterns. Planning policy ensures these changes are managed sensitively and are appropriate to the unique existing and emerging social, economic and environmental conditions.

The primary consideration relating to land use change is to assess whether the proposed development conforms with land use policy and to identify if the proposed development is likely to change the intensity of patterns, types of activities and land uses. Therefore, a review of planning policy was carried out as part of this assessment as well as an assessment of the existing and emerging baseline and its capacity to absorb predicted changes.

4.3.3 SEVERANCE

The proposed development lands are not zoned. The development lands are currently in agricultural use (grazing and tillage) and are owned privately (with the exception of the "farmers lane" which runs parallel to the M6 motorway). Notably the Shannonbridge – Maynooth 220kV overhead line transects the lands, running in a west, southwest /east northeast direction across the lands. The existence of this (and the natural gas transmission line to the north) was an important criterion in the selection of the proposed development lands- siting and selection of the development proposals was undertaken following consideration of alternative sites (refer to Chapter 2). It should also be noted that the proposed LEL GIS Castlelost electricity substation will be located equally distance between the Shannonbridge 220kV electricity substation to the west and the Maynooth 220kV substation to the east (c. 52km each way). The development proposals conform with overriding policy and best practice in relation to the siting of such infrastructure.

LEL is applying for full planning permissions for three separate energy related projects (LEL Flexgen Castlelost, LEL ESS Castlelost and LEL GIS Castlelost Projects). The proposed development lands are currently accessed via a private land serving the (existing landowner's residence) from the R446 and the L51251 local road which routes from the R446 to the south-eastern area of the development lands. It is proposed to construct a new primary access to the development lands and associated projects. The vast majority of the proposed development lands are privately owned. A narrow east-west aligned parcel of land containing a "farmer's lane" runs west from the L51251 along part of the southern boundary of the development lands. Ownership of the farmers lane is vested in Westmeath County Council under two folio numbers. There will be no severance of land as a result of the proposed developments or loss of rights of ways or amenities.

4.3.4 HEALTH AND SAFETY

The primary legislation in Ireland is the Safety Health and Welfare at Work Act 2005. There are a number of amendments to the Act, as well as Regulations and Codes of Practice. Primary legislation can be referenced from the HSA website and the Act can be downloaded from the Irish Statue Book. Within the legislation responsibilities have been assigned to each party at the different stages of the development of a project. These apply to any construction project and are applicable to the three projects discussed within this EIAR.

The Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) (the "COMAH Regulations") implement the Seveso III Directive (2012/18/EU) and aim to prevent and mitigate the effects of major accidents involving dangerous substances which can cause serious harm to people and/or the environment, with the overall objective of providing a high level of protection in a consistent and effective manner. An Environmental Risk Assessment (ERA) of the development proposals was carried out by DNV Services UK Limited. The ERA determined that development of the LEL Flexgen Castlelost Project qualifies as a "lower tier" site under the COMAH Regulations 2015 as it holds quantities of dangerous substances (diesel /gas oil as a secondary fuel) above threshold quantities specified in Schedule 1 of the COMAH Regulations 2015. The LEL GIS Castlelost and LEL ESS Castlelost Projects do not fall under the provisions of the COMAH Regulations 2015.

4.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

4.4.1 DO NOTHING SCENARIO

If the proposed projects are not developed the site remain in agricultural use. However, in light of electricity supply and network challenges which have been publicised and reported by the TSO, failing to address the challenge will have a direct impact on the future growth of the economy. The development lands were carefully selected to avoid impact to sensitive receivers and provide the system with low carbon reserve capacity and flexible carbon free ancillary services. The development proposals supports further integration of renewable generators, such as off-shore renewables, whilst providing for security of supply.

4.4.2 POPULATION AND SETTLEMENT PATTERNS

This project does not contain a housing or services element and is not considered to have any direct positive or negative impact on the local or regional population levels. However, the plant will attract employees who are not based in locally to relocate to the town to reduce commuting distances.

During the construction phase there is the potential for limited impacts on the residential amenity of the local population. The overall impact is considered to be imperceptible in terms of population and an increase in traffic volume. These would be short-term impacts primarily relating to an increase in construction traffic causing noise, dust and an increase in traffic volume. With the recommended traffic and transport mitigation measures in place, no significant adverse roads and traffic related environmental impacts are anticipated during the construction, operational or decommissioning phases of the proposed development.

4.4.3 LANDUSE CHANGE AND SEVERENCE

Overall, the effect of the impact associated with development with the projects in isolation or in combination is considered as slight, neutral and long-term.

4.4.4 HEALTH AND SAFETY

Given the buffer to residential properties and nearby settlements, the sensitivity of the receiver is considered to be low. The predicted impact on air quality is short term and not significant hence the potential human health impact during construction is imperceptible. Air quality and noise are dealt with separately in Chapters 8 (Air Quality and Climate) and 10 (Noise and Vibration). In terms of air quality, it was concluded that short-term slight adverse impact is predicted for the closest receptors during the construction phase with potential short-term impacts from traffic on the surrounding roads within approximately 50m of the proposed Project site. No lasting impact will occur, and the short-term impact will be managed by means of an effective Construction Environmental Management Plan (CEMP) incorporating the mitigation measures outlined. There will be no significant emissions to atmosphere during the operation of the projects. The impacts are assessed as being imperceptible. In terms of noise and vibration, it was determined that there are no significant adverse effects during construction. The magnitude of potential effects is considered negligible. During operation the magnitude of potential noise impacts on receivers, with design embedded mitigation, is considered imperceptible for all projects (in isolation and in combination).

A Stage 1 Road Safety Audit has been carried out in accordance with TII's publication *'GE-STY-01024 – Road Safety Audit'* and is included under the Traffic and Transport Appendix. All issues raised in the Road Safety Audit have been addressed so the proposed development will be satisfactory in terms of traffic operations and safety.

In terms of COMAH, the ERA prepared by DNV concluded that the level of mitigated risk posed by the LEL Flexgen Castlelost Project and the LEL ESS Castlelost Project is acceptable and is therefore the potential effect is considered imperceptible.

4.5 MITIGATION MEASURES

In order to control potential negative impacts during construction, a detailed Construction Environmental Management Plan (CEMP) will be prepared for each project. This will be implemented by the nominated Contractor during the construction phase of the projects. Mitigation measures outlined within the various sections of the EIAR will be incorporated into the CEMP. Post mitigation impacts to population and human health during the construction (and decommissioning stages) are predicted as short-term, direct and indirect slight effects. Given that the receivers sensitivity is considered low, the potential effects associated with operation of the LEL Flexgen Castlelost Project, the LEL GIS Castlelost Project and the LEL ESS Castlelost Project is considered imperceptible.

4.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

Based on the assessment, all three of the proposed projects located on the development lands at Kiltotan and Collinstown and Oldtown are not considered to give rise to any significant population and human health effects.

4.7 CUMULATIVE EFFECTS

Based on the assessment findings presented in all Chapters of the EIAR which have interactions with Population and Human Health, the magnitude of potential effects associated with operation of the three projects in combination is considered imperceptible.

5 BIODIVERSITY

5.1 INTRODUCTION

This chapter provides an assessment of the impacts of the proposed development on the ecological environment, i.e., biodiversity, flora and fauna. It has been compiled in compliance with the European Communities Legal requirements with regard to Environmental Impact Assessment and follows the revised Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017) and Draft Advice Notes for preparing Environmental Impact Statements (EPA, 2015).

This chapter was compiled by Ger O'Donohoe (B.Sc. Applied Aquatic Sciences (GMIT, 1993) & M.Sc. Environmental Sciences (TCD, 1999)) who has over 25 years' experience in environmental impact assessment and has completed numerous Appropriate Assessment Screening Reports and Natura Impact Statements on terrestrial and aquatic habitats.

5.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

This chapter of the EIA Report concentrates on ecological features within the development area of particular significance, primarily designated habitats and species. This includes habitats/species listed in Annex I, II and IV of the EU Habitats Directive, rare plants listed in the Flora Protection Order and other semi-natural habitats of conservation value.

A Report for the purposes of Appropriate Assessment Screening was undertaken by Moore Group for the proposed development which is presented under separate cover as parts of the planning application documents.

In order to screen out a project, it must be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

5.2.1 POLICY AND GUIDANCE

5.2.1.1 EU Habitats Directive

The "Habitats Directive" (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna) is the main legislative instrument for the protection and conservation of biodiversity within the European Union and lists certain habitats and species that must be protected within wildlife conservation areas, considered to be important at a European as well as at a national level. A "Special Conservation Area" or

SAC is a designation under the Habitats Directive. The Habitats Directive sets out the protocol for the protection and management of SACs.

The Directive sets out key elements of the system of protection including the requirement for "Appropriate Assessment" of plans and projects.

Both the Habitats Directive and the Birds Directive have been transposed into Irish law by one set of regulations (i.e., The European Communities (Birds and Natural Habitats) Regulations 2011 to 2015 (S.I. No. 477/2011 as amended by S.I. No. 355 of 2015)).

5.2.1.2 Bird Directive

The "Birds Directive" (Council Directive 2009/147/EC on the Conservation of Wild Birds) provides for a network of sites in all member states to protect birds at their breeding, feeding, roosting and wintering areas. This directive identifies species that are rare, in danger of extinction or vulnerable to changes in habitat and which need protection (Annex I species). Appendix 1 indicates Annex I bird species as listed on the Birds Directive. A "Special Protection Area" or SPA, is a designation under The Birds Directive.

Special Areas of Conservation and Special Protection Areas form a pan-European network of protected sites known as Natura 2000 sites and European sites.

5.2.1.3 Wildlife Acts (1976 - 2012)

The primary domestic legislation providing for the protection of wildlife in general, and the control of some activities adversely impacting upon wildlife is the Wildlife Act of 1976. The aims of the wildlife act according to the National Parks and Wildlife Service are "... to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims." All bird species are protected under the act. The Wildlife (Amendment) Act of 2000 amended the original Act to improve the effectiveness of the Act to achieve its aims.

5.2.2 HABITAT SURVEY

The habitat survey was carried out in three stages; firstly, through desktop research to determine existing records in relation to habitats and species present in the study area. This included research on the National Parks and Wildlife Service (NPWS) metadata website, the National Biodiversity Data Centre (NBDC) database and a literature review of published information on flora and fauna occurring in the proposed development area.

Other environmental information for the area was reviewed, e.g., in relation to soils, geology, hydrogeology and hydrology. Interactions in terms of the chapters on these topics presented in this EIA Report were important in the determination of source vector pathways and links with potentially hydrologically connected areas outside the proposed development site.

The second phase of the survey involved site visits in July and August 2021 to establish the existing environment in the footprint of the proposed development area. Areas which were highlighted during desktop assessment were investigated in closer detail according to the Heritage Council Best Practice Guidance for Habitat Survey and Mapping (Smith *et al*., 2011). Habitats in the proposed development area were classified according to the Heritage Council publication *"A Guide to Habitats in Ireland"* (Fossitt, 2000). This publication sets out a standard scheme for identifying, describing, and classifying wildlife habitats in Ireland. This form of classification uses codes to classify different habitats based on the plant species present. Species recorded in this report are given in both their Latin and English names. Latin names for plant species follow the nomenclature of *"An Irish Flora"* (Parnell & Curtis, 2012).

Habitats were surveyed on 23 June and 28 July 2021 by conducting study area walkovers covering the main ecological areas identified in the desktop assessment. The survey dates are within the optimal survey periods for botanical species.

Signs of mammals such as badgers and otters were searched for while surveying the study area noting any sights, signs or any activity in the vicinity especially along adjacent boundaries.

A site-specific bat survey was carried out during fieldwork on the night of 28 July. A dusk mobile detector survey was carried out completing looped transects of the site during the dusk period to survey for commuting, feeding and potential roost sites. The transects commenced in the area of the farm buildings to the mid-west of the site, which were earmarked for demolition, to assess the potential for roosting and emerging bats.

The survey on 28 July commenced at 20:30 with sunset at Rochfortbridge occurring at c. 21:30. Conditions on the night of the survey were fair with 90% cloud cover and the air temperature varied during the evening of the survey between 21^{0}C at 20:00 to 14^{o}C at 21:30.

The bat detectors used during the walked surveys were a Pettersson D230 bat detector and an Echo Meter Touch 2 Pro. A contact describes a bat observed by the surveyor. This contact can range from a commuter passing quickly to a foraging bat circling a feature lasting for several minutes. Some observations contain multiple bats. When several bats of the same species are encountered together, they are recorded under the one contact. A separate contact is recorded for each species. A contact finishes when the recorder assumes the bat is no longer present. It is likely that the same bat is recorded in several contacts throughout the night. This survey type cannot estimate abundance of bats, rather activity; the amount of use which bats make of an area /feature. The survey followed the guidelines as set out in bat conservation Ireland's 'Bat Survey Guidelines'.

The survey undertaken is in line with recommendations of the Bat Conservation Trust *'Good Practice Guidelines'*, 3rd edition, 2016 (Collins, J (ed)(2016) and Irish Wildlife Manual No. 25' (Kelleher, C. & Marnell, F. 2006).

Birds were surveyed using standard transect methodology and signs were recorded where encountered during the field walkover surveys.

Following desktop assessment an evaluation of the development area and determination of the potential impacts on the flora and fauna of the area is based on the following guidelines and publications:

- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2019).
- EPA Draft EIA Report Guidelines 2017;
- Assessment of plans and projects significantly affecting Natura 2000 sites (EC, 2002);
- Managing Natura 2000 Sites (EC, 2000) Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2000);
- Managing Natura 2000 Sites (EC, 2017) Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2018);
- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG, Rev. Feb. 2010); and

The following resources assisted in the production of this chapter of the report:

- Ordnance Survey Ireland maps;
- OSI, Google and Bing Aerial photography (1995 – 2020);
- NPWS Mapviewer: http://www.npws.ie/en/MapsData/;
- Designated sites (SACs, SPAs, NHAs);
- Records of protected species from 10km squares; and
- National Biodiversity Data Centre Records and Maps.

5.2.3 DESCRIPTION OF THE PROJECTS

A detailed description of the three projects is provided in Chapter 2 of this EIAR. The three projects assessed are summarised as follows:

Project 1: Proposed gas-fired reserve generator of 275MW electrical capacity. The project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system. The proposal includes the installation of five (5no.) dry low emission (DLE) gas turbines, associated stack(s), raw water/fire water tank, fire water retention basin, back-up fuel tank, emergency generator, gas receiving station (AGI), customer control room, and all ancillary electrical plant and delivery systems. GNI will separately manage the process of delivering the underground gas transmission steel pipeline to the proposed site.

Project 2: Proposed 220kV Gas Insulated Switchgear (GIS) Electrical Substation. The project will involve installation of two (2 no.) 220 kV underground circuits forming a connection to the existing Shannonbridge-Maynooth 220 kV overhead line (located within the development boundary) and two (2no.) 220 kV underground circuits and associated low voltage and communication underground cabling connecting the proposed substation with electricity transformers to the adjacent reserve gas-fired generator (LEL Flexgen Castlelost) and energy storage plant (LEL ESS Castlelost), and all associated and ancillary site development works. The GIS substation itself includes a two storey, 17m high building (housing electrical switchgear, a battery room, a workshop room, and WC), transformer bay(s), access roadway and all ancillary site development works.

Project 3: Proposed Energy Storage System (ESS) using vanadium flow battery (VFB) technology and a synchronous condenser. The battery energy storage system (BESS) will comprise a cluster of battery modules positioned within a dedicated BESS outdoor compound. Each module will consist of (i) a battery container (6.1m long container) housing pumps and heat exchangers positioned on top of two (ii) tank (electrolyte) enclosures (12.2m long containers). An associated battery management system (BMS) enclosure (cubicle) and medium voltage power station (MVPS) enclosure will also form part of the battery module. The BMS will monitor and control electrolyte circulation and the MVPS is provided to condition the power generated. The synchronous condenser comprises a rotating generator positioned within a building. The generator is connected to the transmission system via a step-up transformer. When the generator has reached an operating speed that is synchronous to the system frequency, it is synchronised with the transmission network and acts as a motor providing reactive and short circuit power to the electricity network. A customer (IPP) building will also be installed within the ESS compound, and it will house electrical switchgear, store, control room, welfare facilities and administration facilities.

5.3 DESCRIPTION OF RECEIVING ENVIRONMENT

5.3.1 GENERAL

The site comprises a mosaic of open farmland fields (GA1) which are either heavily grazed or under Arable Crops (BC1). The fields are bordered by low gappy sections of hedgerows with occasional semi-mature or mature trees.

The following is a description of the flora and fauna of the existing environment in the study area.

5.3.2 DESIGNATED CONSERVATION AREAS

The Department of Housing, Planning and Local Government (previously DoEHLG)'s Guidance on Appropriate Assessment (2009) recommends an assessment of European sites within a Zone of Influence (ZoI) of 15km. This distance is a guidance only and a potential Zone of Influence of a proposed development is the geographical area over which it could affect the receiving environment in a way that could have significant effects on the Qualifying Interests of a European site. This should be established on a case-by-case basis using the Source- Pathway-Receptor framework and not by arbitrary distances (such as 15km).

The Zone of Influence may be determined by connectivity to the Proposed Development in terms of:

- Nature, scale, timing and duration of works and possible impacts, nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and
- Sensitivity and location of ecological features.

The potential for source pathway receptor connectivity is firstly identified and detailed information is then provided on sites with connectivity. European sites that are located within the potential Zone of Influence of the Proposed Development are listed in Table 5.1 and presented in Figure 5.1 below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on 6 September 2021.

Table 5.1 European Sites located within 15km or the potential Zone of Influence[18] of the Proposed Development.

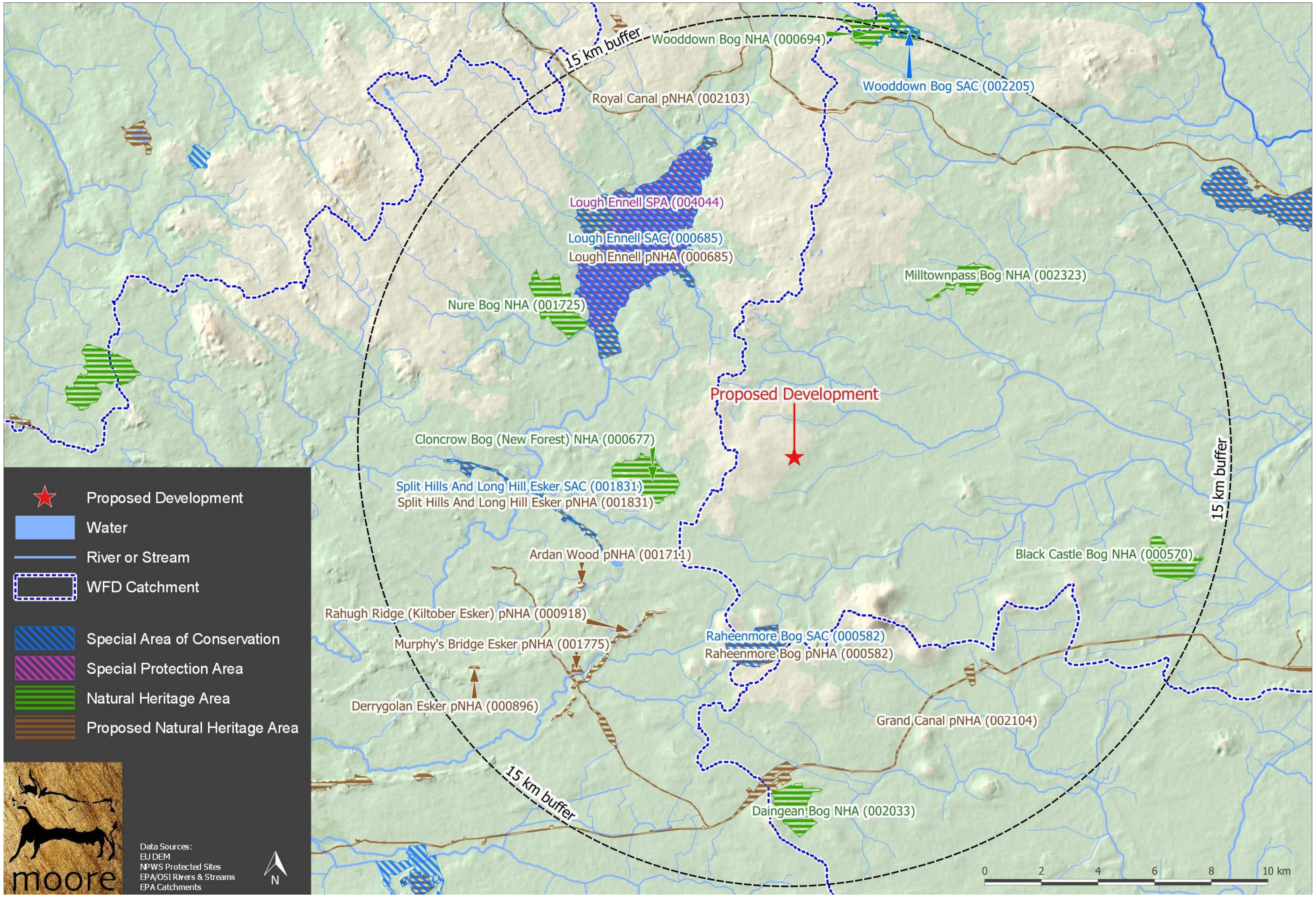
Site Code	Site Name	Distance (km)[19]
000582	Raheenmore Bog SAC	5.79
000685	Lough Ennell SAC	6.25
001831	Split Hills And Long Hill Esker SAC	7.19
002205	Wooddown Bog SAC	14.33
004044	Lough Ennell SPA	6.94

The proposed development lands are located within the hydrological catchment of the Mongagh River, located approximately 1.1km to the north of the water course and in the rural setting of Westmeath.

Downstream, the Mongagh River flows east into the River Boyne with its associated European sites, the River Boyne and River Blackwater SAC (Site Code 002299) and the River Boyne and River Blackwater SPA (Site Code 004232), which are located over 20 river km to the northeast of the Proposed Development.

[18] All European sites potentially connected irrespective of the nature or scale of the Proposed Development.
[19] Distances indicated are the closest geographical distance between the Proposed Development and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

Figure 5.1 Showing location of the Proposed Development Lands in Co. Westmeath



5.3.3 NON-DESIGNATED HABITATS

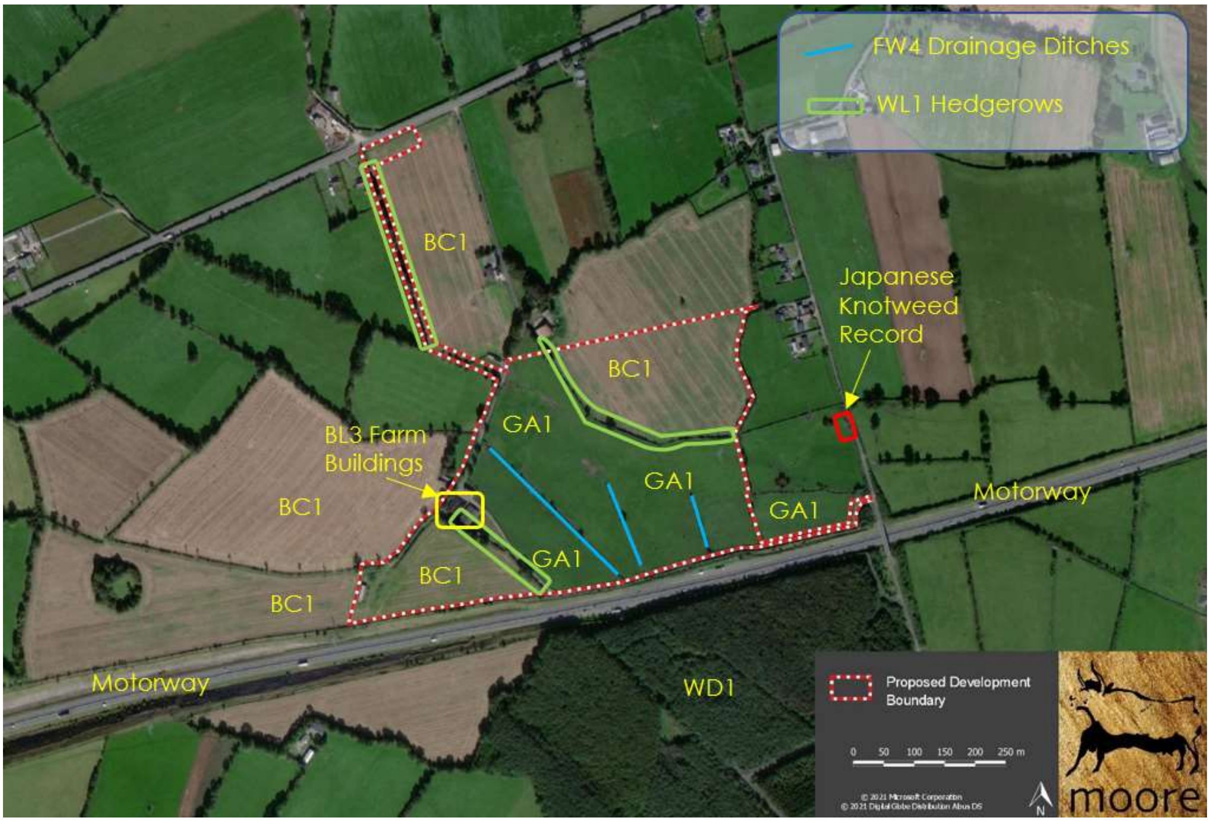
The proposed development area is improved farmland with open fields which are either heavily grazed or under Arable Crops. There are internal hedgerows and associated short shallow drainage ditches and surrounding outgrown hedgerows.

The main habitats are presented on the recent aerial photography in Figure 5.2. A list of habitats recorded and their corresponding Fossitt codes is presented in Table 5.2.

Table 5.2 Details of habitats recorded and their corresponding Fossitt codes.

Habitat	Habitat Category	Habitat Type
(F) Freshwater	(FW) Watercourses	(FW4) Drainage ditches
(G) Grassland	(GA) Improved grassland	(GA1) Improved agricultural grassland
(W) Woodland and Scrub	(WS) Scrub and transitional woodland	(WS1) Scrub
	(WL) Linear woodland	(WL1) Hedgerows
(B) Cultivated and Built land	(BC) Cultivated land	(BC1) Arable crops
(B) Cultivated and Built land	(BL) Built land	(BL3) Buildings and artificial surfaces

Figure 5.2 Showing habitats recorded at the proposed development site



5.3.3.1 (FW4) Drainage ditches

This habitat classification applies to drainage ditches within the site associated with low gappy hedgerows. Draining ditches are generally shallow and stagnant being self-contained draining to ground. During the summer surveys, the ditches on site did not contain water.

Species present include Great willowherb (*Epilobium hirsutum*), Meadowsweet (*Filipendula ulmaria*), Buttercup (*Ranunculus acris*) and Nettle (*Urtica dioica*).

The existing manmade ditches with intermittent or ephemeral characteristics are not considered to be a significant watercourse or stream.

5.3.3.2 (GA1) Improved agricultural grassland

This habitat refers to those grassland areas which comprise the managed fields on the site. Species present include Cocks foot (*Dactylis glomerata*), Bent (*Agrostis* spp.), and Meadow grass (*Poa* spp.). Ribwort plantain (*Plantago lanceolata*), Buttercup (*Ranunculus acris*), Daisy (*Bellis perennis*), and Nettle (*Urtica dioica*) are common along with Dandelion (*Taraxacum* spp.). The fields are intensively grazed by cattle and horses.

5.3.3.3 (WL1) Hedgerows

This habitat refers the site boundaries and four internal dividing field boundaries. The predominant species present is Hawthorn (*Crataegus monogyna*) and Ash (*Fraxinus excelsior*) along with Sycamore (*Acer pseudoplatanus*) and frequent Elder (*Sambucus nigra*).

The field boundary hedgerows are generally poorly maintained and have large gaps and are succeeding to scrub in places. Sections that have understorey flora includes Nettle stands and Bramble scrub.

There is a large outgrown hedgerow along the proposed norther access route the site which comprises a line of mature Ash and Sycamore.

The area of the farm buildings comprising cattle sheds and silos is surrounded by nearby mature Sycamore.

5.3.3.4 (WS1)Scrub

This habitat was recorded in areas where succession of habitats has occurred from spreading Bramble adjacent to field boundaries and in field corners. The ditches are managed, and the central tall herbs are forming a scrub like habitat.

5.3.3.5 (BC1)Arable crops

There are three surrounding fields visible on the habitat map as a pale golden colour which are managed for crops. The field sward in these areas is low with fewer in field species but a similar verge composition to the grassland areas.

5.3.4 INVASIVE SPECIES

Small patches of Japanese Knotweed were record during preliminary site visits in May 2019. The area is located on an access road (L51251) to the east and was treated in the past 5 years having reduced an extensive patch along the road in that area to a few persistent plants.

5.3.5 FAUNA

5.3.5.1 Badgers

There were no badger setts along field boundaries which would be disturbed and no signs of badgers in the study area.

5.3.5.2 Otters

There were no signs of otters in the site or along the drainage ditches which have no fisheries value.

5.3.5.3 Bats

The NBDC database was queried for records of species from a custom polygon covering the site development area up to 100m from the boundary on 6 September 2021. No records of bats are available from the selected area.

The farm buildings to the east of the site have no or low bat roosting potential. There were no signs of emerging bats during the night time bat detector survey in the area of these buildings.

The result of the walked bat transects showed that two confirmed bats species were present; Soprano pipistrelle (*Pipistrellus pygmaeus*) and Leisler's bat (*Nyctalus leisleri*). The first calls of Leisler's bats were made at 21:43 and were distant appearing to come from the northwest of the main central site area.

The Soprano pipistrelle calls were determined to come from the north of the site and may be associated with farm buildings to the north.

In general, the site is of relatively low value to commuting bats with the internal hedgerows being well maintained and low cut.

5.3.5.4 Other Mammals

There were signs of fox recorded along with rabbits. These species are of low ecological concern and are not protected.

5.3.5.5 Birds

Species recorded included regular passerines such as Great Tit (*Parus major*), Chaffinch (*Fringilla coelebs*), Blackbird (*Turdus merula*), Wren (*Troglodytes troglodytes*) and numerous Woodpigeon (*Columba palumbus*).

A list of breeding bird species recorded during fieldwork in September 2020 is presented in Table 5.3.

Table 5.3 Birds recorded during fieldwork in June and July 2021

Birds	Scientific name	BWI Status	Habitat Type
Blackbird	*Turdus merula*	Green	Dense woodland to open moorland, common in gardens
Rook	*Corvus frugilegus*	Green	Open woodland and farmland
Chaffinch	*Fringilla coelebs*	Green	Hedgerows, gardens and farmland
Magpie	*Pica pica*	Green	Farmland, open country with scattered trees or bushes, increasingly in urban areas
Robin	*Erythacus rubecula*	Green	Woodland, gardens and parks
Woodpigeon	*Columba palumbus*	Green	Gardens, woods, hedges
Wren	*Troglodytes troglodytes*	Green	Low cover anywhere, especially woodlands
Swallow	*Hirundo rustica*	Amber	Common summer visitor throughout Ireland from mid-March to late-September

5.3.6 HABITAT EVALUATION

The ecological value of the site was assessed following the guidelines set out in the Institute of Ecology and Environmental Management's Guidelines for Ecological Impact Assessment (2019) and according to the Natura Scheme for evaluating ecological sites (after Nairn & Fossitt, 2004). Additionally, the TII Guidelines (formerly NRA) for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) outlines the methodology for evaluating ecological impacts Judgements on the evaluation were made using geographic frames of reference, e.g., European, National, Regional or Local, see Table 5.4 below.

Due cognisance of features of the landscape which are of major importance for wild flora and fauna, such as those with a "stepping stone" and ecological corridors function, as referenced in Article 10 of the Habitats Directive were considered in this assessment.

Table 5.4 Details of TII Guidelines (formerly NRA) for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)

Ecological valuation: Examples

International Importance:

- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.
- Proposed Special Protection Area (pSPA).
- Site that fulfills the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).
- Features essential to maintaining the coherence of the Natura 2000 Network.[4]
- Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.
- Resident or regularly occurring populations (assessed to be important at the national level)[5] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.
- Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
- World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
- Biosphere Reserve (UNESCO Man & The Biosphere Programme).
- Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
- Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
- Biogenetic Reserve under the Council of Europe.
- European Diploma Site under the Council of Europe.
- Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).[6]

National Importance:

- Site designated or proposed as a Natural Heritage Area (NHA).
- Statutory Nature Reserve.
- Refuge for Fauna and Flora protected under the Wildlife Acts.
- National Park.
- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
- Resident or regularly occurring populations (assessed to be important at the national level)[7] of the following:
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing 'viable areas'[8] of the habitat types listed in Annex I of the Habitats Directive.

County Importance:

- Area of Special Amenity.[9]
- Area subject to a Tree Preservation Order.
- Area of High Amenity, or equivalent, designated under the County Development Plan.
- Resident or regularly occurring populations (assessed to be important at the County level)[10] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
- County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP,[11] if this has been prepared.
- Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
- Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (higher value):

- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;
- Resident or regularly occurring populations (assessed to be important at the Local level)[12] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value):

- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;
- Sites or features containing non-native species that are of some importance in maintaining habitat links.

The Proposed Development is located within the hydrological catchment of the Mongagh River, located approximately 1.1km to the north of the water course. As previously established, the site drainage ditches being seasonally dry have limited connectivity to the adjacent Motorway drainage system leading to the Mongagh River.

Downstream, the Mongagh River flows east into the River Boyne with its associated European sites, the River Boyne and River Blackwater SAC (Site Code 002299) and the River Boyne and River Blackwater SPA (Site Code 004232), which are located over 20 river km to the northeast of the Proposed Development. Therefore, the proposed development site has limited connectivity to the River Boyne.

Additionally, the proposed development design includes SuDS features to attenuate surface water. Thus, the potential for downstream impacts is considered highly unlikely.

There is no potential for connectivity to any other European sites.

Given the above analysis, it is considered that there will be no potential for significant effects on any European sites considered and therefore potential effects on European sites can be excluded at the screening stage.

The open field habitats are considered of low biodiversity value at a local level as are the internal hedgerows.

There are no rare or protected habitats recorded in the study areas inside the licenced areas. Overall, the proposed development area is of Low Local Ecological Value.

5.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

5.4.1 LEL FLEXGEN CASTLELOST ASSESSMENT

5.4.1.1 Potential direct effects

The open field habitats are considered of low biodiversity value at a local level as are the internal hedgerows.

There are no rare or protected habitats recorded in the study areas inside the licenced areas. Overall, the proposed development area is of Low Local Ecological Value.

Potential direct effects on breeding birds can be avoided by appropriate timing.

The potential direct effects on Biodiversity will be imperceptible and neutral.

5.4.1.2 Potential indirect effects

The potential indirect effects on habitats will be imperceptible and neutral.

There will be earth movement during site preparation, however, there will be no discharge of silt laden or contaminated surface water to the Mongagh River.

The possibility of contaminated surface water reaching the Rover Boyne is extremely low given the downstream distance of over 20 river km.

Guidance on lighting has been based on the Bats & Lighting document; (BCI , 20 the Bats and artificial lighting in the UK Guidance Note 08/18 (BC T, 2018) and Guidelines for consideration of bats in lighting projects. EUROBATS Publication Series No. 8 (Voigt, 2018). Lighting can alter the behaviour of bats and the insects they prey on.

5.4.2 LEL ESS CASTLELOST ASSESSMENT

5.4.2.1 Potential direct effects

The open field habitats are considered of low biodiversity value at a local level as are the internal hedgerows.

There are no rare or protected habitats recorded in the study areas inside the licenced areas. Overall, the proposed development area is of Low Local Ecological Value.

Potential direct effects on breeding birds can be avoided by appropriate timing.

The potential direct effects on Biodiversity will be imperceptible and neutral.

5.4.2.2 Potential indirect effects

The potential indirect effects on habitats will be imperceptible and neutral.

There will be earth movement during site preparation, however, there will be no discharge of silt laden or contaminated surface water to the Mongagh River.

The possibility of contaminated surface water reaching the Rover Boyne is extremely low given the downstream distance of over 20 river km.

Guidance on lighting has been based on the Bats & Lighting document; (BCI , 20 the Bats and artificial lighting in the UK Guidance Note 08/18 (BC T, 2018) and Guidelines for consideration of bats in lighting projects. EUROBATS Publication Series No. 8 (Voigt, 2018). Lighting can alter the behaviour of bats and the insects they prey on.

5.4.3 LEL GIS CASTLELOST ASSESSMENT

5.4.3.1 Potential direct effects

The open field habitats are considered of low biodiversity value at a local level as are the internal hedgerows.

There are no rare or protected habitats recorded in the study areas inside the licenced areas. Overall, the proposed development area is of Low Local Ecological Value.

Potential direct effects on breeding birds can be avoided by appropriate timing.

The potential direct effects on Biodiversity will be imperceptible and neutral.

5.4.3.2 Potential indirect effects

The potential indirect effects on habitats will be imperceptible and neutral.

There will be earth movement during site preparation, however, there will be no discharge of silt laden or contaminated surface water to the Mongagh River.

The possibility of contaminated surface water reaching the Rover Boyne is extremely low given the downstream distance of over 20 river km.

Guidance on lighting has been based on the Bats & Lighting document; (BCI , 20 the Bats and artificial lighting in the UK Guidance Note 08/18 (BC T, 2018) and Guidelines for consideration of bats in lighting projects. EUROBATS Publication Series No. 8 (Voigt, 2018). Lighting can alter the behaviour of bats and the insects they prey on.

5.5 MITIGATION MEASURES

5.5.1 LEL FLEXGEN CASTLELOST MITIGATION

Potential impacts on birds will be avoided by cutting of vegetation outside the bird nesting season March 1st to August 31st. If this cannot be enforced, then the site will be surveyed for the presence of nesting birds and/or nests prior to cutting and if none are recorded the vegetation may be removed within 48 hours.

In order to minimise the extent of light spill onto perimeter habitats, all lights that are pole mounted will be directional and/or cowled to ensure that light is directed downward and inwards. Lights will be programmed or otherwise to be off unless required.

5.5.2 LEL ESS CASTLELOST MITIGATION

Potential impacts on birds will be avoided by cutting of vegetation outside the bird nesting season March 1st to August 31st. If this cannot be enforced, then the site will be surveyed for the presence of nesting birds and/or nests prior to cutting and if none are recorded the vegetation may be removed within 48 hours.

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In order to minimise the extent of light spill onto perimeter habitats, all lights that are pole mounted will be directional and/or cowled to ensure that light is directed downward and inwards. Lights will be programmed or otherwise to be off unless required.

5.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

Specific local mitigation measures include the avoidance of cutting of vegetation during the bird nesting season with regard to the construction phase. The remaining hedgerow habitat to be conserved in site. There will be a loss of relatively low value local habitats including short sections of low value gappy hedgerow, scrub, grassland and overgrown drainage ditches. The overall effect is considered neutral, imperceptible, and long-term.

With the employment of appropriate mitigation measures with regard to local biodiversity, the Proposed Development will have a neutral, imperceptible and long-term effect on biodiversity.

5.7 CUMULATIVE EFFECTS INCLUDING GAS PIPELINE CONNECTION

Three potential routes for gas pipelines connections to the proposed LEL Flexgen Castlelost development from the gas transmission pipeline to the north were considered. Management of the route selection process, selection of the final pipeline route and construction of the underground pipeline will be managed and undertaken by Gas Networks Ireland. Any gas connection pipeline will be undergrounded. There is potential for pipelines to impact on unknown habitats and fauna such as badgers. However, this can be mitigated by appropriate avoidance measures to ensure no cumulative effects occur.

The Westmeath County Development Plan in complying with the requirements of the Habitats Directive requires that all Projects and Plans that could affect the Natura 2000 sites in the same zone of influence of the Proposed Development site would be initially screened for Appropriate Assessment and if requiring Stage 2 AA, that appropriate employable mitigation measures would be put in place to avoid, reduce or ameliorate negative impacts. In this way any, in-combination impacts with Plans or Projects for the proposed development area and surrounding townlands in which the proposed development site is located, would be avoided.

A review of developments granted permission in the vicinity in most cases have been granted with conditions relating to sustainable development by the consenting authority in compliance with the relevant Local Authority Development Plan and in compliance with the Local Authority requirement for regard to the Habitats Directive. Any consented development cannot have received planning permission without having met the consenting authority requirement in this regard. There are no predicted in-combination or cumulative effects given that it is predicted that the Proposed Development will have no effect on any European site.

5.8 MONITORING AND FURTHER WORKS

No ecological monitoring is required during the construction phase of development. The mitigation measures specifying review of the lighting plan by a bat ecologist may require additional surveys and monitoring during site construction and operation. The Local Authority may propose additional monitoring in order to address this. No reinstatement measures are proposed.

5.9 SUMMARY OF SIGNIFICANT EFFECTS

There will be no significant effects on designated sites in the potential Zone of Influence of the proposed development lands.

There will be no significant effects on low value local biodiversity.

5.10 REFERENCES

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- Department of the Environment, Heritage and Local Government (2010) Guidance on Appropriate Assessment of Plans and Projects in Ireland (as amended February 2010).
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6 SOILS & GEOLOGY

6.1 INTRODUCTION

This Chapter of the EIAR focuses on the soils and geology environment and discusses the potential impacts associated with the development proposals during the construction and operational phases. The chapter provides an overview of the baseline geological and soil conditions across the development lands and an assessment of potential significant effects during the construction, operational and decommissioning stages.

For the purpose of the Environmental Impact Assessment (EIA) the following is defined:

- The term "Geology" refers to the bedrock and superficial deposits.
- The term "Soil" refers to the material produced largely by weathering and biological activity which are often principally derived from the underlying bedrock and superficial geology.

The amended EIA Directive introduces Land as a prescribed environmental factor. Recital 9 gives context to this addition, showing that it relates to the issue of 'land take'. This aspect is separately discussed under Material Assets Chapter.

This Section on Geology and Soils involved the following:

- Review of development proposals.
- Review of site-specific reports.
- Consultation with relevant statutory authorities /databases to help establish baseline conditions and identify any significant concerns in the area.
- Consideration of potential interactions and identification of possible impacts.
- Assessment of impacts, within the context of the receiving environment including cumulative effects.
- Identification of measures and solutions to avoid, minimise and mitigate potential impacts; and,
- Assessment of residual impacts, taking account of mitigation measures.

6.2 METHODOLOGY & SIGNIFICANCE CRITERIA

6.2.1 ASSESSMENT METHODOLOGY

This assessment has been undertaken in line with the Source – Pathway – Receptor Model as per the documents *'Guidelines on the Information to be contained in Environmental Impact Assessment Impact Assessment Reports Draft',* August 2017 and *'Advice Notes for Preparing Environmental Impact Statements Draft'*, September 2015.

At the impact assessment stage, any potentially beneficial or adverse impacts associated with the development are identified and assessed with reference to the baseline environment. This requires consideration of:

- Sensitivity/value of the receptor,
- Magnitude of the impact,
- Impact duration,
- Whether impact occurs in isolation, is cumulative or is interactive; and
- Performance against environmental quality standards or other relevant thresholds.

6.2.2 ASSESSMENT CRITERIA AND IMPACT ASSESSMENT METHODOLOGY

This assessment considers the potential risk to environmental receptors and the pathways by which the receptors may be affected. Definitions of the key descriptors are detailed below:

- Source: potential contaminant sources,
- Pathway: the mechanism by which the source may affect a receptor, and
- Receptor: identified features that may be affected, based on the sensitivity of the site.

The strength of the pathway between a source and a receptor is a function of the distance between the two and the ease or otherwise of the migration pathway. For example, on sites underlain by impermeable clays, the migration pathway via groundwater would be weak even over short distances, whereas within sands or gravels, the migration pathway would be strong for receptors in close proximity to a source and weak for receptors at some distance from the source.

The significance of predicted impacts likely to occur during all phases of the proposed development was determined by considering the value and sensitivity of the key attributes that may be affected and the magnitude of the predicted impact.

6.2.3 DETERMINING THE VALUE AND SENSITIVITY OF THE RECEPTOR THROUGH BASELINE STUDIES

The value or sensitivity of a receptor is largely determined by its quality, rarity and scale. The determination of value or sensitivity takes into account the scale at which the attribute is important. For the purpose of assessing the significance of environmental impacts predicted as part of this assessment, the value of receptors is scaled based on the relative importance of the receptor defined as follows:

- LOCAL LEVEL: On the development lands or immediately adjacent to it.
- DISTRICT LEVEL: Beyond the development land boundary but within the district.
- COUNTY LEVEL: County Level e.g., Westmeath
- REGIONAL LEVEL: Eastern and Midlands Region
- NATIONAL LEVEL: Ireland.
- INTERNATIONAL LEVEL: European Community.

A receptors value and sensitivity must be defined using available guidance and professional knowledge and taking into account the site sensitivities. In some cases, the inherent value of the receptor has been recognised and been afforded a statutory designation (e.g., Special Areas of Conservation (SAC's)), which makes the value assignment more straightforward. The judgement of receptor significance is made on a case-by-case basis for each receptor or resource identified as having the potential to be subject to impacts associated with the proposed development.

Irrespective of its recognised value, all receptors/features would exhibit a degree of sensitivity to the changes imposed by new development. The 'sensitivity' element of the criterion ensures that this characteristic of each receptor is assessed. The classification for determining sensitivity of receptors is detailed in Table 6.1. This classification is used as a generic methodology and professional judgement has been applied in each case.

Table 6.1 Receptor Sensitivity and Typical Descriptors

Sensitivity	Descriptors
Very Low	Feature / receptor is generally insensitive to impact, no discernible changes e.g., soils are not in use, the land is used for industrial/commercial purposes and /or mainly covered by hard standing.
Low	Feature / receptor has some tolerance to accommodate the proposed change. It responds in a minimal way such that only minor changes are detectable e.g., landscaped areas.

Sensitivity	Descriptors
Medium	Feature / receptor has a low capacity to accommodate the proposed form of change. It clearly responds to effects in a quantifiable manner e.g. low-grade agricultural land and recreational ground.
High	Feature / receptor has a very low capacity to accommodate the proposed form of change. The response is a major change e.g. agricultural land use for food production, allotments.

6.2.3.1 Magnitude of Impacts

Magnitude refers to the 'scale' or 'amount' of an impact. Key impacts have been identified and the likely magnitude of each potential impact has been determined through the predicted change from the baseline conditions throughout the various phases of development. The magnitude of an impact is a measure of aspects such as the impacts:

- Extent (i.e., the geographical area over which the impact occurs),
- Duration (i.e., the time for which the impact is expected to last prior to recovery or replacement of the resource or feature: short, medium or long term),
- Likelihood (i.e., the probability that the impact will occur),
- Direct or Indirect (i.e., difficult to avoid), and,
- Reversibility (i.e., an irreversible (permanent) impact is one from which recovery is not possible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it: Temporary or Permanent).

In order to help define the level of impact magnitude the following guidance (see Table 6.2) has been adopted for the purpose of providing a transparent assessment. The professional judgement of the technical author is used in the decision-making process when characterising impacts in accordance with the criteria set out in Table 6.2.

Table 6.2 Assessment Criteria for Magnitude

Magnitude	Assessment Criteria
No Change	• No loss or alteration of characteristics, features or elements. • No observable impact on receptors/features.
Negligible	• Noticeable, temporary (for part of the development duration) change; or • Barely discernible change for any length of time, over a small area, to any key characteristics or features. • Impact unlikely or rarely to occur. • Results in effects on attribute of insufficient magnitude to affect the use/integrity.

Magnitude	Assessment Criteria
Slight	• Noticeable, temporary (during the project duration) change, over a partial area, to key characteristics or features. Impact will possibly occur. • Impact predicted to extend over a small area. • Impact predicted to affect small numbers of people. • Impact predicted to affect a small number of other receptors (ecological, businesses, facilities). • Impact not predicted to have trans-boundary effects, but possibility remains. • Slight but discernible change in environmental conditions predicted. • Impact not predicted to entail unusual/complex effects for receptors. • Impact not predicted to affect particularly scarce features/resources. • Impact not predicted to result in breaches of legislation or statutory Environmental Quality Standard or Objectives. • Impact not predicted to result in loss of attribute. • Impact will continue for a short period of time only. • Impact will be temporary. • Impact will be intermittent and/or rare. • Impact will be reversible. • Impact will be possible to avoid, reduce, repair, or compensate for; or • Slight positive change in environmental conditions resulting in minor improvements in quality or value of a receptor.
Moderate	• Significant, permanent / irreversible changes, over the majority of the development area and potentially beyond, to key characteristics or features. Impact certain or likely to occur. • Impact predicted to extend over a moderate area. • Impact predicted to affect moderate numbers of people. • Impact predicted to affect some other receptors (ecological, businesses, facilities). • Impact unlikely to have trans-boundary effects, but possibility remains. • Moderate change in environmental conditions predicted. • Impact unlikely to entail unusual/complex effects for receptors but possibility remains. • Impact unlikely to affect particularly scarce features/resources but possibility remains. • Impact entails a low probability that breaches of legislation or statutory Environmental Quality Standard or Objectives will occur. • Impact unlikely to result in loss of attribute but possibility remains. • Impact will continue for a moderate period of time. • Impact will be semi-permanent. • Impact will be intermittent.

Magnitude	Assessment Criteria
	• Impact will be possible to avoid, reduce, repair, or compensate for; or • Notable positive change in environmental conditions resulting in measurable improvements in quality or value of a receptor.
Substantial	• Very significant, permanent / irreversible changes, over the whole development area and beyond (i.e. off-site), to key characteristics or features of character or distinctiveness. Impact certain or likely to occur. • Impact predicted to extend over a large or very large area. • Impact predicted to affect considerable numbers of people. • Impact predicted to affect considerable numbers of other receptors (ecological, businesses, facilities). • Impact predicted to have trans-boundary effects. • Significant change in environmental conditions predicted. • Impact will entail unusual/complex effects for receptors. • Impact will affect particularly scarce features/resources. • Impact entails a high probability that breaches of legislation or statutory Environmental Quality Standard or Objectives will occur; • Impact will result in total loss of attribute. • Impact will continue for extended periods of time. • Impact will be permanent rather than temporary. • Impact will be continuous rather than intermittent, or were intermittent, frequent rather than rare. • Impact will be irreversible. • Impact will be very difficult to avoid, reduce, repair, or compensate for; or • Significant positive change in environmental conditions resulting in major improvements in quality or value of a receptor.

6.2.3.2 Impact Significance

Part 10 of 'The Planning and Development Regulations, 2001 as amended are concerned with 'significance' and the identification of *'significant environmental effects'*. Therefore, an assessment of significance is necessary in order to identify the main environmental effects of the proposed development and assist in determining what weight these effects should be given. Definitive guidance in the preparation of EIA in the soils and geological environment exists *in 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements',* issued by the Institute of geologists of Ireland. From the guidance, a significant effect is defined as "an impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment".

It is widely recognised that 'significance' reflects the relationship between the magnitude of an impact and the sensitivity (or value) of the affected environmental receptor.

To assist in the assessment process, the Impact Significance Matrix (ISM) (Table 6.3) provides a transparent methodology to ensure consistency and ease of interpretation of the judgement of impact significance.

An initial indication of impact significance (adverse or beneficial) is gained by combining magnitude and sensitivity / value in accordance with the ISM provided. It should be noted that although the ISM provides a good framework for the consistent assessment of impacts across all environmental parameters, there is still an important role for professional judgement and further objective assessment to play in moderating an impact's significance. Given that the criteria represent levels on a continuum or continuous gradation, professional judgement and awareness of the relative balance of importance between magnitude and sensitivity / value is required.

Features to which legal designations apply have automatically been determined to be of high value (or of a higher value than non-designated features), and any impact tends to be of a greater significance than an impact of features to which no designation applies. Hence, for designated features, the use of the value criteria leads to an initial presumption that impacts will be of a high significance. Information on sensitivity can then be used to modify or maintain this initial assessment.

Table 6.3 Impact Significance Assessment

Magnitude[1]	Value/sensitivity of receptor[2]			
	Very Low	Low	Medium	High
No Change	Negligible	Negligible	Negligible	Minor
Negligible	Negligible	Minor	Minor	Moderate
Slight	Minor	Minor	Moderate	Major
Moderate	Minor	Moderate	Major	Major
Substantial	Moderate	Major	Major	Major

Note 1 Refer to Table 6.2
Note 2 Refer to Table 6.1

Given the use of professional judgement in the assessment process, there may be some variation between subject areas (i.e., different environmental parameters) in the significance rating process. This may be as a result of limited information on the sensitivity of features and / or the complexity of interactions that require assessment in determining the magnitude of change. However, the ratings derived through the impact assessment process, as set out in Table 6.3 can also be described in a generic fashion as given in Table

6.4. The following definitions are proposed in relation to the significance of environmental impacts predicted throughout this EIAR.

Table 6.4 Impact Significance Definitions

Level of Significance	Description
Negligible	No discernible effect. An impact that is likely to have imperceptible or insignificant impact.
Minor	Slight, very short or highly localised impact of no significant consequence. These effects may be raised as local issues but on their own are unlikely to be of importance in the decision-making process. When combined with other effects these could have a more material influence.
Moderate	Intermediate limited (extent / duration / magnitude) impact that may be considered as significant. These effects are likely to be important considerations at a local level. These could have influence on decision making especially when combined with other similar effects.
Major	Very large or considerable impact (extent/duration/magnitude). Effects, both adverse and beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation. In isolation, these could have a material influence on the decision-making process.

6.2.3.3 Impact Mitigation Measures

Following the implementation of mitigation measures the identified impacts may be reduced to environmentally acceptable levels (or not).

It is best practice to consider mitigation measures for all impacts that are of a minor negative significance (i.e., slight, very short or highly localised impact of no significant consequence) or higher and this has been adopted for the purpose of this assessment.

The purpose of mitigation is to reduce the significance of the residual impact (see below) to a minor adverse or negligible level, which is a level that is expected to be acceptable by local authority, environmental regulators, and the public. Individual impacts assessed as being of minor adverse or negligible significance have not automatically been considered to require mitigation. However, where appropriate, and taking into account views and comments received through consultation, consideration has been given to the implementation of mitigation measures designed to reduce minor adverse impacts to a negligible level.

Mitigation measures can be incorporated at various stages in the proposed development. The preferred hierarchy of mitigation is as follows:

- Prevention: At the design stage: avoid, relocate, modify the design and / or do not process with the development.
- Reduction: introduce design modification or additional structures (e.g., screens), reduce size and scale of development etc.; and,
- Compensation or remediation: compensation to provide like-for-like replacement for any lost environmental elements. When adverse impacts are unavoidable, it may also be possible to limit the duration of an impact by undertaking remedial works. For example, the impact on the landscape of mineral extraction is largely unavoidable, but the land can be progressively restored following the completion of extraction to complement or enhance the character of the landscape.

6.3 DESCRIPTION OF THE DEVELOPMENT

The following provides a summary description of the three projects which are proposed within the development lands at Kiltotan and Collinstown and Oldtown. A detailed description of the projects is provided in Chapter 2 of this EIAR.

LEL Flexgen Castlelost**:** Proposed gas-fired reserve generator of 275MW electrical capacity. The project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system. The proposal includes the installation of five (5no.) dry low emission (DLE) gas turbines, associated stack(s), raw water/fire water tank, fire water retention basin, back-up fuel tank, emergency generator, gas receiving station (AGI), low, medium and high voltage transformers, customer control room, and all ancillary electrical plant and delivery systems. GNI will separately manage the process of delivering the underground natural gas pipeline to the proposed site to serve the generator.

LEL GIS Castlelost Project**:** Proposed 220kV Gas Insulated Switchgear (GIS) Electrical Substation. The project will involve installation of two (2 no.) 220 kV underground circuits forming a connection to the existing Shannonbridge-Maynooth 220 kV overhead line (located within the development boundary) and two (2no.) 220 kV underground circuits and associated low voltage and communication underground cabling connecting the proposed substation with electricity transformers on the adjacent reserve gas-fired generator (Project 1) and ESS (Project 3) sites, and all associated and ancillary site development works. The GIS substation itself includes a two storey, 17m high building (housing electrical switchgear, a battery room, a workshop room, and WC), transformer bay(s), access roadway and all ancillary site development works.

LEL ESS Castlelost Project**:** Proposed Energy Storage System (ESS) using vanadium flow battery (VFB) technology and synchronous condenser. The battery energy storage system (BESS) will comprise a cluster of battery modules positioned within a dedicated BESS outdoor compound. Each module will consist of (i) a battery container (6.1m long container) housing pumps and heat exchangers positioned on top of two (ii) tank (electrolyte) enclosures (12.2m long containers). An associated battery management system (BMS) and medium voltage power station (MVPS) enclosure will also form part of the battery module. The synchronous condenser comprises a rotating generator positioned within a building. The generator is connected to the transmission system via a step-up transformer. When the generator has reached an operating speed that is synchronous to the system frequency, it is synchronised with the transmission network and acts as a motor providing reactive and short circuit power to the electricity network. A customer (IPP) building will also be installed within the ESS compound, and it will house electrical switchgear, store, control room, welfare facilities and administration facilities.

6.4 DESCRIPTION OF RECEIVING ENVIRONMENT

6.4.1 INTRODUCTION

The site is located 2km southwest of Rochfortbridge and 3km east, north-east of Tyrrellspass, Co. Westmeath. The development lands are greenfield. The M6 motorway runs along the site's southern boundary. There are existing residential properties bordering the site boundary to the northeast, northwest and west. The primary access to the site is via the regional road (R446) which borders part of the development lands to the north.

6.4.2 HISTORICAL LAND USE

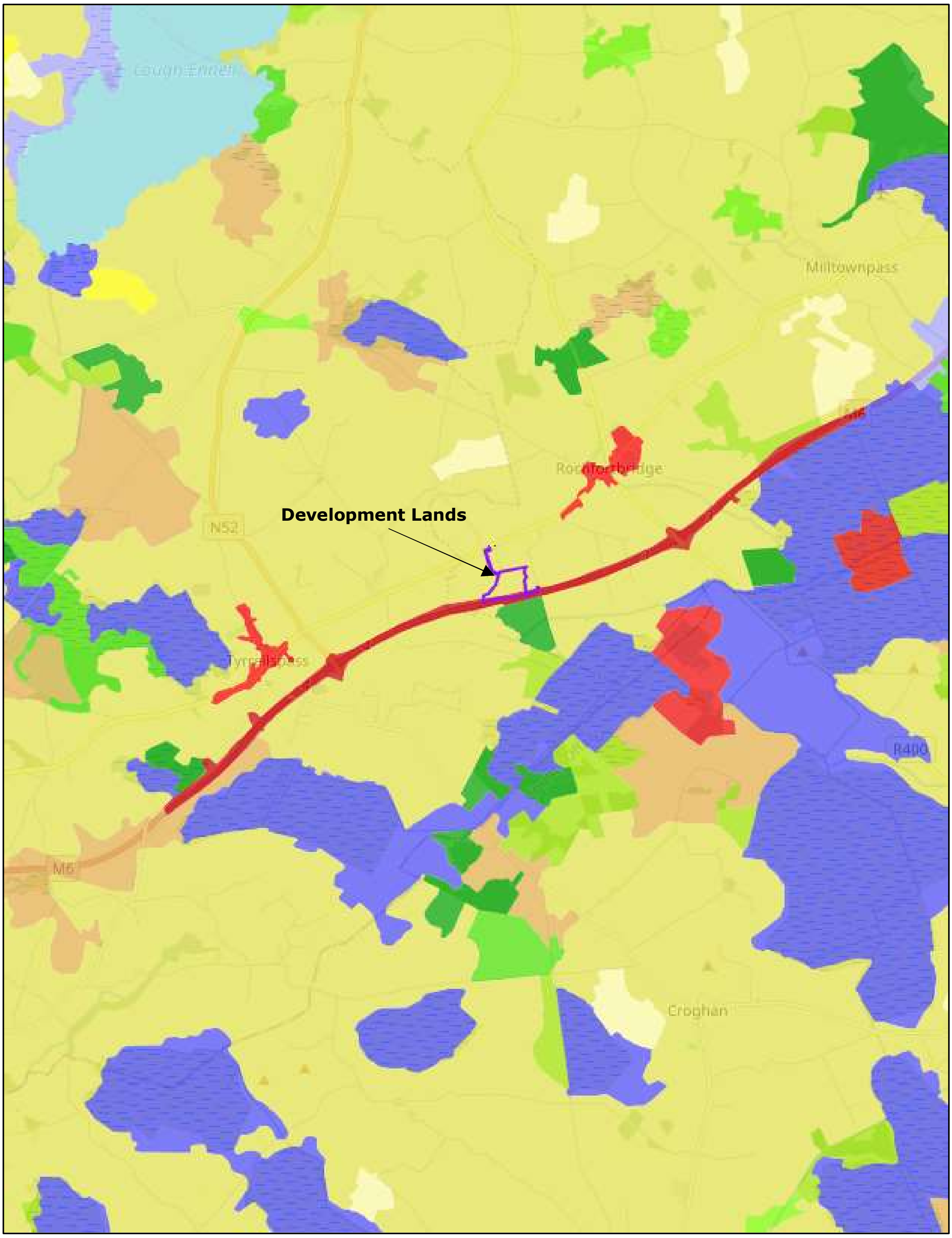
Review of historical aerial imagery and mapping indicates that the site was historically used as agricultural land. There are areas of extensive cutaway bogs, quarries and forestry located to the south and beyond the M6 motorway. Lands in the general area of the site are predominantly agricultural pastures with some arable lands.

6.4.3 SOILS AND GEOLOGY

6.4.3.1 Desktop Study

The current land use is described as agricultural pastures depicted by the yellow colour on Figure 6.1. The Geological Survey of Ireland's *'The Quaternary geology of Ireland – Sediments Map'* is a representation of the superficial geology of Ireland at a scale of 1 to 50,000. The map shows the sediments mapped within 1 metre of the surface which were laid down during the Quaternary period as well as bedrock at or close to the surface, water bodies and made ground.

Figure 6.1 Corine Land Cover (EPA 2018)



The mapped sediments underlying the site are describe as *"Cut over raised peat"* and *"Till derived from limestones"* and shown in Figure 6.3. The soils within the development lands are classed as fine loamy drift with limestones (Eton association) of moderate drainage with cutover peat near the southern boundary. Subsoils are classed as limestone tills (Carboniferous) and peat.

The bedrock geology underlying the site is mapped on the GSI 1:100,000 bedrock formations map. This data shows that the bedrock geology underlying the development lands is mapped as Waulsortian Limestones. Waulsortian limestones are described as Massive unbedded lime-mudstone and are dominantly pale-grey, crudely bedded or massive limestone. No bedrock outcrops are identified by the GSI. It is envisaged that bedrock is close to the surface in the extreme southwestern area of the site. This is supported by GSI vulnerability classification of high in this area and the motorway (M6 cutting in the general area of the electricity tower (no. 150) which is located adjacent to the motorway (refer to Plate 6.2 and 6.3).

Plate 6.1 Aerial view of motorway (M6) rock cutting

Plate 6.2 Motorway (M6) rock cutting (west of development lands)

Figure 6.2 Quaternary Deposits

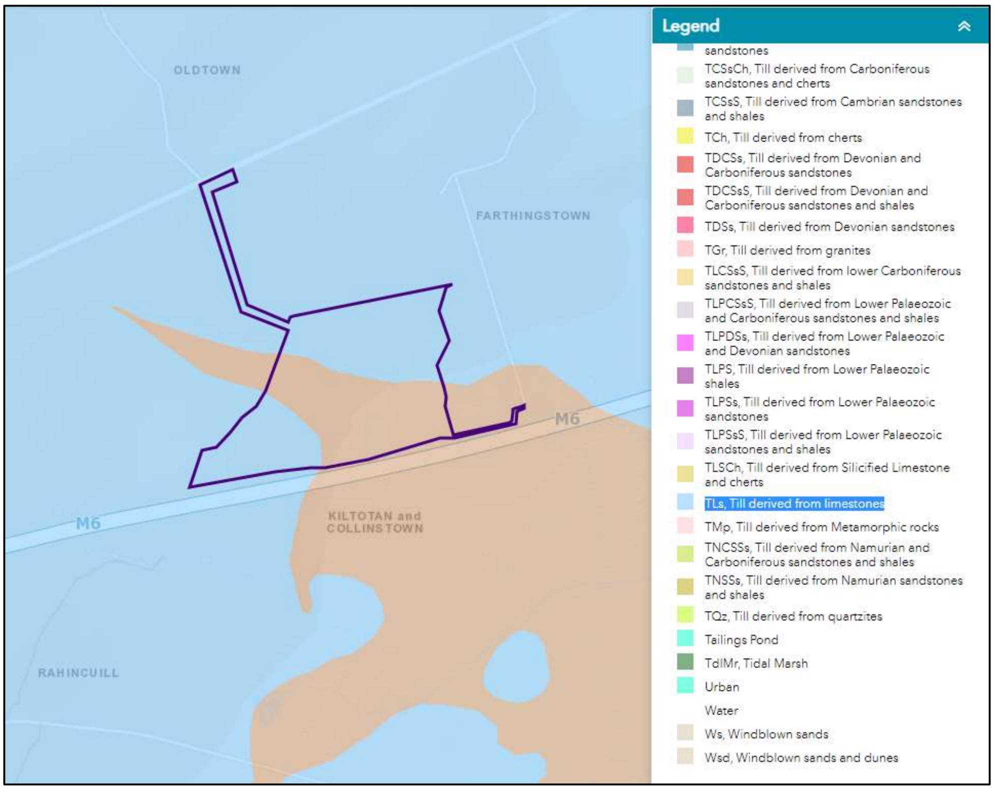
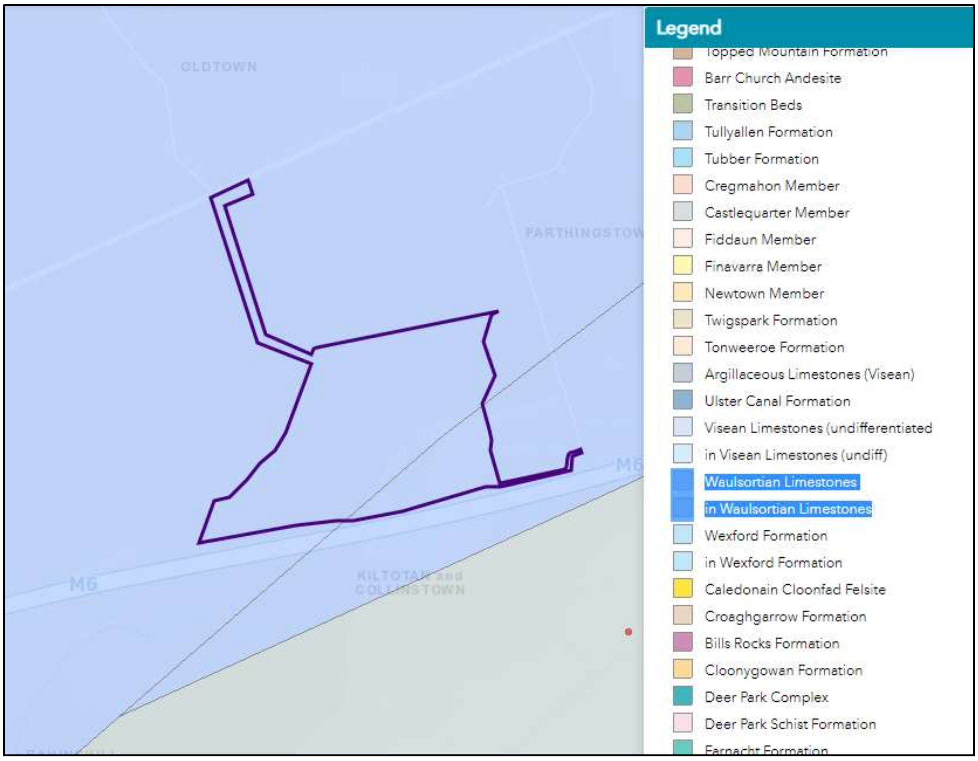


Figure 6.3 Bedrock Geology Map



6.4.4 FIELD WORK

As part of site assessment works a number of trial pits were excavated across the development lands on the 13th of July 2021 to depths of c.2.7m below ground level (bgl) for the purposes of foul and storm drainage design. No bedrock was encountered in any of the trial pits excavated. No groundwater was observed within the trial pits. The soils were described as silty clay containing an abundance of cobbles and boulders and no evidence of mottling. Photographs of the trial pits are presented in Plate 6.3-6.7.

Plate 6.3 Trial pit in eastern area of the site

Plate 6.4 Trial pit in eastern area of the site

Plate 6.5 Trial Pit towards the northern area of the site

Plate 6.6 Trial Pit in western area of the site close to farm shed

Plate 6.7 Trial Pit in eastern area of the site – arisings from pit shown

6.4.4.1 Karst

Karst landscapes develop through the process of karstification, this occurs primarily in soluble rocks such as limestone and dolomite. Karstification takes place due to calcite dissolution from meteoric water. As rain descends through the atmosphere it picks up additional CO_2 causing a chemical reaction within the soluble limestone, leading to the development of numerous surface and subsurface features. There are no karst features within or near (within 5km) the site.

6.4.4.2 Geological Heritage

The Geological Survey of Ireland in conjunction with the Geoparks network and GSNI have undertaken the programme *"Geoheritage"* dedicated to the protection and promotion of regions and features of geological importance throughout the country. The sites are identified as County Geological Sites for inclusion in County Development and Heritage Plans. There are no sites of geological interest within or close to the development boundary.

6.5 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

This section provides an assessment of the potential environmental impacts of the proposed development on the soils and geological environment during the construction and operational phases of the projects (LEL Flexgen Castlelost, LEL GIS Castlelost and LEL ESS Castlelost).

Judgments made are based on an assessment of the magnitude of contamination sources, geotechnical hazards and mineral sterilisation as obtained from desk study, existing ground investigation and monitoring information, which form the baseline conditions and an assessment of the source – pathway – receptor philosophy and identified pollutant linkages.

The development lands and the area within its immediate environs (i.e.,1 km of development land boundary) have been considered in detail to assess the changes in ground conditions.

The receptors potentially at risk that could be present are indicated in Table 6.11 and their relative sensitivity is assessed to enable predicted impact to be determined.

6.5.1.1 Receptor Sensitivity

The receptors considered for the risk assessment are detailed in the table below and considered in relation to their relative importance and receptor sensitivity; justifications for the classification are provided.

Table 6.5 Receptor Sensitivity

Receptor	Relative Importance	Receptor Sensitivity	Justification
Shallow Soils	Local Level	Low	The receptor does not make a significant contribution to local character or distinctiveness. The receptor is considered very local.
Underlying Drift Deposits (Till)	Local Level	Low	The projects are expected to cause minimal change to the drift deposits in the local area, e.g., any excavated drift depositions will remain on site be used as part of landscaping works (berming).
Bedrock Geology (Limestone)	County Level	Low	Based on the findings from the baseline assessment undertaken, development of the three projects within the development lands will not result in impact to the underlying limestone bedrock.

6.5.2 CONSTRUCTION PHASE

The main potential environmental effects during the construction phase have been tabulated below. As the construction activities for the three projects are similar, the information has been outlined within one table.

Table 6.6 Construction Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Drift Deposits and Shallow Soils (Low)	Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 6.10
	Loss of shallow soils and drift through construction onsite e.g., buildings, compounds, access roads and car park.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 6.10
	Earthworks have the potential to cause disturbance of contaminated soil.	No change	Negligible No mitigation measures required The impact is considered reasonable as there are no known sources of contamination within the soils on-site.
Bedrock Geology (Low)	Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 6.10.
	Contamination of bedrock due to foundation construction and road works	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 6.10.

6.5.3 OPERATIONAL PHASE

6.5.3.1 LEL Flexgen Castlelost Assessment

Table 6.7 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Drift Deposits and Shallow Soils (Low)	Contamination of underlying drift deposits and soils due to road drainage, chemicals (such as ammonia for SCR operation) stored on site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 6.11
	Contamination of underlying drift deposits and soils due to leaks/spills	Moderate	Moderate (without mitigation)

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
	of fuel / gasoil (secondary fuel) storage tanks, oils from transformers (LV, MV and HV)		Mitigation is proposed in Table 6.11
Bedrock Geology (Low)	Contamination of bedrock due to road drainage, and chemicals (such as ammonia for SCR operation), oils and lubricant required for maintenance activities.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 6.11.
	Contamination of bedrock due to leaks/spills of fuel / gasoil (secondary fuel) storage tanks, oils from transformers (LV, MV and HV)	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 6.11

6.5.3.2 ESS Castlelost Assessment

Table 6.8 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Drift Deposits and Shallow Soils (Low)	Contamination of underlying drift deposits and soils due to road drainage, chemicals stored on the for-maintenance activities s e.g., paints, lubricants, oils.	Slight	Minor (without mitigation) Mitigation is proposed in Table 6.11
	Contamination of underlying drift deposits and soils due to leaks/spills of electrolyte and oils from transformers	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 6.11
Bedrock Geology (Low)	Contamination of bedrock due to road drainage, chemicals stored on site and used during site operations e.g., paints, lubricants, oils.	Slight	Minor (without mitigation) Mitigation is proposed in Table 6.11.
	Contamination of bedrock due to leaks/spills of BESS electrolyte and oils from transformers	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 6.11

6.5.3.3 GIS Castlelost Assessment

Table 6.9 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Drift Deposits and Shallow Soils (Low)	Contamination of underlying drift deposits and soils due to road drainage and small volumes of maintenance chemicals (oils, solvents, detergents and lubricants)	Slight	Minor (without mitigation) Mitigation is proposed in Table 6.11
Bedrock Geology (Low)	Contamination of underlying drift deposits and soils due to road drainage and small volumes of maintenance chemicals (oils, solvents, detergents and lubricants)	Slight	Minor (without mitigation) Mitigation is proposed in Table 6.11.
	Contamination of bedrock due to leaks/spills of oils from transformers (LV, MV and HV)	Slight	Minor (without mitigation) Mitigation is proposed in Table 6.11

6.6 MITIGATION MEASURES

6.6.1 CONSTRUCTION PHASE

Due to similar potential environmental effects being common to the three projects, mitigation is presented in single table for each of the construction and operational phases of projects.

Table 6.10 Mitigation of Potential Environmental Effects

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, solvents, detergents lubricants, adhesives, oils etc.	Moderate	Soils and bedrock geology	Construction	• Construction compounds will be located at least 30m from local on site drains. • Dedicated area of hard standing for material deliveries separated a minimum of 10m from adjacent watercourses; • Concrete will be mixed off–site and imported to the site. • Dedicated area of hard standing for vehicle wash-out; • Specific areas for oil storage and refuelling, separated a minimum of 10m from adjacent watercourses and comply with legislation, including providing bunds which contain 110% of on-site fuel storage capacity; • Use spill kits, fill point drip trays, bunded pallets and secondary containment units; • Enclosed and secured site and fuel storage areas will be secondarily secured; • Appointed contractor to development Construction Environmental Management Plan (CEMP); • Develop a site-specific Incident Response Plan; • Works involving the use of chemicals which are potentially harmful to the aquatic environment will be undertaken in a contained or lined area; • Good housekeeping (daily site clean-ups, use of disposal bins, etc.) on the project site, and the proper use, storage and disposal of many substances used on construction sites, such as lubricants, fuels and oils and their containers can prevent soil contamination.	Negligible
Loss of shallow soils and drift through construction onsite e.g., buildings, compounds, access roads and car park.	Moderate	Soils and Drift	Construction	• All excavated material will be retained on site as used for landscaping berming. Thereby the original material will be available as part of decommissioning works.	Negligible

6.6.2 OPERATIONAL STAGE

The main potential environmental effects during the operational phase of the three projects have been tabulated below.

Table 7.12 Mitigation of Potential Environmental Effect

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination of receptor due to road drainage, chemicals (such as ammonia for SCR operation) stored on site and used throughout the site operations e.g., paints, lubricants, oils. - (LEL Flexgen Castlelost Project) Contamination of receptor due to leaks/spills of fuel / gasoil (secondary fuel) storage tanks, oils from transformers (LV, MV and HV) - (LEL Flexgen Castlelost Project) Contamination of receptor due to leaks/spills of electrolyte and oils from transformers (LEL ESS Castlelost Project)	Moderate (For LEL Flexgen Castlelost and LEL ESS Castlelost) Minor (For LEL GIS Castlelost)	Soils and Bedrock	Operational	• All roads are designed to drain to the filter drains running parallel with the proposed access road and shown on the drainage drawings. This system shall allow runoff to filter down through the stone media providing filtering and delay and storage action. This stone shall be wrapped in a permeable membrane allowing runoff to infiltrate into the surrounding soils thus providing reduction action. • Dedicated indoor chemical storage areas within the three projects are provided for the storage of chemicals. The secondary fuel and other oils will be stored in bunds • Electrolyte stored within the BESS compound (LEL ESS Castlelost) is contained within bunded structures (secondary containment) with leak detection equipment. • Specific areas for oil storage and re-fuelling, are provided and are separated from local drainage. Secondary containment (bunding) is designed to comply with best practice – the greater of (a)110% of the largest tank or drum within the bund or (b) 25% of the total volume of substance within the bund.	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination of receptor from road drainage and use of maintenance chemicals (oils, solvents, detergents, lubricants, oils from transformers (LV, MV and HV)				• Bunds floor fall to internal sump areas which will allow bunds to be emptied via pump only. • Bund sumps will have impermeable surfaces Pumps will either be permanently fitted in sumps / bunds (submersible) or dry mounted at bund wall height with suction lift (self-priming). Mobile pumps will also be used for smaller bunded structures as and when required. • Site drainage network are designed in consideration of SuDS principles. Stormwater moving through 'dirty' site areas (e.g., parking, deliveries) to pass through oil interceptor prior to being infiltrated. • Spill kits, fill point drip trays, bunded pallets and secondary containment units provided will be provided across all projects. • Enclosed and secured site and fuel storage areas will be secondarily secured. • A site-specific Incident Response Plan will be put in place for each project • Works involving the use of chemicals which are potentially harmful to the aquatic environment will be undertaken in a contained or lined area. • The drainage system is designed to ensure separation and isolation of 'contaminated' surface water with 'uncontaminated' surface water. In order to ensure that uncontaminated surface drains are not mixing with possibly contaminated surface drains,	

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				risk areas will discharge into a separate system. Small areas that have the potential for causing contamination of surface drain water are separated from the overall surface water drainage; • Interceptors containing oil contaminated rainwater will be contained before being exported off-site for suitable disposal; • The application for EPA licensing associated with the LEL Flexgen Castlelost Project will be progressed and in place in advance of operation. • Appropriate surfacing and containment or drainage facilities for all operational area is designed taking into consideration collection capacities, surface thicknesses, strength/reinforcement; falls, materials of construction, permeability, resistance to chemical attack, and inspection and maintenance procedures •	

6.6.3 DECOMMISSIONING

Prior to decommissioning, a site closure and decommissioning plan will be completed to ensure the identification and mitigation of any further effects present at that time.

6.7 RESIDUAL IMPACTS OF THE DEVELOPMENT

The proposed developments will not have any significant residual effects on soils and geology post implementation of mitigation. The site development will result in the creation of low permeability and impermeable surfaces (particularly in the LEL Flexgen Castlelost Project), limiting the potential for contamination of the subsurface.

6.8 CUMULATIVE EFFECTS INCLUDING GAS PIPELINE CONNECTION

Within the European Commission - Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, dated May 1999, cumulative effects are described as *"impacts that result from incremental changes caused by other development, plans or projects together with the proposed development or developments"*. The cumulative impacts of the proposed development in conjunction with current and future developments in the vicinity of the subject site are considered in this report. The cumulative impacts of the LEL Flexgen Castlelost, LEL ESS Castlelost and LEL GIS Castlelost projects have been considered within this assessment with various overlapping activities considered in the assessment. Connection of the LEL Flexgen Castlelost Project to the natural gas pipeline will be managed and undertaken by Gas Networks Ireland (GNI). The nature of that work is such that the works in the immediate vicinity of the site would be temporary and very short term and the additional construction phase impacts are assessed as short-term and imperceptible in the overall site context.

6.9 MONITORING AND FURTHER WORKS

Whilst the development proposals have the potential to cause detriment to receptors identified, the recommended mitigation measures will ensure that the risk of potential impacts are reduced to negligible. Give the receptor sensitivities are classed as low at amd in the vicinity of the development lands, no future monitoring is recommended during the construction programmes. The LEL Flexgen Castlelost Project will require an Industrial Emissions Licence. If successfully obtained, the licence will prescribe specific conditions including monitoring requirements designed to monitor and protect the existing quality of soils and geology. The licence will also require preparation of a baseline site report (to establish existing condition, which will inform the decommissioning plan (closure plan) and satisfy environmental liability and risk assessment (ELRA) legislative requirements.

7 WATER ENVIRONMENT

7.1 INTRODUCTION

This chapter identifies and assesses the potential impacts and related effects arising from the construction and long-term operation of LEL Flexgen Castlelost, LEL ESS Castlelost and LEL GIS Castlelost Projects at Kiltotan and Collinstown and Oldtown, Castlelost, Co. Westmeath.

For the purpose of the Environmental Impact Assessment (EIA) the following is defined:

- The term "Hydrology" refers to surface waters;
- The term "Hydrogeology" refers to groundwater.

7.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

This assessment has been undertaken in line with the Source – Pathway – Receptor Model as per the documents 'Guidelines on the Information to be contained in Environmental Impact Assessment Impact Assessment Reports Draft', August 2017 and 'Advice Notes for Preparing Environmental Impact Statements Draft', September 2015.

At the impact assessment stage, any potentially beneficial or adverse impacts associated with the development are identified and assessed with reference to the baseline environment. This requires consideration of:

- Sensitivity/value of the receptor,
- Magnitude of the impact,
- Impact duration,
- Whether impact occurs in isolation, is cumulative or is interactive, and
- Performance against environmental quality standards or other relevant thresholds.

7.2.1 ASSESSMENT CRITERIA AND IMPACT ASSESSMENT METHODOLOGY

This assessment considers the potential source of risk to environmental receptors and the pathways by which the receptors may be affected. Definitions of the key descriptors are detailed below:

- Source: potential contaminant sources,
- Pathway: the mechanism by which the source may affect a receptor, and

- Receptor: identified features that may be affected, based on the sensitivity of the site.

The strength of the pathway between a source and a receptor is a function of the distance between the two and the nature of the migration pathway. For example, on sites underlain by impermeable clays, the migration pathway via groundwater would be weak even over short distances, whereas within sands or gravels, the migration pathway would be strong for receptors in proximity to a source and weak for receptors at some distance from the source.

The significance of predicted impacts likely to occur during all phases of the proposed development was determined by considering the value and sensitivity of the key attributes that may be affected and the magnitude of the predicted impact.

The value or sensitivity of a receptor is largely determined by its quality, rarity and scale. The determination of value or sensitivity takes into account the scale at which the attribute is important. For the purpose of assessing the significance of environmental impacts predicted as part of this assessment, the value of receptors is scaled based on the relative importance of the receptor defined as follows:

- LOCAL LEVEL: On the development lands or immediately adjacent to it.
- DISTRICT LEVEL: Beyond the development land boundary but within the district.
- COUNTY LEVEL: County Level e.g., Westmeath
- REGIONAL LEVEL: Eastern and Midlands Region
- NATIONAL LEVEL: Ireland.
- INTERNATIONAL LEVEL: European Community.

A receptors value and sensitivity must be defined using available guidance and professional knowledge and taking into account the site sensitivities. In some cases, the inherent value of the receptor has been recognised and been afforded a statutory designation (e.g., Special Areas of Conservation (SAC's)), which makes the value assignment more straightforward. The judgement of receptor significance is made on a case-by-case basis for each receptor or resource identified as having the potential to be subject to impacts associated with the proposed development.

Irrespective of its recognised value, all receptors/features would exhibit a degree of sensitivity to the changes imposed by new development. The 'sensitivity' element of the criterion ensures that this characteristic of each receptor is assessed. The classification for determining sensitivity of receptors is detailed in Table 7.1. This classification is used as a generic methodology and professional judgement has been applied in each case.

Table 7.1 Receptor Sensitivity and Typical Descriptors

Sensitivity	Descriptors
Very Low	Feature / receptor is generally insensitive to impact, no discernible changes e.g., soils are not in use, the land is used for industrial/commercial purposes and /or mainly covered by hard standing.
Low	Feature / receptor has some tolerance to accommodate the proposed change. It responds in a minimal way such that only minor changes are detectable e.g., landscaped areas.
Medium	Feature / receptor has a low capacity to accommodate the proposed form of change. It clearly responds to effects in a quantifiable manner e.g., low grade agricultural land and recreational ground.
High	Feature / receptor has a very low capacity to accommodate the proposed form of change. The response is a major change e.g., agricultural land use for food production, allotments.

7.2.1.1 Magnitude of Impacts

Magnitude refers to the *'scale'* or *'amount'* of an impact. Key impacts have been identified and the likely magnitude of each potential impact has been determined through the predicted change from the baseline conditions throughout the various phases of development. The magnitude of an impact is a measure of aspects such as the impacts:

- Extent (i.e., the geographical area over which the impact occurs),
- Duration (i.e., the time for which the impact is expected to last prior to recovery or replacement of the resource or feature: short, medium or long term),
- Likelihood (i.e., the probability that the impact will occur),
- Direct or Indirect (i.e., difficult to avoid), and,
- Reversibility (i.e., an irreversible (permanent) impact is one from which recovery is not possible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it: Temporary or Permanent).

In order to help define the level of impact magnitude the following guidance (see Table 7.2) has been adopted for the purpose of providing a transparent assessment. The professional judgement of the technical author is used in the decision-making process when characterising impacts in accordance with the criteria set out in Table 7.2.

Table 7.2 Assessment Criteria for Magnitude

Magnitude	Assessment Criteria
No Change	• No loss or alteration of characteristics, features or elements. • No observable impact on receptors/features.
Negligible	• Noticeable, temporary (for part of the development duration) change; or • Barely discernible change for any length of time, over a small area, to any key characteristics or features. • Impact unlikely or rarely to occur. • Results in effects on attribute of insufficient magnitude to affect the use/integrity.
Slight	• Noticeable, temporary (during the project duration) change, over a partial area, to key characteristics or features. Impact will possibly occur. • Impact predicted to extend over a small area. • Impact predicted to affect small numbers of people. • Impact predicted to affect a small number of other receptors (ecological, businesses, facilities). • Impact not predicted to have trans-boundary effects, but possibility remains. • Slight but discernible change in environmental conditions predicted. • Impact not predicted to entail unusual/complex effects for receptors. • Impact not predicted to affect particularly scarce features/resources. • Impact not predicted to result in breaches of legislation or statutory Environmental Quality Standard or Objectives. • Impact not predicted to result in loss of attribute. • Impact will continue for a short period of time only. • Impact will be temporary. • Impact will be intermittent and/or rare. • Impact will be reversible. • Impact will be possible to avoid, reduce, repair, or compensate for; or • Slight positive change in environmental conditions resulting in minor improvements in quality or value of a receptor.
Moderate	• Significant, permanent / irreversible changes, over the majority of the development area and potentially beyond, to key characteristics or features. Impact certain or likely to occur. • Impact predicted to extend over a moderate area. • Impact predicted to affect moderate numbers of people. • Impact predicted to affect some other receptors (ecological, businesses, facilities). • Impact unlikely to have trans-boundary effects, but possibility remains. • Moderate change in environmental conditions predicted. • Impact unlikely to entail unusual/complex effects for receptors but possibility remains.

Magnitude	Assessment Criteria
	• Impact unlikely to affect particularly scarce features/resources but possibility remains. • Impact entails a low probability that breaches of legislation or statutory Environmental Quality Standard or Objectives will occur; • Impact unlikely to result in loss of attribute but possibility remains. • Impact will continue for a moderate period of time. • Impact will be semi-permanent. • Impact will be intermittent. • Impact will be possible to avoid, reduce, repair, or compensate for; or • Notable positive change in environmental conditions resulting in measurable improvements in quality or value of a receptor.
Substantial	• Very significant, permanent / irreversible changes, over the whole development area and beyond (i.e. off-site), to key characteristics or features of character or distinctiveness. Impact certain or likely to occur. • Impact predicted to extend over a large or very large area. • Impact predicted to affect considerable numbers of people. • Impact predicted to affect considerable numbers of other receptors (ecological, businesses, facilities). • Impact predicted to have trans-boundary effects. • Significant change in environmental conditions predicted. • Impact will entail unusual/complex effects for receptors. • Impact will affect particularly scarce features/resources. • Impact entails a high probability that breaches of legislation or statutory Environmental Quality Standard or Objectives will occur. • Impact will result in total loss of attribute. • Impact will continue for extended periods of time. • Impact will be permanent rather than temporary. • Impact will be continuous rather than intermittent, or where intermittent, frequent rather than rare. • Impact will be irreversible. • Impact will be very difficult to avoid, reduce, repair, or compensate for; or • Significant positive change in environmental conditions resulting in major improvements in quality or value of a receptor.

7.2.1.2 Impact Significance

An assessment of significance is necessary in order to identify the main environmental effects of the proposed development and assist in determining what weight these effects should be given. Definitive guidance in the preparation of EIA in the soils and geological environment exists in *'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements',* issued by the Institute of geologists of Ireland. From the guidance, a significant effect is defined as "an impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment".

It is widely recognised that 'significance' reflects the relationship between the magnitude of an impact and the sensitivity (or value) of the affected environmental receptor.

To assist in the assessment process, the Impact Significance Matrix (ISM) (Table 7.3) provides a transparent methodology to ensure consistency and ease of interpretation of the judgement of impact significance.

An initial indication of impact significance (adverse or beneficial) is gained by combining magnitude and sensitivity / value in accordance with the ISM provided. It should be noted that although the ISM provides a good framework for the consistent assessment of impacts across all environmental parameters, there is still an important role for professional judgement and further objective assessment to play in moderating an impact's significance. Given that the criteria represent levels on a continuum or continuous gradation, professional judgement and awareness of the relative balance of importance between magnitude and sensitivity / value is required.

Features to which legal designations apply have automatically been determined to be of high value (or of a higher value than non-designated features), and any impact tends to be of a greater significance than an impact of features to which no designation applies. Hence, for designated features, the use of the value criteria leads to an initial presumption that impacts will be of a high significance. Information on sensitivity can then be used to modify or maintain this initial assessment.

Table 7.3 Impact Significance Assessment

Magnitude[1]	**Value/sensitivity of receptor[2]**			
	Very Low	**Low**	**Medium**	**High**
No Change	Negligible	Negligible	Negligible	Minor
Negligible	Negligible	Minor	Minor	Moderate
Slight	Minor	Minor	Moderate	Major
Moderate	Minor	Moderate	Major	Major
Substantial	Moderate	Major	Major	Major

Note 1 Refer to Table 7.2
Note 2 Refer to Table 7.1

Given the use of professional judgement in the assessment process, there may be some variation between subject areas (i.e., different environmental parameters) in the significance rating process. This may be as a result of limited information on the sensitivity of features and / or the complexity of interactions that require assessment in determining the magnitude of change. However, the ratings derived through the impact assessment process, as set out in Table 7.3 can also be described in a generic fashion as given in Table 7.4. The following definitions are proposed in relation to the significance of environmental impacts predicted throughout this EIAR.

Table 7.4 Impact Significance Definitions

Level of Significance	Description
Negligible	No discernible effect. An impact that is likely to have imperceptible or insignificant impact.
Minor	Slight, very short or highly localised impact of no significant consequence. These effects may be raised as local issues but on their own are unlikely to be of importance in the decision-making process. When combined with other effects these could have a more material influence.
Moderate	Intermediate limited (extent / duration / magnitude) impact that may be considered as significant. These effects are likely to be important considerations at a local level. These could have influence on decision making especially when combined with other similar effects.
Major	Very large or considerable impact (extent/duration/magnitude). Effects, both adverse and beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation. In isolation, these could have a material influence on the decision-making process.

7.2.1.3 Impact Mitigation Measures

In accordance with Part 10 of the Planning and Development Regulations 2001, as amended, this Chapter of the EIAR includes a description of mitigation measures envisaged to prevent, remove and reduce the significant adverse effects from the development. Following the implementation of mitigation measures the identified impacts may be reduced to environmentally acceptable levels (or not).

It is best practice to consider mitigation measures for all impacts that are of a minor negative significance (i.e., slight, very short or highly localised impact of no significant consequence) or higher and this has been adopted for the purpose of this assessment.

The purpose of mitigation is to reduce the significance of the residual impact (see below) to a minor adverse or negligible level, which is a level that is expected to be acceptable by local authority, environmental regulators, and the public. Individual impacts assessed as being of minor adverse or negligible significance have not automatically been considered to require mitigation. However, where appropriate, and taking into account views and comments received through consultation, consideration has been given to the implementation of mitigation measures designed to reduce minor adverse impacts to a negligible level.

- Mitigation measures can be incorporated at various stages in the proposed development. The preferred hierarchy of mitigation is as follows:
- Prevention: At the design stage: avoid, relocate, modify the design and / or do not process with the development.
- Reduction: introduce design modification or additional structures (e.g., screens), reduce size and scale of development etc.; and,
- Compensation or remediation: compensation to provide like-for-like replacement for any lost environmental elements. When adverse impacts are unavoidable, it may also be possible to limit the duration of an impact by undertaking remedial works. For example, the impact on the landscape of mineral extraction is largely unavoidable, but the land can be progressively restored following the completion of extraction to complement or enhance the character of the landscape.

7.3 DESCRIPTION OF THE DEVELOPMENT

The following provides a summary description of the three projects which are proposed within the development lands at Kiltotan and Collinstown and Oldtown. A detailed description of the projects is provided in Chapter 2 of this EIAR.

<u>LEL Flexgen Castlelost</u>**:** Proposed gas-fired reserve generator of 275MW electrical capacity. The project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system. The proposal includes the installation of five (5no.) dry low emission (DLE) gas turbines, associated stack(s), raw water/fire water tank, fire water retention basin, back-up fuel tank, emergency generator, gas receiving station (AGI), low, medium and high voltage transformers, customer control room, and all ancillary electrical plant and delivery systems. GNI will separately manage the process of delivering the underground natural gas pipeline to the proposed site to serve the generator.

<u>LEL GIS Castlelost Project</u>**:** Proposed 220kV Gas Insulated Switchgear (GIS) Electrical Substation. The project will involve installation of two (2 no.) 220 kV underground circuits forming a connection to the existing Shannonbridge-Maynooth 220 kV overhead line (located within the development boundary) and two (2no.) 220 kV underground circuits and associated low voltage and communication underground cabling connecting the proposed substation with electricity transformers on the adjacent reserve gas-fired

generator (Project 1) and ESS (Project 3) sites, and all associated and ancillary site development works. The GIS substation itself includes a two storey, 17m high building (housing electrical switchgear, a battery room, a workshop room, and WC), transformer bay(s), access roadway and all ancillary site development works.

LEL ESS Castlelost Project**:** Proposed Energy Storage System (ESS) using vanadium flow battery (VFB) technology and synchronous condenser. The battery energy storage system (BESS) will comprise a cluster of battery modules positioned within a dedicated BESS outdoor compound. Each module will consist of (i) a battery container (6.1m long container) housing pumps and heat exchangers positioned on top of two (ii) tank (electrolyte) enclosures (12.2m long containers). An associated battery management system (BMS) and medium voltage power station (MVPS) enclosure will also form part of the battery module. The BMS will monitor and control electrolyte circulation and the MVPS is provided to condition the power generated. The synchronous condenser comprises a rotating generator positioned within a building. The generator is connected to the transmission system via a step-up transformer. When the generator has reached an operating speed that is synchronous to the system frequency, it is synchronised with the transmission network and acts as a motor providing reactive and short circuit power to the electricity network. A customer (IPP) building will also be installed within the ESS compound, and it will house electrical switchgear, store, control room, welfare facilities and administration facilities.

7.4 DESCRIPTION OF RECEIVING ENVIRONMENT

7.4.1 INTRODUCTION

The site is located 2km southwest of Rochfortbridge and 3km east, north-east of Tyrrellspass, Co. Westmeath. The development lands are greenfield. The M6 motorway runs along the site's southern boundary. There are existing residential properties bordering the site boundary to the northeast, northwest and west. The primary access to the site is via the regional road (R446) which borders part of the development lands to the north.

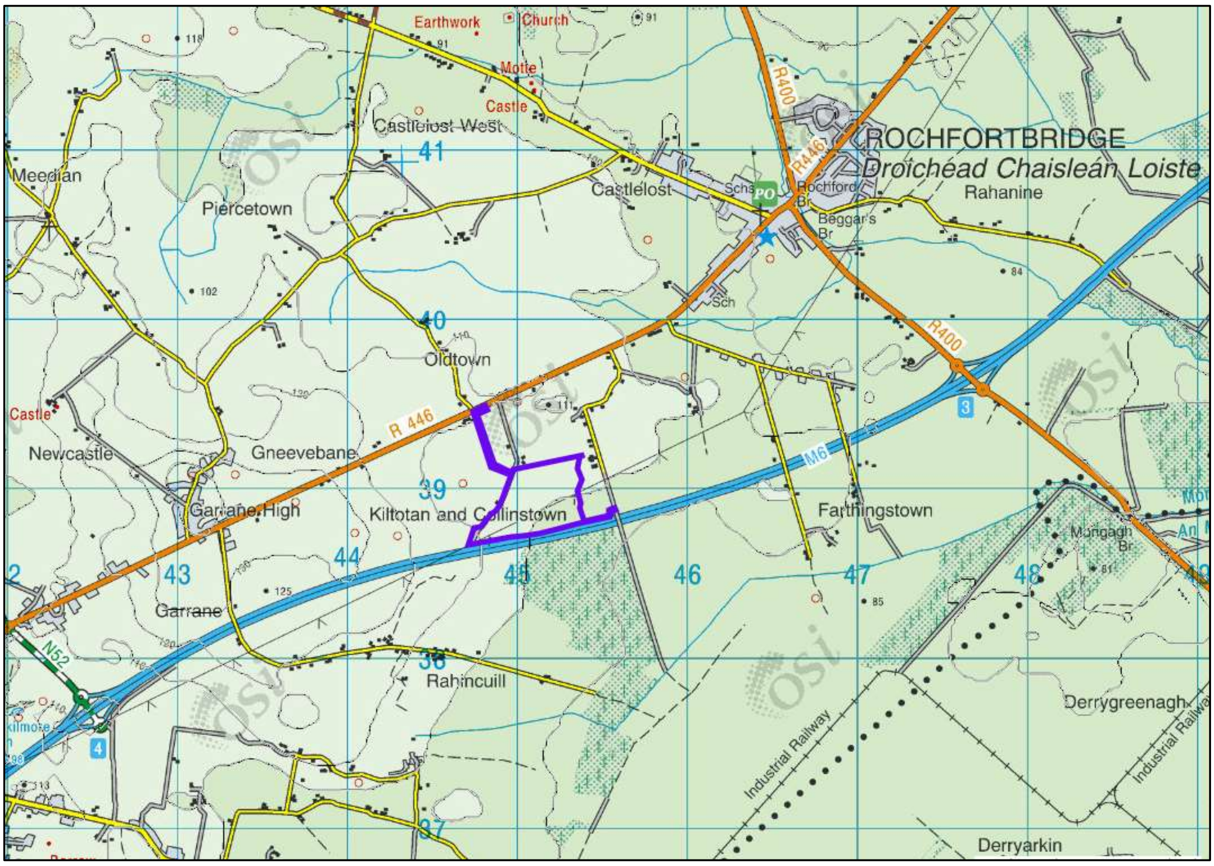
7.4.2 HISTORICAL LAND USE

Review of historical aerial imagery and mapping indicates that the site was historically used as agricultural land. There are areas of extensive cutaway bogs, quarries and forestry located to the south and beyond the M6 motorway. Lands in the general area of the site are predominantly agricultural pastures with some arable lands.

7.4.3 TOPOGRAPHY

The M6 motorway defines the southern boundary of the proposed development lands and the R446 (N6) provides the proposed main access point to the site. The topography in the general area of the site gently slopes from the agricultural pastures to the north towards peatlands, beyond the M6 to the south /southeast. The highest feature in the general area of the site is Croghan Hill, which is located approximately 6.3km southeast of the site. In terms of the proposed development lands, topography is best described as as gradually sloping from higher ground in the west and north to lower ground in the southeast. The lands within the development boundary gently rise from the lowest point of 93.5m OD in the southeast, close to the boundary with the M6 motorway, to 107.1m OD in the west of the site and 105m OD and 107m OD (at the proposed main entrance to the development lands from the R446).

Figure 7.1 Ground Elevation Contours in the General Area of the site



7.4.4 PROTECTED AREAS

There are No Natura 2000 sites (European Sites) are within or immediately close to the development lands. The nearest European sites to the development lands are associated with Raheenmore Bog and include the Raheenmore Bog SAC (Site Code 000582), which is located just over 5.79km to the south. Other designated ecological sites within a 15km radius of the site are as follows:

- Cloncrow Bog (New Forest) NHA, Site Code 000677, is located 3km west of the development lands.
- Raheenmore Bog SAC and NHA, site code 00582, is located approximately 5.79km south of the development lands.
- Lough Ennell SAC and NHA, site code 000685, is located 6.25km northwest of the development lands.
- Split Hills and Long Hill Esker SAC, site code 001831 is located 7.19km west of the development lands.
- Wooddown Bog SAC, site code 002205, is located approximately 14.33km northwest of the development lands.
- Lough Ennell SPA, site code 004044, is located 6.94km northwest of the development lands.
- Milltownpass Bog NHA, site code 002323, is located approximately 7km northeast of the development lands.
- Black Castle Bog NHA site code 000570 is located 12.5km southeast of the development lands.
- Grand Canal NHA, site code 002104, which is located approximately 10km south of the development lands at its closest point.
- Royal Canal NHA, site code 002103, which is located 11.8km north east of the development lands at its closest point.
- Daingean Bog NHA, site code 0020033, which is located 11.4km south of the development lands.
- Rahugh Ridge (Kiltober Esker), NHA, which is located 6.7km southeast of the development lands.
- Murphys Bridge Esker NHA, site code 0017756, which is located 9.4km southeast of the development lands.
- Nure Bog NHA, site code 001725, which is located 8km northwest of the development lands.

Figure 7.2 Ground Elevation Contours within the Development Land Boundary

7.4.5 SOILS AND GEOLOGY

7.4.5.1 Quaternary Deposits

The Geological Survey of Ireland's '*The Quaternary geology of Ireland – Sediments Map'* is a representation of the superficial geology of Ireland at a scale of 1 to 50,000. The map shows the sediments mapped within 1 metre of the surface which were laid down during the Quaternary period as well as bedrock at or close to the surface, water bodies and made ground. The mapped sediments underlying the site are describe as *"Cut over raised peat"* and *"Till derived from limestones"* and shown in Figure 7.3.

The soils within the development lands are classed as fine loamy drift with limestones (Eton association) of moderate drainage with cutover peat near the southern boundary. Subsoils are classed as limestone tills (Carboniferous) and peat.

The bedrock geology underlying the site is mapped on the GSI 1:100,000 bedrock formations map. This data shows that the bedrock geology underlying the development lands is mapped as Waulsortian Limestones. Waulsortian limestones are described as

Massive unbedded lime-mudstone and are dominantly pale-grey, crudely bedded or massive limestone. No bedrock outcrops are identified by the GSI. It is envisaged that bedrock is close to the surface in the extreme southwestern area of the site. This is supported by GSI vulnerability classification of high in this area and the motorway (M6 cutting in the general area of the electricity tower (no. 150) which is located adjacent to the motorway.

Plate 7.1 Motorway rock cutting

Figure 7.3 Quaternary Deposits

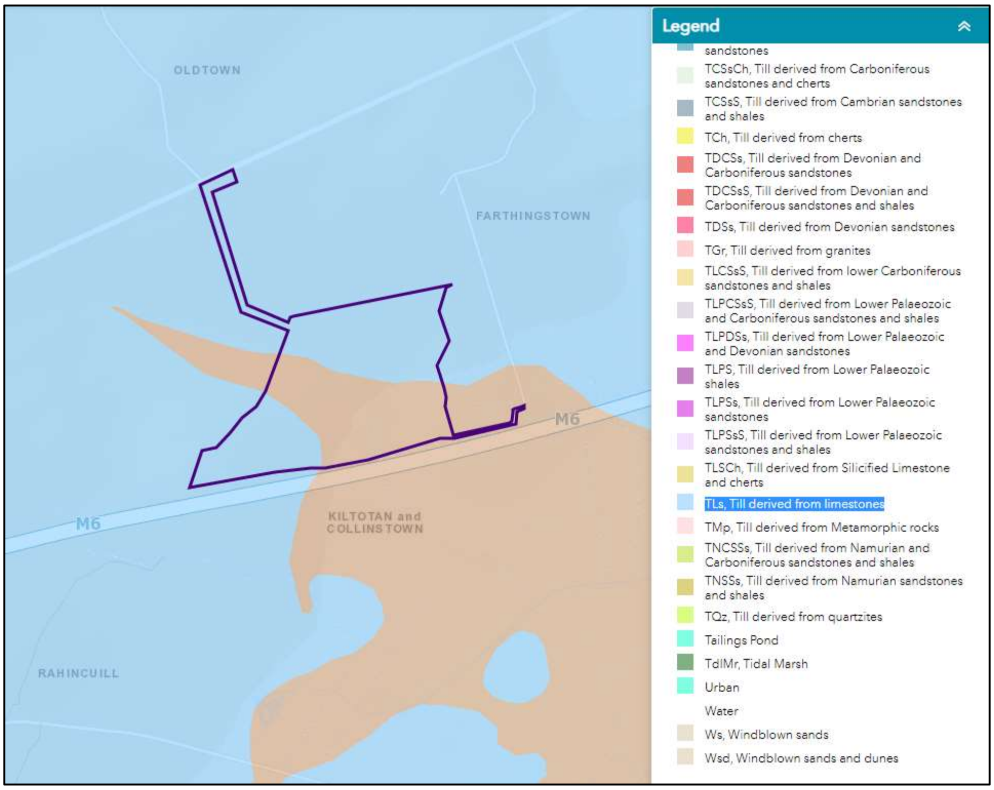
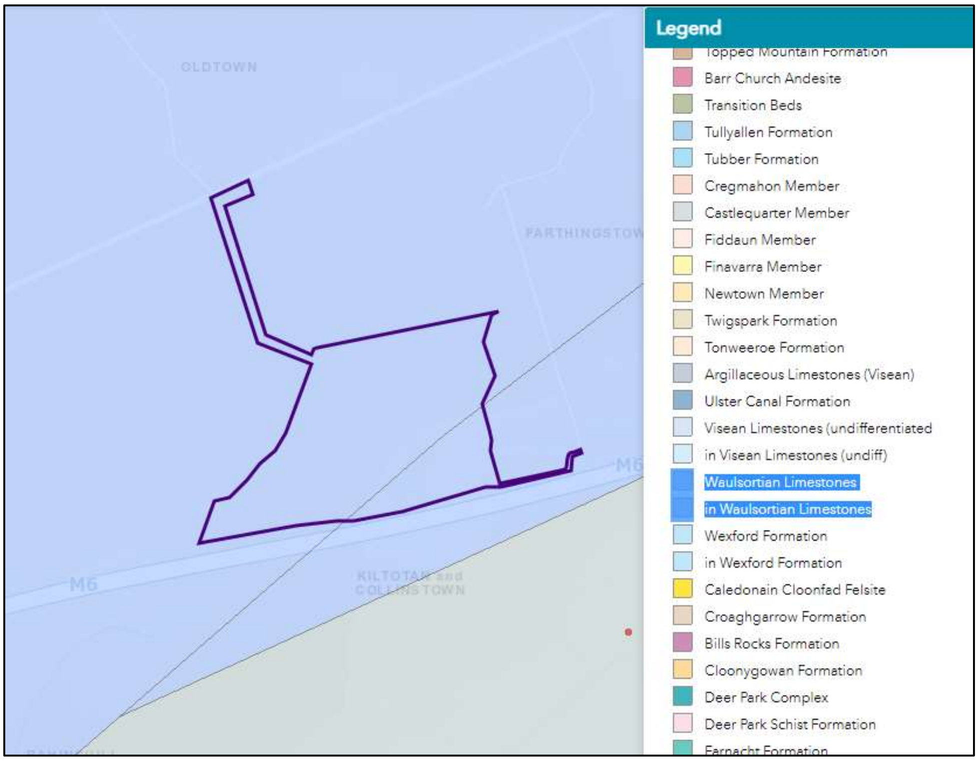


Figure 7.4 Bedrock Geology Map



As part of site assessment works a number of trial pits were excavated across the development lands to depths of c.2.7m below ground level (bgl) for the purposes of foul and storm drainage design. No bedrock was encountered in any of the trial pits excavated. The soils were described as silty clay containing an abundance of cobbles and boulders and no evidence of mottling. Photographs of the trial pits are presented in Plate 7.2-7.4.

Plate 7.2 Trial pit in eastern area of the site

Plate 7.3 Trial pit in eastern area of the site

Plate 7.4 Trial Pit towards the northern area of the site

Plate 7.4 Trial Pit in western area of the site close to farm shed (to be demolished)

7.4.5.2 Karst

Karst landscapes develop through the process of karstification, this occurs primarily in soluble rocks such as limestone and dolomite. Karstification takes place due to calcite dissolution from meteoric water. As rain descends through the atmosphere it picks up additional CO_2 causing a chemical reaction within the soluble limestone, leading to the development of numerous surface and subsurface features. There are no karst features within or near (within 5km) the site.

7.4.5.3 Geological Heritage

The Geological Survey of Ireland in conjunction with the Geoparks network and GSNI have undertaken the programme *"Geoheritage"* dedicated to the protection and promotion of regions and features of geological importance throughout the country. The sites are identified as County Geological Sites for inclusion in County Development and Heritage Plans. There are no sites of geological interest within or close to the development boundary.

7.4.6 HYDROGEOLOGICAL AND HYDROLOGICAL SETTING

7.4.6.1 Groundwater Body

The development lands are located in the Athboy groundwater body (WFD site code IE_EA_G-001). According to the EPA, the GWB is classed as having "good" status (2013-

2018). The GWB extends from Navan in the northeast to Tyrrellspass and Rochfortbridge in Westmeath. The area is typical of the midlands of Ireland with little relief. There are some isolated hills which rarely rise above 150 m OD. In general, the elevation falls from northwest to southeast, reflected in the overall drainage pattern. The region shows a distinctive topography, a typical product of the last glaciation. The land surface is undulating, with large hummocks of glacial drift, deposited under the ice as moraines.

Typically, in a locally important aquifer such as this the majority of groundwater flow is expected to occur in an upper broken and weathered zone, which is considered to be about 3m thick. Additional flows are commonly found in the upper 10m where groundwater flows along fracture networks. Occasionally deeper isolated groundwater flows are found in cavities which may have been layers or pure limestone solutionally enlarged by karstification. Diffuse recharge appears to be the dominant process for water to reach the aquifer. The slope and the thickness and permeability of the soil and subsoil will determine the amount of recharge reaching the aquifer. Due to the generally low permeability of the aquifer a high proportion of the recharge will then discharge rapidly to surface water courses via the upper weathered layers of the aquifer, effectively reducing the available groundwater resources in the aquifer. This GWB discharges to the overlying rivers and streams. In some instances, there may be discharge to the adjacent Trim GWB to the east. Discharge to rivers will be in the form of baseflow. Dry Weather Flows (DWF) are moderate to low. Data collected by the EPA for this GWB shows the water is generally Hard (250-350 mg/l $CaCO_3$) with high Electrical Conductivity (600-700 µS/cm).

7.4.6.2 Bedrock Aquifer

An aquifer is defined as a geological formation that is capable of yielding significant quantities of water. Aquifers generally consist of clean, coarser geological materials where permeability has developed in response to a variety of geological processes. There are a variety of aquifer types in Ireland. Limestone, dolomite, sandstone and volcanic strata are bedrock aquifers and sands and gravels are unconsolidated aquifers. The aquifer beneath the proposed development lands is classed as a *"locally important aquifer – bedrock which is moderately productive only in local zones"*.

In Ireland the entire land surface is divided into four vulnerability categories - extreme (E), high (H), moderate (M) and low (L) - based on geological and hydrogeological factors. The term *'vulnerability'* is used to describe the ease with which groundwater may be contaminated by human activities (DELG et al., 1999). The vulnerability of groundwater depends on the time of travel of infiltrating water (and contaminants), the relative quantity of contaminants that can reach the groundwater and the contaminant attenuation capacity of the geological materials through which the water and contaminates infiltrate. These are more specifically determined at the site by the type and permeability of the subsoils, the thickness of the unsaturated zone through which the contaminant moves and the recharge type, whether point or diffuse. The classification guidelines, as published by the GSI, are given in Table 7.5 below. It shows that the less permeable and thicker the overburden overlying an aquifer is, the lower the vulnerability of the aquifer to contamination.

Table 7.5 GSI Groundwater Vulnerability Guidelines

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) & Thickness			Unsaturated Zone	Karst Features
	High Permeability (sand/gravel)	Moderate permeability (e.g. sandy subsoil)	Low permeability (e.g. clayey subsoil, clay, peat)	(sand/gravel aquifers only)	(<30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
High (H)	>3.0m	3.0 – 10.0m	3.0 – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 – 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A
Notes: (1) N/A = not applicable (2) Precise permeability values cannot be given at present (3) Release point of contaminants is assumed to be 1-2m below ground surface.					

Groundwater vulnerability across the vast majority of the development lands is classed as *'Moderate'* vulnerability. An area of high vulnerability is shown to be present in the southwestern corner of the site and near the proposed site entrance at the R446.

Figure 7.5 Aquifer Classification

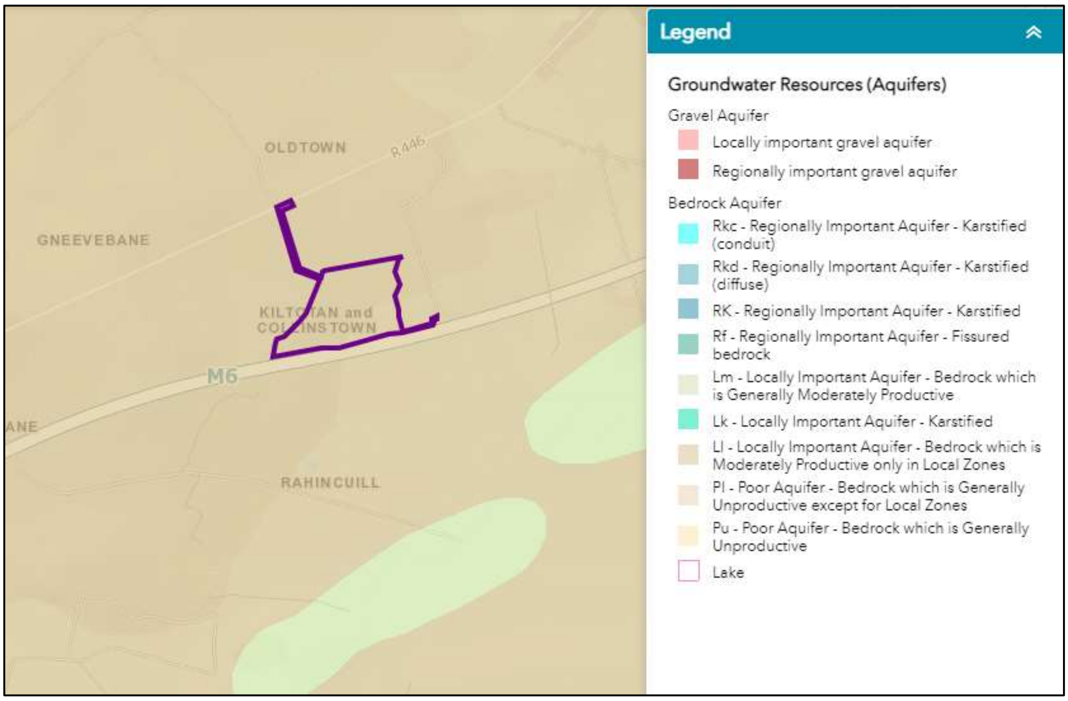
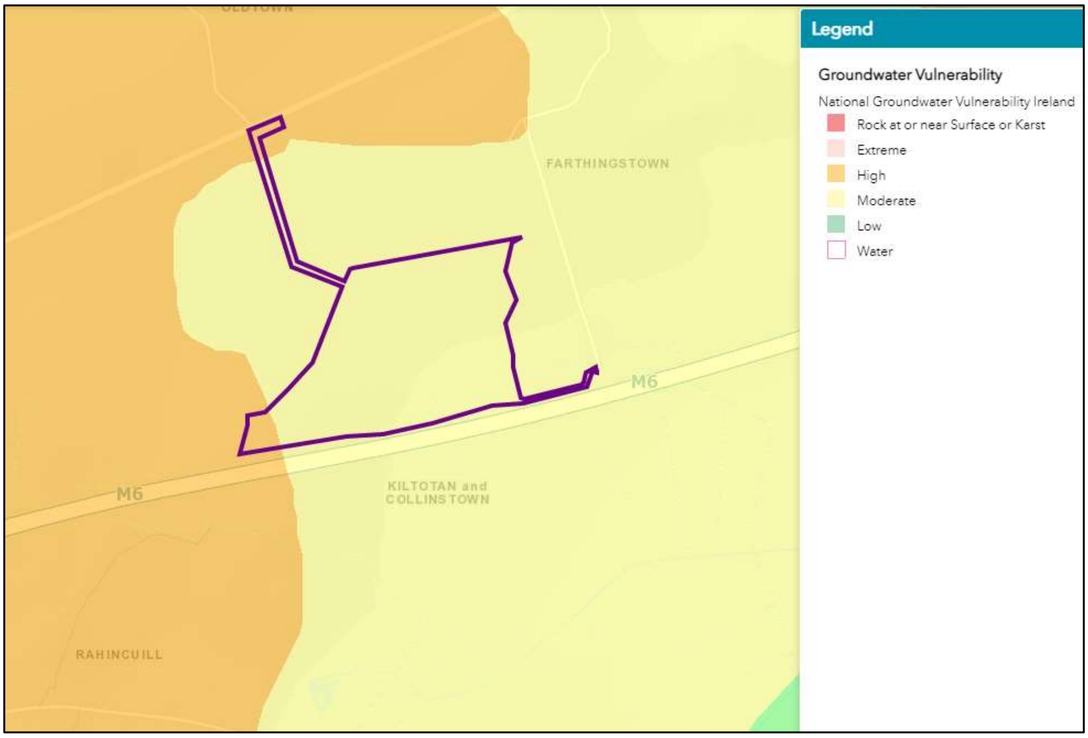


Figure 7.6 Aquifer Vulnerability



7.4.6.3 Groundwater Flow

No field data was available to determine groundwater flow direction or gradient across the site. In the absence of site-specific data, it is assumed that groundwater flow direction will coincide with topography and be to the east/southeast towards the Mongagh and Castlejordan Rivers.

7.4.6.4 Water Regions /Catchment Identification

The EU Water Framework Directive (2000/60/EC) (WFD) establishes a framework for the protection, improvement and management of surface water and groundwater. The Catchment datasets are built on clusters of subcatchments (derived from river waterbody polygons and the subcatchment dataset are built on clusters of river water body polygons and are entirely contained within the Catchment polygons datasets. The proposed development lands are located within the Boyne WFD Catchment, the Yellow[Castlejordan]_SC_010 subcatchment and the Castlejordan_020 River Sub Basin (Refer to Figures 7.7 to 7.9 below).

The Boyne catchment includes the area drained by the River Boyne and by all streams entering tidal water between The Haven and Mornington Point, Co. Meath, draining a total area of 2,694km². The largest urban centre in the catchment is Drogheda. The other main urban centres are Navan, Trim, Kells, Virginia, Bailieborough, Athboy, Kinnegad, Edenderry and Enfield. The total population of the catchment is approximately 196,400 with a population density of 73 people per km². This catchment is characterised by an undulating landscape in the south which changes to a more hummocky, drumlin topography (steep-sided, lenticular hills) in the north. The catchment is underlain by metamorphic rocks in the north and limestone bedrock in the centre and south of the catchment. There are extensive sand and gravel areas in this catchment, particularly along the upper reaches of the Boyne.

Figure 7.7 WFD Catchment (Boyne (07))

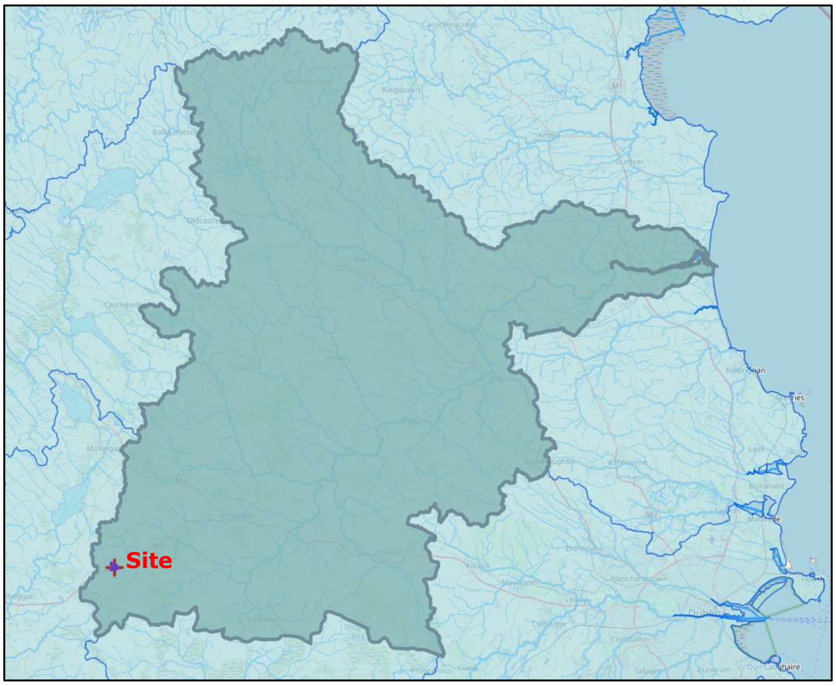
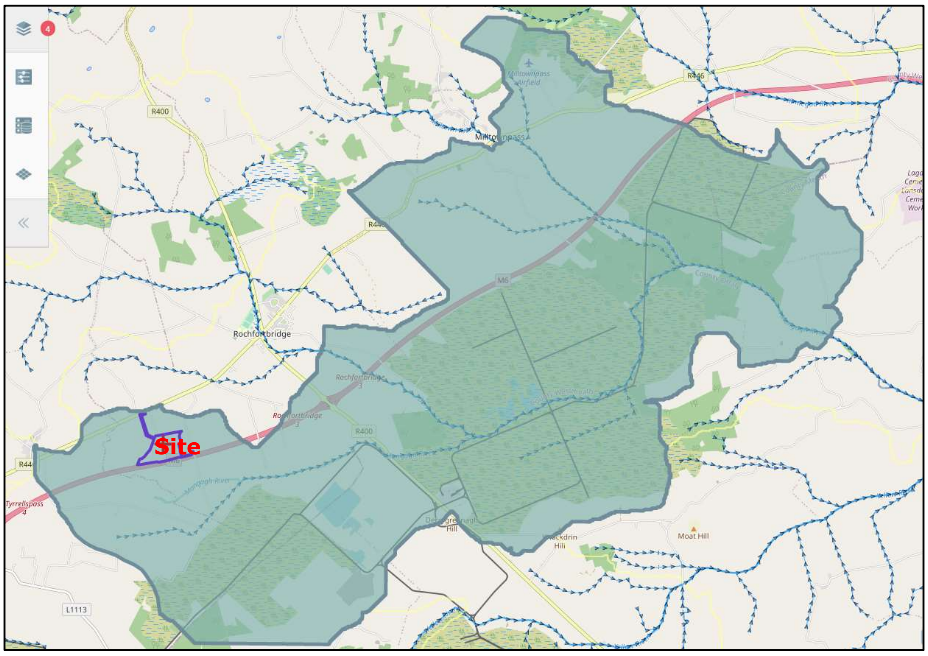


Figure 7.8 WFD Subcatchment (Yellow[Castlejordan]_SC_010))

Figure 7.9 WFD River Sub Basin (Castlejordan_020)



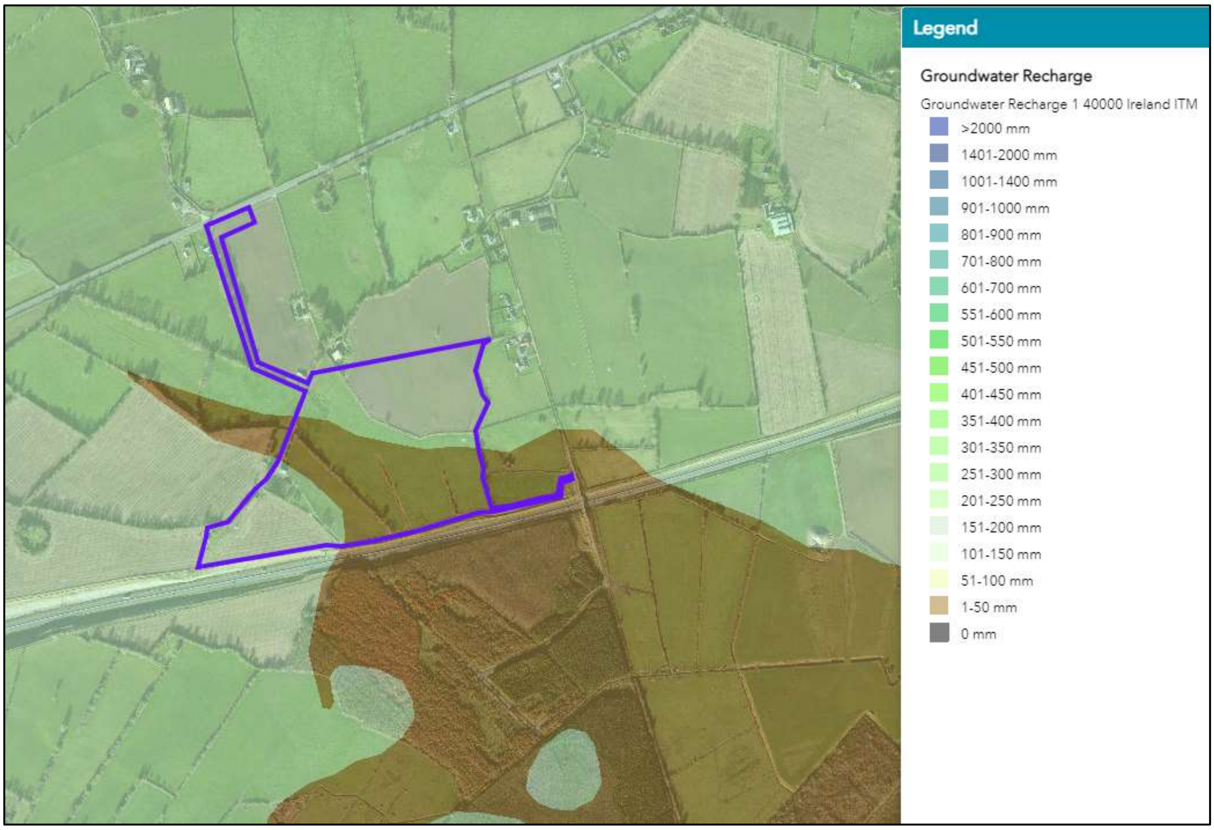
7.4.6.5 <u>Groundwater Recharge</u>

Groundwater recharge is the primary method by which water enters an aquifer. This occurs mainly through downward movement of surface water to groundwater. Both point and diffuse recharge occur. Diffuse recharge occurs via rainfall percolating through the permeable subsoil and rock outcrops. Point recharge occurs by means of swallow holes, collapse features/dolines, and where flow is concentrated in the epikarst.

The groundwater recharge in a region depends mainly on the precipitation change during the major recharge season. Data acquired by the Geological Survey of Ireland shows the average recharge rate for the area in brown to be 20mm/year with a recharge coefficient of 4%. The hydrogeological setting for the areas highlighted in brown are described as having "Moderate permeability subsoil, cut peat".

The southwestern area of the site, shown in light green, is shown to have an average recharge rate of 319mm/yr with a recharge coefficient of 60%. Northern areas of the site, again are shown in light green, are shown to have an average recharge rate of 319mm/yr with a recharge coefficient of 60%. The hydrogeological setting for the areas shown in green are described as having "Moderate permeability subsoil overlain by poorly drained (gley) soil".

Figure 7.10 Groundwater Recharge



7.4.6.6 <u>Groundwater wells and springs</u>

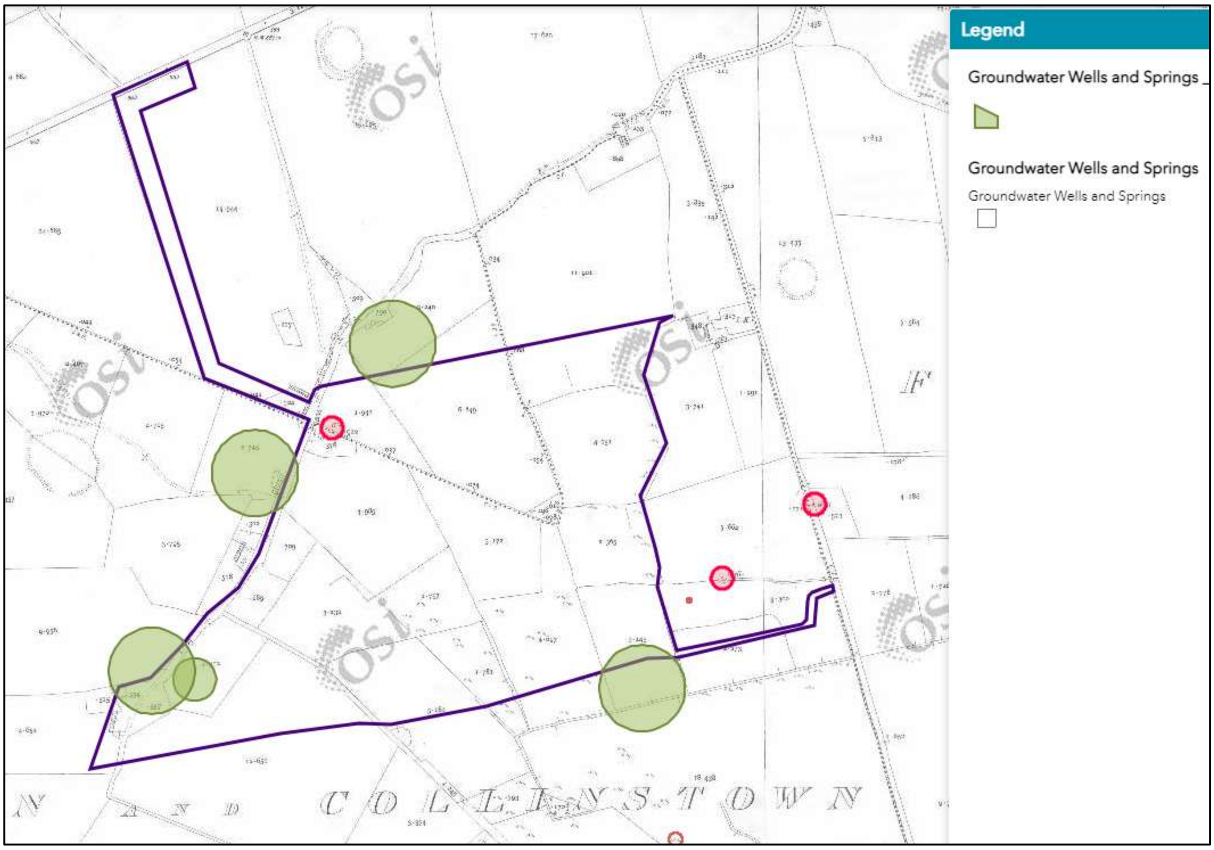
According to the GSI, there are a number of identified wells at and in the vicinity of the development lands. Details of the wells are tabulated in Table 7.6 and illustrated in Figure 7.11. Review of historical OSI mapping also shows the location of three "wells" in the vicinity of the development lands. These are depicted using red circles on Figure 7.11.

Table 7.6 GSI Groundwater wells and springs

GSI Name	Well Type	Drill Date	Easting	Northing	Depth	Depth to Rock	Yield, m^3/d	Casing Ø (mm)
2323SEW200	Dug well	August 8, 1996	245350	238760	1.6	NS	NS	NS
2323SEW201	Dug well	August 8, 1996	245060	239160	1.7m	NS	NS	NS
2323SEW202	Borehole	August 13, 1998	244830	238770	60.9	12.2	76.3 (moderate)	150mm
2323SWW100	Dug well	August 14, 1996	244780	238780	1.6	NS	NS	NS
2323SWW101	Dug well	August 14, 1996	244900	239010	1.5	NS	NS	NS

In terms of the site applications boundaries associated with each of the three projects, there are no groundwater wells impacted by the siting of infrastructure associated with the three projects. This was confirmed following the desktop study by undertaking a ground truthing survey.

Figure 7.11 Groundwater wells and springs



7.4.6.7 Hydrology

The development lands are located within the hydrological catchment of the Mongagh River. The proposed development lands are located approximately 500m to the north of the water course. The Mongagh River flows east into the River Boyne with its associated European sites, the River Boyne and River Blackwater SAC (Site Code 002299) and the River Boyne and River Blackwater SPA (Site Code 004232), which are located over 20 river km to the northeast of the proposed development lands.

There are no significant hydrological features identified within or near the site. However, some surface water drains (drainage ditches) were identified within the site boundary. The drainage ditches originate within the site boundary and run in a southerly direction before flowing in culvert under a gravel surfaced access road (farmers lane) and then into a TII drain that runs along the crest of the motorway cutting in an easterly direction within an oversized grassy channel. The TII drain meets a headwall and culvert that goes under the M6 in a southerly direction. Waters from the drain discharge to the Mongagh River to the south (refer to Figures 7.12 and 7.13). On the various dates when site walkover visits were undertaken during the months of June to August 2021, the drainage ditches within the boundary of the development lands were found to be dry and overgrown with vegetation (refer to Plates 7.1 and 7.2).

Figure 7.12 Site location map showing local surface water features

Figure 7.13 Site location map showing local surface water features

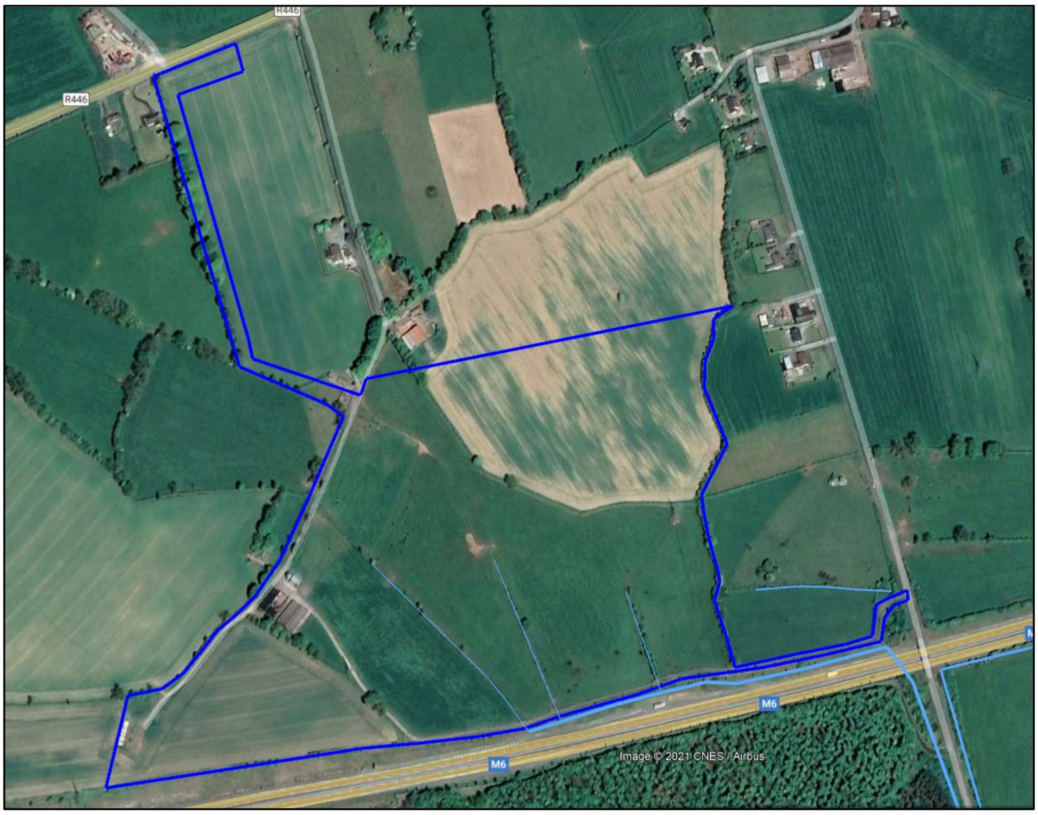


Plate 7.1 Photograph of drainage ditch within development lands

Plate 7.2 Photograph of drainage ditch within development lands - dry

7.4.6.7.1 Flood Risk

A flood risk assessment (FRA) was prepared and is provided in Appendix 7.1. The FRA was undertaken to inform the future development of the site as it relates to flood risk. The development lands are shown to reside in Flood Zone C and are at low risk of inundation from fluvial, coastal and groundwater sources and is appropriate for development at this location.

7.5 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

This section provides an assessment of the potential environmental impacts of the development proposals on the water environment during the construction and operational phases of the development. Judgments made are based on an assessment of the magnitude of contamination sources, geotechnical hazards and mineral sterilisation as obtained from desk study, existing ground investigation and monitoring information, which form the baseline conditions and an assessment of the source – pathway – receptor philosophy and identified pollutant linkages.

The overall development site and the area within its immediate environs have been considered in detail to assess the changes in ground conditions. The receptors potentially at risk that could be present are indicated below and their relative sensitivity is assessed using the criteria listed in Table 7.6 to enable predicted impact to be determined.

7.5.1 RECEPTOR SENSITIVITY

The receptors considered for the risk assessment are detailed in the table below and considered in relation to their relative importance and receptor sensitivity (using the criteria listed in Table 7.15 to enable predicted impact); justifications for the classification are provided.

Table 7.6 Receptor Sensitivity

Receptor	Relative Importance	Receptor Sensitivity	Justification
Groundwater	County Level	Low	The current *"good status"* of groundwater should be protected. The desktop study and ground investigation works undertaken support the groundwater vulnerability across the site as being classed as moderate.
Surface Water	County Level	Low	There is an absence of significant surface water features at or in immediately proximity to the site and limited connectivity to off-site sensitive receiving waters.

7.5.2 CONSTRUCTION PHASE

The main potential environmental effects during the construction phase have been tabulated below.

Table 7.7 Construction Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Surface Water (Low)	Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11
	Earthworks have the potential to result in overland run-off of silty water to local drainage	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11
	Earthworks have the potential to cause disturbance of contaminated soil and subsequent surface water pollution.	No change	Negligible No mitigation measures required The impact is considered reasonable as there are no known sources of contamination within the soils on-site.
Groundwater (Low)	Increased vulnerability of the aquifer as a result of soil removal.	Negligible	Minor (without mitigation) Mitigation is proposed in Table 7.11.
	Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11
	Contamination of groundwater by concrete, cement paste or grout.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.11.
	Decreased infiltration due to increase in hard standing onsite	No Change	Negligible No mitigation measures required
	Earthworks have the potential to cause disturbance of contaminated soil and subsequent groundwater pollution.	No Change	Negligible No mitigation measures required The impact is considered reasonable as there are no known sources of contamination within the soils on-site.

7.5.3 OPERATIONAL PHASE

7.5.3.1 LEL Flexgen Castlelost Assessment (Project 1)

Table 7.8 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Surface Water (Low)	Contamination of underlying drift deposits and soils due to leak from road drainage, chemicals (such as ammonia) stored on site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12
	Contamination of surface water due to leaks/spills of fuel / gasoil storage tanks, oils from transformers	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12
Groundwater (Low)	Contamination of underlying drift deposits and soils due to leak from chemicals (such as ammonia) stored on site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12.
	Contamination of groundwater due to leaks/spills of fuel / gasoil storage tanks, oils from transformers (LV, MV and HV)	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12
	Decreased infiltration due to increase in hard standing onsite. A large proportion of the Flexgen site is surfaced with impermeable material. Drainage is collected and routed via fire wastewater retention tank and oil/water separator.	No change	No mitigation measures required The impact is considered reasonable due to the connection between the groundwater and surface water environments

7.5.3.2 ESS Castlelost Assessment

Table 7.9 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Surface Water (Low)	Contamination of underlying drift deposits and soils due to leak from road drainage, chemicals (such as electrolyte) stored on the BESS site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
	Contamination of surface water due to leaks/spills of oils from transformers or within the synchronous condenser compound.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12
Groundwater (Low)	Contamination of underlying drift deposits and soils due to leak from chemicals (such as electrolyte) stored on the BESS site and used throughout the site operations e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12.
	Contamination of groundwater due to leaks/spills of oils from transformers (LV, MV and HV) or within the synchronous condenser compound.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12
	Decreased infiltration due to increase in impermeable areas (predominantly around the synchronous condenser compound.	No change	Negligible No mitigation measures required The impact is considered reasonable due to the connection between the groundwater and surface water environments

7.5.3.3 GIS Castlelost Assessment

Table 7.10 Operational Phase Potential Environmental Effects

Receptor and its corresponding sensitivity	Potential Environmental Effects	Magnitude of impacts	Impact of significance and discussion
Surface Water (Low)	Contamination of surface water due to leaks from transformers	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12
Groundwater (Low)	Contamination of underlying drift deposits and soils due to road drainage and leaks from chemicals stored on site and used on site e.g., paints, lubricants, oils.	Moderate	Moderate (without mitigation) Mitigation is proposed in Table 7.12
	Decreased infiltration due to increase in hard standing onsite	Slight	Minor No mitigation measures required

7.6 MITIGATION MEASURES

7.6.1 CONSTRUCTION PHASE

Due to similar potential environmental effects being common to the three projects, mitigation is presented in single table for each of the construction and operational phases of projects.

Table 7.11 Mitigation of Potential Environmental Effects

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination from spills or leaks of fuel/oil and hazardous substances stored onsite e.g., paints, lubricants, adhesives, oils etc. (LEL Flexgen Castlelost Project, LEL ESS Castlelost Project and LEL GIS Castlelost Project))	Moderate	Surface Water Groundwater	Construction	• Construction compounds will be located at least 30m from local on site drains. • Dedicated area of hard standing for material deliveries separated a minimum of 10m from adjacent watercourses; • Concrete will be mixed off–site and imported to the site. • Dedicated area of hard standing for vehicle wash-out; • Specific areas for oil storage and refuelling, separated a minimum of 10m from adjacent watercourses and comply with legislation, including providing bunds which contain 110% of on-site fuel storage capacity; • Use spill kits, fill point drip trays, bunded pallets and secondary containment units; • Enclosed and secured site and fuel storage areas will be secondarily secured; • Develop a Construction Waste Management Plan; • Develop a site-specific Incident Response Plan; • Works involving the use of chemicals which are potentially harmful to the aquatic environment will be undertaken in a contained or lined area; • Excavation and disposal off-site of contaminated soils (where required).	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				• Good housekeeping (daily site clean-ups, use of disposal bins, etc.) on the project site, and the proper use, storage and disposal of many substances used on construction sites, such as lubricants, fuels and oils and their containers can prevent soil contamination.	
Earthworks have the potential to result in overland run-off of silty water to local drainage (LEL Flexgen Castlelost Project, LEL ESS Castlelost Project and LEL GIS Castlelost Project))	Moderate	Surface Water	Construction	• Minimisation of exposed ground and soil stockpiles, through careful earthworks design. • Minimising the time that ground is exposed and excavations are open through careful construction programming. • Stockpiles will be located away from watercourses, limited in height to 3m (topsoil) and the surface smoothed. • Silt fences will be placed around the stockpiles where required to limit the potential for rainfall to wash fines into the drainage system. These comprise a technical filter fabric positioned as a fence around the exposed soil and sediment to catch fines within the runoff and reduce the input of fine sediment to the drainage system. Stockpiles which may be present for some time will be covered or seeded. • Areas around infrastructure will be landscaped, and restored with topsoil and revegetated as soon as possible. • Track drainage, designed to prevent the interception of large volumes of water, will be porous and act as soakaways thereby minimising any direct discharge to watercourses. • Wheel washing activities will be conducted in designated areas, with runoff waters being conducted to soakaways constructed according to best practice. • Use of buffer zones, silt traps and settlement ponds to avoid sediment reaching watercourses.	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination of groundwater by concrete, cement paste or grout. (LEL Flexgen Castlelost Project, LEL ESS Castlelost Project and LEL GIS Castlelost Project))	Moderate	Groundwater	Construction	• A suitable casing will be used where wet concrete is proposed to ensure protection of groundwater until concrete has set.	Negligible
Increased vulnerability of the aquifer as a result of soil removal. (LEL Flexgen Castlelost Project, LEL ESS Castlelost Project and LEL GIS Castlelost Project))	Negligible	Groundwater	Construction	• Land disturbance is expected to be minimised and quickly re-stabilised during the construction; • Due to the limited soil and superficial cover present onsite, it is not thought that large quantities of soils and superficial deposits will be moved during construction; • During construction, areas where the bedrock aquifer is exposed should be protected from surface activities through utilisation of appropriate surface coverings.	Negligible

7.6.2 OPERATIONAL STAGE

The main potential environmental effects during the operational phase have been tabulated below.

Table 7.12 Mitigation of Potential Environmental Effect

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
Contamination from road drainage, spills or leaks of fuel/oil and hazardous substances stored onsite e.g., electrolyte, paints, lubricants, adhesives, oils etc.	Moderate	Surface Water Groundwater	Operational	• All roads are designed to drain to the filter drains running parallel with the proposed access road and shown on the drainage drawings. This system shall allow runoff to filter down through the stone media providing filtering and delay and storage action. This stone shall be wrapped in a permeable membrane allowing runoff to infiltrate into the surrounding soils thus providing reduction action. • Dedicated indoor chemical storage areas within the three projects are provided for the storage of chemicals. The secondary fuel and other oils will be stored in bunds • Electrolyte stored within the BESS compound (LEL ESS Castlelost) is contained within bunded structures with leak detection equipment. • Specific areas for oil storage and re-fuelling, are provided and are separated from local drainage. Secondary containment (bunding) is designed to comply with best practice – the greater of (a)110% of the largest tank or drum within the bund or 25% of the total volume of substance within the bund. • Bunds floor fall to internal sump areas which will allow bunds to be emptied via pump only. • Bund sumps will have impermeable surfaces Pumps will either be permanently fitted in sumps / bunds (submersible) or dry mounted	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				at bund wall height with suction lift (self-priming). Mobile pumps will also be used for smaller bunded structures as and when required. • Site drainage network are designed in consideration of SuDS principles. Stormwater moving through 'dirty' site areas (e.g., parking, deliveries) to pass through oil interceptor prior to being infiltrated. • Spill kits, fill point drip trays, bunded pallets and secondary containment units provided will be provided across all projects. • Enclosed and secured site and fuel storage areas will be secondarily secured. • A site-specific Incident Response Plan will be put in place for each project • Works involving the use of chemicals which are potentially harmful to the aquatic environment will be undertaken in a contained or lined area.	
Contamination of waters due to leaks/spills from pipework and storage plant /tanks	Moderate	Groundwater Surface Water	Operational	• Engineered controls included within the design to contain and recover spills • Water-efficient techniques will be used at source where possible to maximise reuse. Water will be recycled within the process from which it issues. • The drainage system is designed to ensure separation and isolation of 'contaminated' surface water with 'uncontaminated' surface water. In order to ensure that uncontaminated surface drains are not mixing with possibly contaminated surface drains, risk areas will discharge into a separate system. Small areas that have the potential for causing contamination of surface drain water are separated from the overall surface water drainage;	Negligible

Potential Environment effect	Impact of Significance	Receptor	Phase	Mitigation	Impact of Significance following mitigation
				• Appropriate surfacing and containment or drainage facilities for all operational area is designed taking into consideration collection capacities, surface thicknesses, strength/reinforcement; falls, materials of construction, permeability, resistance to chemical attack, and inspection and maintenance procedures; • Bunded (secondary containment) is provided for all storage tanks – site areas where tanks located fully bunded; • Interceptors containing oil contaminated rainwater will be contained before being exported off-site for suitable disposal; • The application for EPA licensing associated with the LEL Flexgen Castlelost Project will be progressed and in place in advance of operation.	

7.6.3 DECOMMISSIONING PHASE

Prior to decommissioning, a site closure and decommissioning plan will be completed to ensure the identification and mitigation of any further effects present at that time.

7.7 RESIDUAL IMPACTS OF THE DEVELOPMENT

The proposed developments will not have any significant residual effects on the water environment post implementation of mitigation. The site development will result in the creation of low permeability and impermeable surfaces (particularly in the LEL Flexgen Castlelost Project), limiting the potential for contamination of the subsurface.

7.8 CUMULATIVE EFFECTS INCLUDING GAS PIPELINE CONNECTION

Within the European Commission - Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, dated May 1999, cumulative effects are described as *"impacts that result from incremental changes caused by other development, plans or projects together with the proposed development or developments"*. The cumulative impacts of the proposed development in conjunction with current and future developments in the vicinity of the subject site are considered in this report. The cumulative impacts of the LEL Flexgen Castlelost, LEL ESS Castlelost and LEL GIS Castlelost projects have been considered within this assessment with various overlapping activities considered in the assessment. Connection of the LEL Flexgen Castlelost Project to the natural gas pipeline will be managed and undertaken by Gas Networks Ireland (GNI). The nature of that work is such that the works in the immediate vicinity of the site would be temporary and very short term and the additional construction phase impacts are assessed as short-term and imperceptible in the overall site context.

7.9 MONITORING AND FURTHER WORKS

Whilst the development proposals have the potential to cause detriment to the sensitive receptors identified, the recommended mitigation measures will ensure that the risk of potential impacts are reduced to negligible. Give the lack of significant watercourses within the development lands, no water monitoring is recommended during the construction programmes. The LEL Flexgen Castlelost Project will require an Industrial Emissions Licence. If successfully obtained, the licence will prescribe specific conditions including monitoring requirements designed to monitor and protect the existing quality of receiving waters (surface water and groundwater). The licence will also require preparation of a baseline site report which will inform the decommissioning plan (closure plan) and satisfy environmental liability and risk assessment (ELRA) legislative requirements.

8 AIR QUALITY & CLIMATE

8.1 INTRODUCTION

This Chapter of the EIAR considers the potential air quality and climate impacts associated with the proposed development. Impacts of site operations are considered by taking account of the existing baseline environment, the projected impacts and compliance with relevant standards.

8.2 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The overall proposed development for which planning permission is sought comprises three Project. These are described as follows. A full description of the projects is provided in Chapter 2 of this EIAR.

<u>LEL Flexgen Castlelost Project:</u> Proposed gas-fired reserve generator of 275MW electrical capacity. The project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system. The proposal includes the installation of five (5no.) dry low emission (DLE) gas turbines, associated stack(s), raw water/fire water tank, fire water retention basin, back-up fuel tank, emergency generator, gas receiving station (AGI), low, medium and high voltage transformers, customer control room, and all ancillary electrical plant and delivery systems. GNI will separately manage the process of delivering the underground natural gas pipeline to the proposed site to serve the reserve generator.

<u>LEL GIS Castlelost Project:</u> Proposed 220kV Gas Insulated Switchgear (GIS) Electrical Substation. The project will involve installation of two (2 no.) 220 kV underground circuits forming a connection to the existing Shannonbridge-Maynooth 220 kV overhead line (located within the development boundary) and two (2no.) 220 kV underground circuits and associated low voltage and communication underground cabling connecting the proposed substation with electricity transformers on the adjacent reserve gas-fired generator (Project 1) and ESS (Project 3) sites, and all associated and ancillary site development works. The GIS substation itself includes a two storey, 17m high building (housing electrical switchgear, a battery room, a workshop room, and WC), transformer bay(s), access roadway and all ancillary site development works.

<u>LEL ESS Castlelost Project:</u> Proposed Energy Storage System (ESS) using vanadium flow battery (VFB) technology and synchronous condenser. The battery energy storage system (BESS) will comprise a cluster of battery modules positioned within a dedicated BESS outdoor compound. Each module will consist of (i) a battery container (6.1m long

container) housing pumps and heat exchangers positioned on top of two (ii) tank (electrolyte) enclosures (12.2m long containers). An associated battery management system (BMS) and medium voltage power station (MVPS) enclosure will also form part of the battery module. The synchronous condenser comprises a rotating generator positioned within a building. The generator is connected to the transmission system via a step-up transformer. When the generator has reached an operating speed that is synchronous to the system frequency, it is synchronised with the transmission network and acts as a motor providing reactive and short circuit power to the electricity network. A customer (IPP) building will also be installed within the ESS compound.

8.3 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

8.3.1 INTRODUCTION

The assessment follows a well-established scheme involving identification and characterisation of the air quality impacts that must be addressed, characterisation of the receiving environment to benchmark the existing situation, quantitative prediction of air quality impacts and assessment of the impacts against recognised Air Quality Standards and Guidelines. From this assessment comes a definition of the Management Plans and environmental solutions that are required to ensure that all aspects of the impacts of the development proposal through Construction and Operation Phases are managed and controlled to protect human health, the environment and amenity.

The EPA Revised Draft Guidelines on the Information to be Contained in Environmental Impact Statements were published in May 2017. These draft Guidelines take account of the revised EIA Directive (2014/52/EU) and are considered in this assessment. Impacts are described in the draft Guidance in terms of quality, significance, magnitude, probability, duration and type. A description of the significance of effects is presented in Table 8.1, and Table 8.2 presents the description of the duration of effects as shown in the Draft Guidelines.

In addition to considering the above guidance, the general approach adopted for the air quality impact assessment is summarised as follows.

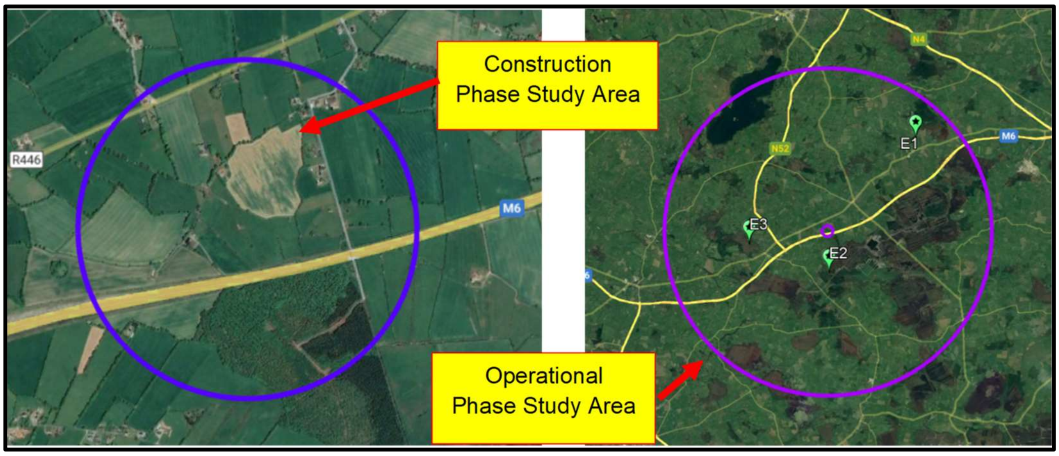
(i) Describe the existing baseline air quality at the site and in the vicinity of receptors – addressed in Section 8.5;
(ii) Describe the potential impacts of the development on air quality – addressed in Section 8.6;
(iii) Identify appropriate criteria against which to assess the significance of the impacts associated with the proposed development – addressed in Section 8.3;

(iv) Propose mitigation and avoidance measures where required.

(v) Identify and assess all cumulative impacts with potential to impact upon the receiving environment.

The Study Area for the assessment is shown in Figure 8.1. Construction Phase impacts are assessed in accordance with guidance at distances up to 350m from the proposed site boundary and the operational phase impacts are assessed at distances up to 10km from the proposed site boundary.

Figure 8.1 Study Area



In addition to the general description of the Study Area specified Receptors are selected for detailed study as representative receptors to assess impacts of the proposed development. Sensitive receptors across the study area were identified for detailed study as shown in Figure 8.2 (human receptors) and in Figure 8.3 (ecological receptors). The receptors were selected as outlined in section 8.6.

Figure 8.2 Sensitive receptors included in the detailed assessment

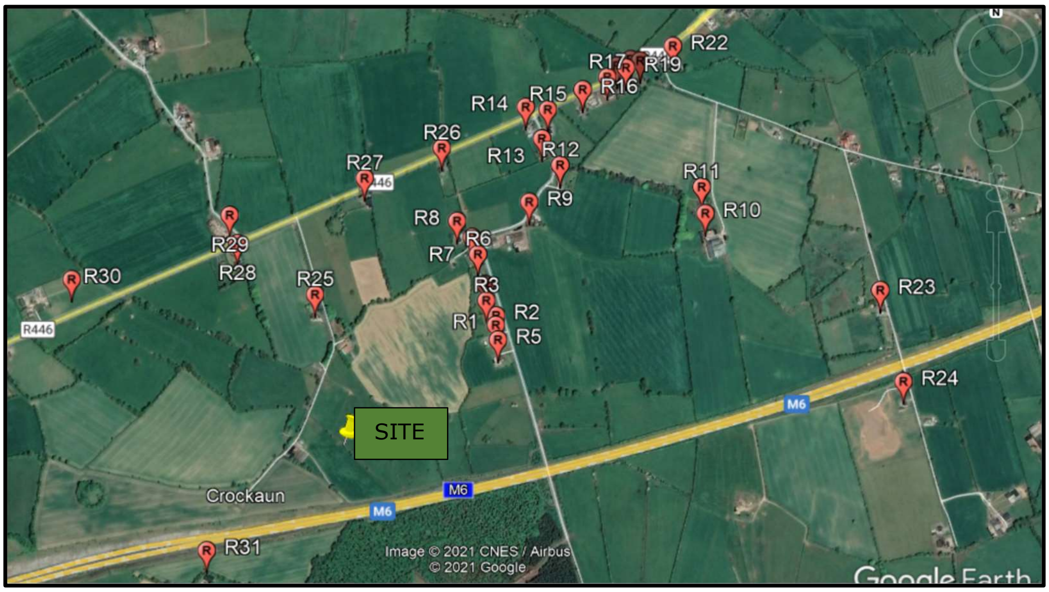
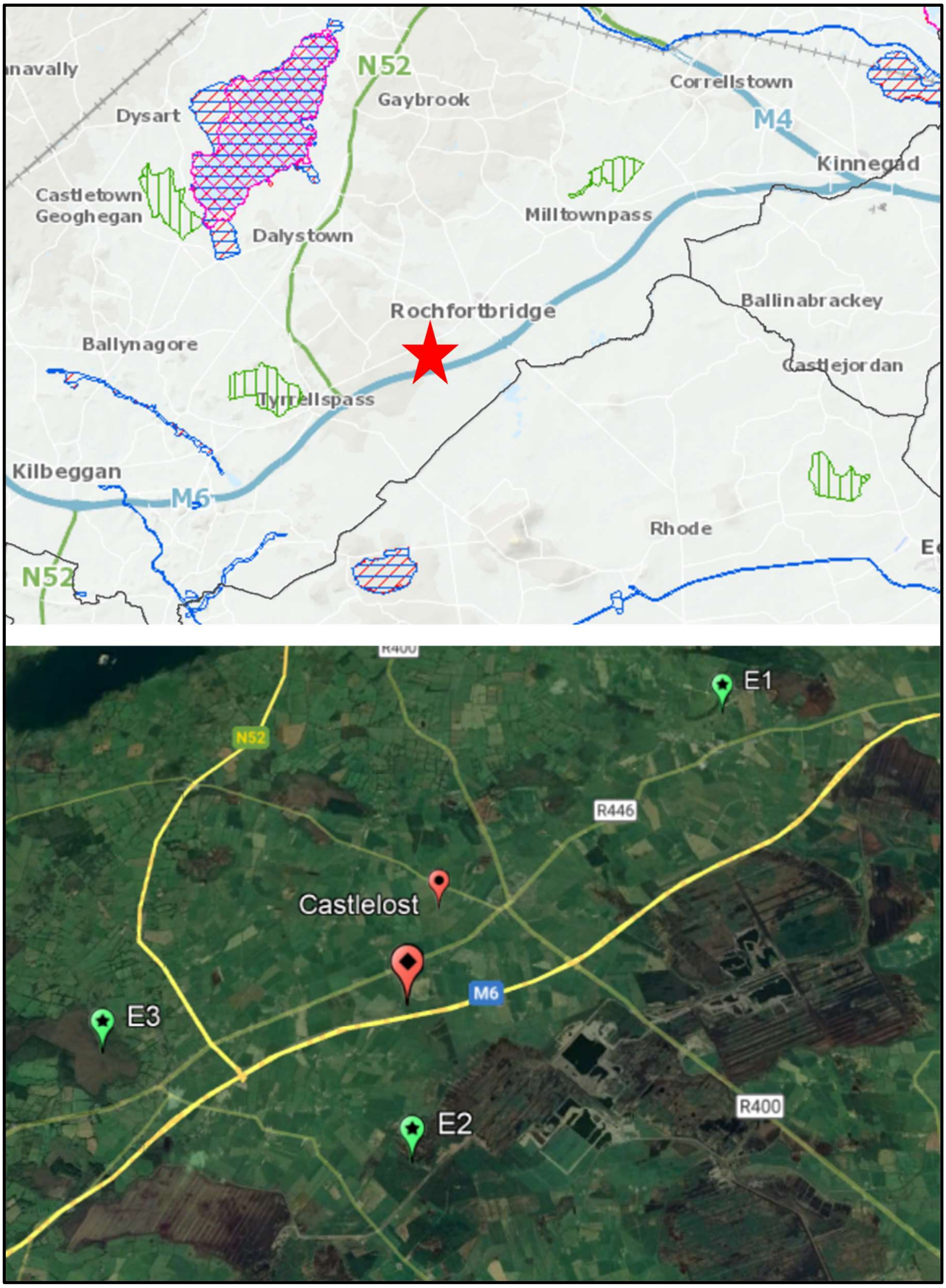


Figure 8.3 Ecological receptors for detailed study



8.3.2 AIR QUALITY IMPACT ASSESSMENT CRITERIA

The assessment of impact significance is based on a comparison of predicted impacts with air quality standards and guidelines, and consideration of the magnitude and duration of the potential impact.

Air Quality Standards in Ireland have been defined to ensure compliance with EC Directives; they are developed at different levels for different purposes. European legislation on air quality has been framed in terms of two categories, limit values and guide values. Limit values are concentrations that cannot be exceeded and are based on WHO guidelines for the protection of human health. Guide values are set as a long-term precautionary measure for the protection of human health and the environment. The World Health Organisation (WHO) guidelines differ from EU air quality standards in that they are primarily set to protect public health from the effects of air pollution, whereas Air Quality Standards are recommended by governments, and other factors such as socio-economic factors, may be considered in setting the standards.

The Clean Air for Europe (CAFE) Directive (Council Directive 2008/50/EC) is an amalgamation of the Air Quality Framework Directive and its subsequent daughter Directives and sets out limit and target values for named air quality parameters. The fourth daughter Directive (European Parliament 2004) also sets out limit values to be met for certain air quality parameters. The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). The 4^{th} Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. no. 58 of 2009).

The air quality standards and guidelines referenced in this report are summarized in Table 8.3. The Clean Air for Europe (CAFE) Directive (Council Directive 2008/50/EC) was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). This Directive and the Irish Regulations set out the main standards against which the potential impact of the development on air quality are assessed.

In addition to the Air Quality Standards Regulations and the Directive Standards, it is also appropriate to consider the WHO Guidelines. These guidelines were developed by the WHO to provide appropriate air quality targets worldwide, based on the latest health information available. The air quality guidelines for particulate matter (PM_{10}), nitrogen dioxide and sulphur dioxide, and $PM_{2.5}$ are considered in this report (WHO, 2005; updated in 2008). While the WHO Guidelines are not mandatory, they represent current informed opinion on the levels to which we should be aspiring in order to minimise adverse health impacts of air pollution. The WHO guidelines referenced in this report are summarised in Table 8.4.

There are no national or European Union air quality standards with which dust deposition can be compared. However, a figure of 350 mg/m^2-day based on the German Standard TA Luft Regulations is commonly applied by Local Authorities and the EPA (Environmental Protection Agency) to ensure that no nuisance effects will result from specified industrial activities. This criterion is the principal impact assessment criterion for the construction phase of the proposed project.

8.3.3 CLIMATE IMPACTS

Ireland has ratified and are signatory to a number of international agreements and Protocols as well as being legally obliged to meet the EU requirements in respect of climate commitments. The National Energy & Climate Plan (NECP) 2021-2030, which was published in August 2020, outlines the roadmap for meeting the EU-required climate obligations and specifically includes the steps required to meet a 30% reduction in greenhouse gas emissions from the non-Emissions Trading Scheme (ETS) sector. Under the Programme for Government, published after the NECP, Ireland is committed to achieving more ambitious targets of 7% annual average reduction in greenhouse gas emissions between 2021 and 2030 and is currently developing the policies and measures needed to meet those more challenging targets.

As an electricity provider, the proposed scheme is part of the ETS, therefore greenhouse gas emissions from the proposed facility are exempt from consideration in terms of the targeted reduction in emissions from the non-ETS sector. Consequently, the proposed facility will not affect Ireland's obligations to meet the EU Effort Sharing Decision in relation to reduction of greenhouse gas emissions. This situation will continue until at least 2030. Obligations if any beyond that date are unknown at this time.

Construction phase climate impacts are assessed by using a qualitative approach that considers the nature, scale and duration of the construction programme for the proposed development.

Table 8.1 Describing the Significance of Effects

"Significance" is a concept that can have different meaning for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	
Imperceptible	An effect capable of measurement but without significant consequences.
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant Effects	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound Effects	An effect which obliterates sensitive characteristics.

Table 8.2 Describing the Duration of Effects

'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	
Momentary Effects	Effects lasting from seconds to minutes.
Brief Effects	Effects lasting less than a day.
Temporary Effects	Effects lasting less than a year.
Short-term Effects	Effects lasting one to seven years.
Medium-term Effects	Effects lasting seven to fifteen years.
Long-term Effects	Effects lasting fifteen to sixty years.
Permanent Effects	Effects lasting over sixty years.
Reversible Effects	Effects that can be undone, for example through remediation or restoration.

Table 8.3 Air Quality Standards Regulations 2011 (based on EU Clean Air For Europe [CAFE] Directive 2008/50/EC)

Pollutant	EU Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	None	200 µg/m^3 NO_2
		Annual limit for protection of human health	None	40 µg/m^3 NO_2
		Annual limit for protection of vegetation	None	30 µg/m^3 NO +NO_2
Sulphur Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	150 µg/m^3	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m^3
		Annual & Winter limit for the protection of human health and ecosystems	None	20 µg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 µg/m^3
		Annual limit for protection of human health	20%	40 µg/m^3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health (Stage 1)	20% from June 2008. Decreasing linearly to 0% by 2015	25 µg/m^3
		Annual limit for protection of human health (Stage 2)	None To be achieved by 2020	20 µg/m^3
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	60%	10 mg/m^3 (8.6 ppm)
Benzene	2008/50/EC	Annual limit for protection of human health	0% by 2010	5 µg/m^3

NOTE
1. The Air Quality Standards Regulations 2011 (SI 180 of 2011) transposed EU Directive 2008/50/EC (CAFE) into Irish law.

Table 8.4 WHO Air Quality Standards

Pollutant	Limit Type	Value
Nitrogen Dioxide	Hourly limit for protection of human health	200 µg/m^3
	Annual limit for protection of human health	40 µg/m^3
Sulphur Dioxide	Daily limit for protection of human health	20 µg/m^3
	10-minute limit for protection of human health	500 µg/m^3
Particulate matter (as PM_{10})	24-hour limit for protection of human health	50 µg/m^3
	Annual limit for protection of human health	20 µg/m^3
Particulate matter (as $PM_{2.5}$)	24-hour limit for protection of human health	25 µg/m^3
	Annual limit for protection of human health	10 µg/m^3

8.3.4 IMPACT IDENTIFICATION

8.3.4.1 Existing Activities

The subject site is currently a greenfield site and in agricultural use. The only potential for emissions to air from the site are associated with the occasional use of agricultural machinery on the land or from ruminants grazing on the land. Existing activities in the immediate vicinity of the site of the proposed development have the potential to exert an influence on air quality by release of emissions associated with the following:

- emissions of particulate matter (PM_{10} and $PM_{2.5}$), Sulphur dioxide (SO_2), nitrogen oxides (NO_x) and carbon monoxide CO from heating sources in the area;
- emissions of particulate matter (PM_{10} and $PM_{2.5}$), SO_2, NO_x, CO from traffic in the area and in particular on the M6 running past the site.

The magnitude of the emissions from the existing site is very small relative to the dominant influence on air quality in the surrounding area which is traffic from the adjoining road network.

8.3.4.2 Impact Identification of Proposed Activities

Construction Impacts

The proposed development for which planning permission is sought will involve a significant amount of earthworks to prepare the site, construction of the buildings on the site and installation of plant and machinery. The potential air quality and climate impacts on the surrounding environment that requires consideration for a proposed development of this type includes two distinct stages, the short-term construction phase and the long-term operational phase.

The potential air quality impacts during Construction are summarised as follows:

a) Dust emissions associated with excavations and demolition works

There are minor demolition works proposed for the proposed development. The most significant of the potential air quality impacts associated with the construction site is dust. Dust can be generated as a result of disturbance of materials, as a result of wind blowing across exposed surfaces and as a result of construction vehicle movements across exposed surfaces.

There are three potential impacts on air quality of the dust / particulate matter emissions. Dust deposition on surfaces is the main potential impact associated with the larger particles, nuisance effects such as reduced visibility could be associated with excessively high levels of suspended particulate matter and respiratory effects could occur as a result of excessive levels of fine particles such as PM_{10} and $PM_{2.5}$.

Dust emissions associated with the Construction Phase of the proposed development are expected to be predominantly in the 10–75µm particle size range so these particles, because of their size, will generally be deposited within 100m of the emission source. Only under exceptional meteorological conditions would the dusts be carried further downwind.

Suspended particulate matter (SPM) may also be released and this matter may remain suspended in the air. The main effect would be on visibility, but this type of material could also be a respiratory nuisance if present at excessive levels. Emissions of dust in the form of fine particulate matter, PM_{10} and $PM_{2.5}$, may also occur, primarily as a result of materials handling and storage since the dominant particle size of the main construction materials is in the lower size ranges. There may also be some emissions of particles in these size ranges from the general site activities.

b) Construction transport emissions

Emissions of dust raised by vehicle movement on the roads near the site and also on site are considered under the general construction phase emissions in section (a) above. Emissions from the construction vehicles as a result of fuel combustion are considered here. The emissions include PM_{10} and $PM_{2.5}$, NO_2 and NO_x and CO and benzene.

c) Aspergillus emissions from excavation and earthmoving activity

There is concern about a fungal disease, *"invasive Aspergillosis"* which may be contracted as result of disturbance of materials that release fungal spores into the atmosphere. Fungal spores (the Aspergillus moulds) are found everywhere but are of particular concern when large scale demolition, excavation and earth-moving activity takes place.

Operational Impacts

The most significant potential impacts are emissions of combustion gases such as CO, SO_2 and NO_2 from the gas turbines and associated back up and emergency units.

Sulphur dioxide emissions originate from the sulphur in the fuel used in the combustion process. Since natural gas is the principal fuel to be used sulphur dioxide emissions will be negligible. Nitrogen oxides are also present in the emission stream as a result of the combustion process. Much of the emissions are in the form of nitrogen oxide (NO) which is expected to be substantially oxidised to nitrogen dioxide in the atmosphere. Nitrogen oxide emissions from sources using natural gas as fuel are significantly lower than the emissions associated with other fuels. For the Flexgen project, low emission DLE burners will be employed and additionally an SCR abatement system utilising ammonia is proposed to further reduce the nitrogen oxide emissions.

Particulate matter and carbon monoxide may also arise from the combustion process in the emission stream but only in minor amounts. Again, natural gas is a very clean fuel and particulate emissions are predicted to be very low.

There is the potential for a number of greenhouse gas emissions to atmosphere which may give rise to CO_2 emissions.

There is a requirement to run the turbines using gas oil to ensure that there is always a guaranteed energy supply and emissions to atmosphere from the use of gas oil are the same as those associated with natural gas combustion. Emissions when using gas oil will be slightly higher for sulphur dioxide since there is a higher sulphur content in the fuel but the same limits for nitrogen oxides will continue to apply for the diesel fuel usage scenario.

<u>Traffic Impacts</u>
The traffic associated with the proposed development during construction and operation will lead to emissions to atmosphere which are considered in the assessment. The principal substances that are associated with transport activity are particulate matter, nitrogen oxides and carbon monoxide. Dust emissions associated with construction traffic are also possible.

8.4 DESCRIPTION OF RECEIVING ENVIRONMENT

8.4.1 METEOROLOGICAL CONDITIONS

The magnitude of potential impacts of the proposed development on air and climate will largely be influenced by the local meteorological conditions, in particular by wind speed and direction and by precipitation rates. An evaluation of the climatic conditions at the site is therefore useful for an assessment of the type required for this study.

Met Éireann operate a Synoptic Network of weather stations at Belmullet, Malin Head, Rosslare (closed since 2008), Johnstown Castle, Birr, Clones, Kilkenny and Mullingar while the Aviation Division of Met Éireann maintains observing stations at Shannon Airport, Knock Airport, Casement Aerodrome, Dublin Airport and Cork Airport. There is no continuous meteorological monitoring on the subject site but the general guidance on selection of meteorological data for air quality impact assessments is to choose representative data, recently acquired, which best represents conditions at the site. At least three years of recently acquired data is preferred.

Comprehensive monitoring data is available for Mullingar (approximately 13km north of the subject site), which would be indicative of the meteorological conditions that are experienced at the site. Therefore, for the purpose of obtaining reliable information about the climatological conditions at the site of the proposed development, a full set of meteorological data for the period 2016 – 2020 recorded at Mullingar was analysed. This is considered an appropriate data set for the study because of the close proximity of the station to the site and the similarity in topography in the immediate area of both the station at Mullingar and the site of the proposed development.

Wind speed and direction in particular are important in determining how emissions associated with the activity are dispersed. The prevailing wind direction determines which areas are most significantly affected by the emissions from the activity and wind speed determines in part the effectiveness of the dispersion of the emissions.

The windroses for Mullingar are presented in Figure 8.4 for each of the years 2016 – 2020. The dominant wind direction is from the southwest quadrant with wind blowing from this quadrant for more than 50% of the time. The average long-term wind speed over the period 1985 – 2010 is 5.5m/s.

8.4.2 INFLUENCES ON AMBIENT AIR QUALITY

The existing activities at and in the vicinity of the site have the potential to exert an influence on ambient air quality by release of emissions to atmosphere as follows:

- emissions of fine particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO) from domestic, commercial and industrial heating;
- emissions of particulate matter (PM_{10} and $PM_{2.5}$), SO_2, NO_x, CO and benzene from traffic on adjoining roads;

Overall, the contribution of traffic travelling on the surrounding road network and heating sources in the area are considered to be the dominating influence on air quality in the immediate vicinity of the site.

The main substances which are of interest in terms of existing air quality are sulphur dioxide, nitrogen oxides, particulate dusts including PM_{10} and $PM_{2.5}$ which could originate from combustion sources and traffic. There are no new substances expected to be present in emissions released from the proposed development. A description of existing levels of the various substances in ambient air is required to allow completion of the evaluation of air quality impacts associated with the development and is presented in the following section.

Figure 8.4 Windroses for Mullingar Meteorological Station

8.4.3 EXISTING AMBIENT AIR QUALITY

The site is located in agricultural fields immediately southwest of Rochfortbridge. The M6 Motorway runs east-west along the southern boundary of the site.

The dominant influences on air quality in the area are emissions from domestic heating and traffic. Emissions from traffic sources are expected to be the principal contributors to ambient air quality in the vicinity of the site.

The main substances which are of interest in terms of existing air quality are sulphur dioxide, nitrogen oxides (nitric oxide, NO and nitrogen dioxide NO_2, collectively referred to as NO_x), fine particulate matter including PM_{10} and $PM_{2.5}$ which could originate from combustion sources and traffic. Carbon monoxide is also potentially of interest, and benzene may also be of interest from traffic sources. There are no significant new substances expected to be present in emissions released from the proposed development relative to the existing situation.

Particulate matter is made up of tiny particles in the atmosphere that can be solid or liquid and is produced by a wide variety of natural and manmade sources. Particulate matter includes dust, dirt, soot, smoke and tiny particles of pollutants. Particulate matter of 10 micrometers in aerodynamic diameter or less are also referred to as PM_{10} or more strictly, particles which pass through a size selective inlet with a 50% efficiency cut-off at 10 μm aerodynamic diameter. Similarly, $PM_{2.5}$ refers to particulate matter of 2.5 micrometers or less in aerodynamic diameter. In the past domestic coal burning was a major source of particulate matter in Irish cities during winter months. Levels of particles have decreased significantly since then following the introduction of abatement strategies including Special Control Areas and other Regulations regarding the use, marketing, sale and distribution of certain fuels. The significance of particulate matter is predominantly related to human health and respiratory effects.

Nitrogen oxides (NO_x, which is the sum of NO and NO_2), are generated primarily by combustion processes. The main anthropogenic sources are mobile combustion sources (road, air and traffic) and stationary combustion sources (including industrial combustion). The main source of nitrogen oxides in the vicinity of the site is traffic. The significance is health-related for nitrogen dioxide (NO_2) and ecological for nitrogen oxides (NO_x).

Sulphur dioxide also originates from combustion but predominantly from heating sources and not traffic. The trend in ambient SO_2 concentrations in Ireland is very clearly downward and this pollutant is not a matter for concern in Ireland. This reduction can be attributed to fuel switching from high-sulphur fuels, such as coal and oil, to natural gas and to decreases in the sulphur content of oil.

Carbon Monoxide (CO) is a colourless and odourless gas, formed when carbon in fuel is not burned completely. It is a component of motor-vehicle exhaust, which accounts for most of the CO emissions nationwide. Consequently, CO concentrations are generally higher in areas with heavy traffic congestion.

A description of existing levels of the various substances in ambient air is required to allow completion of the evaluation of air quality impacts associated with the development. The available data from the National Ambient Air Quality Network is a reliable data set for consideration in this study.

The Environmental Protection Agency (EPA) and local authorities maintain and operate a number of ambient air quality monitoring stations throughout Ireland in order to implement EU Directives and to assess the country's compliance with national air quality standards. Ireland's small population and generally good air quality means that a relatively small number of monitoring stations are sufficient across the country for the purposes of implementing the EU Air Directives. For ambient air quality management and monitoring in Ireland, four zones, A, B, C and D are defined in the Air Quality Standards (AQS) Regulations (S.I. No. 180 of 2011) and are defined as follows:

- Zone A: Dublin Conurbation.
- Zone B: Cork Conurbation.
- Zone C: 24 cities and large towns. Includes Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Newbridge, Mullingar, Letterkenny, Celbridge and Balbriggan, Portlaoise, Greystones and Leixlip.
- Zone D: Rural Ireland, i.e., the remainder of the State excluding Zones A, B &C.

The subject site is considered to be located in Zone D and is considered a rural location site for assessment purposes. Air Quality Data from representative air monitoring stations in Zone D are therefore considered representative of air quality at the subject site. The EPA publishes Ambient Air Quality Reports every year which details the air quality in each of the four zones. The most recent report, published by the EPA in 2020, is the Air Quality in Ireland 2019, which contains monitoring data collected during 2019.

The EPA maintains monitoring stations in a number of rural locations including Castlebar, Claremorris, Emo, Enniscorthy, Kilkitt and Longford to monitor rural background air quality. Other monitoring stations have operated at various times and some new stations have been added to the network, but long-term data is available for the above stations. Data from the Air Quality Monitoring Annual reports for 2017 - 2019 was reviewed and a summary of the data for representative stations for the three most recent years is presented for each parameter of interest in Table 8.5.

The approach taken is to take the average of the three most recent years for each of the Zone D rural stations detailed above and the averages of the values for the stations are reported in Table 8.5. This is the data set which is used in the assessment of the potential impact of the proposed development on air quality.

It is noted from the data that existing ambient air quality is good for all health-related pollutants. All concentration levels are well within the EU Standards for all parameters of interest.

Table 8.5 Summary baseline air quality data (2017 - 2019)

Data set	Parameter and averaging interval		Concentration $\mu g/m^3$
Rural background	Nitrogen dioxide NO_2	Annual Mean, $\mu g/m^3$	4.9
Rural background	Nitrogen oxides, NO_x	Annual Mean, $\mu g/m^3$	6.7
Rural background	Particulate Matter PM_{10}	Annual Mean, $\mu g/m^3$	11.7
Rural background	Particulate Matter $PM_{2.5}$	Annual Mean, $\mu g/m^3$	8.9
Rural background	Sulfur dioxide, SO_2	Annual Mean, $\mu g/m^3$	1.8
Rural background	Carbon Monoxide CO	Annual Mean 8-hour, mg/m^3	Note 2
Rural background	Benzene	Annual Mean, $\mu g/m^3$	0.21

NOTE

1. Data summarised from the EPA Annual Ambient Air Quality Monitoring Reports 2016 to 2018.
2. No Zone D measurements recorded during this interval but a value of $0.1 mg/m^3$ was recorded for Zone C.

8.4.4 SITE SPECIFIC AMBIENT AIR QUALITY MONITORING

A survey of air quality in the area of the site was carried out during July - September 2021. The survey consisted of deployment of a series of diffusion tubes to measure ambient nitrogen oxides at 5 locations in the vicinity of the site. A continuous monitoring survey of nitrogen oxides (NO, NO_2 and NO_x) was also undertaken at one of these locations. The detailed results of the surveys are presented in Appendix 8.1 (diffusion tube survey) and in Appendix 8.2 (continuous monitoring survey). A summary of the- results is presented in Table 8.6 and Table 8.7. The results are consistent with expectations in that the levels are generally low and are clearly influenced by emissions from traffic on the motorway. The results are seen to decrease with increasing distance from the motorway. All of the monitoring results are compliant with the annual mean air quality standard for nitrogen oxides and the results are consistent with the longer-term EPA monitoring data for rural locations. The EPA monitoring data is generally lower for the annual mean than the values recorded in this survey which is not surprising given the limited duration of this survey. The longer-term EPA data is likely to be more representative of the annual average concentrations and is therefore selected for use in this assessment. The data from the continuous monitoring survey is a useful benchmark, it confirms the dominant influence of traffic emissions on air quality at the site and also provides valuable information on the variation in concentration at distances removed from the motorway.

Table 8.6 Diffusion tube NOx survey

Location	02 – 16 July 2021	16 – 30 July 2021	30 July – 13 Aug 2021	Average
OD1	5.12	7.65	6.01	6.26
OD2	4.50	6.31	6.17	5.66
OD3	3.11	6.11	3.48	4.23
OD4	3.97	6.10	3.11	4.39
OD5	3.93	7.10	3.15	4.73

Table 8.7 Continuous monitoring survey for NOx

Location	07 July 2021 to 13 Sep 2021		
	NO2, µg/m³	NO, µg/m³	NOx, µg/m³
OD3 Survey average	12.9	0.2	12.4

8.5 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

8.5.1 EXISTING ACTIVITIES

Section 8.5 describes the existing air quality at and in the vicinity of the site. The available data supports the conclusion that traffic emissions are the dominant influence on air quality in the area. The existing air quality complies with the Air Quality Standards and indicates that existing activities are not exerting an unacceptable effect on air quality.

The proposed Project is considered under the Project headings of Flexgen, ESS and GIS Projects. The construction phases of these projects are projected, if granted permission, to overlap and the overall assessment has therefore considered the likely overall impacts associated with each phase of the overall development.

Guidance on assessment of dust from demolition and construction was published in 2014 by the Institute of Air Quality Management (IAQM). This Guidance describes a five-step approach to the assessment which is summarised as follows.

(i) Screen the development to determine if there is a requirement for a more detailed assessment.
(ii) Assess the risk of dust impacts for each of the four activities (demolition, earthworks, construction and construction traffic) and take account of the scale and nature of the works, and the sensitivity of the area.
(iii) Determine the site-specific mitigation for each potential activity.
(iv) Examine the residual effects and determine whether or not these are significant.
(v) Prepare the dust assessment report.

This approach has been applied to the development at the proposed site and is summarised below. A detailed assessment is required when there are human receptors within 350m of the boundary of the site and since the closest human receptors to the site boundary are within this distance, a detailed assessment is required. There are no European or designated sites within 50m of the site boundary, which is the threshold distance for ecological sensitivity, so there are no significant construction impacts predicted for ecological sites. The Guidance advises that most projects will require a detailed assessment as the approach adopted is conservative. A detailed description of the methodology employed is provided in Appendix 8.3 and a summary of the methodology and principal findings is presented here.

The risk of dust being emitted in sufficient quantities to cause a nuisance or health impacts is evaluated by considering the scale of the works programme. The IAQM Guidance Note gives advice on classifying the magnitude of the potential dust impacts and using the advice and information derived from the Construction and Demolition Plan for the site, the magnitude of the dust emissions is estimated as shown in Table 8.8.

Table 8.8 Assessment of Magnitude of dust emissions and area sensitivity for Construction Programme

Activity	Magnitude of Dust Emission	Sensitivity of receptors and surrounding areas		
		Dust Soiling	Human Health	Ecological
Demolition	Small	Low	Low	Low
Excavations	Large	Medium	Low	Low
Construction	Medium	Medium	Low	Low
Construction Traffic	Small	High	Low	Low

The proposed development consists of a construction programme with very minor demolition works required. The construction phase is estimated to last for up to 28 months. Excavation work is required as the site is a greenfield site with by far the majority of excavated materials being soils (grassed topsoil, topsoil and subsoil). There is a significant volume of excavated materials required to create the required finished levels much of which will be used to construct a screening bank on the northern site boundary. The construction programme is moderately significant and therefore significant emissions could be expected.

The significance of the dust emissions and impacts is evaluated in terms of the sensitivity of the receptors in the area that could be affected by the emissions. In general, receptors located close to the construction site boundary are considered high sensitivity with sensitivity decreasing with increasing distance from the source reflecting the exponential decrease in dust levels as distance increases. The highest receptor sensitivity in the immediate vicinity of the proposed site is medium and is low for the vast majority of the construction activity.

The potential air quality impact arises from emissions of particulate matter and may result in deposition of dust around the site, and trackout onto the roads in the vicinity of the site. The magnitude of the potential emissions associated with construction is assessed as Low using the above criteria. Using the alternative assessment approach outlined in the Draft Guidelines on Environmental Impact Assessment as outlined in Section 8.3, the significance of potential dust emissions during construction is summarised in Table 8.9.

Table 8.9 Assessment of Significance of Dust Emissions for Construction Programme

Activity	Significance of Dust Emission	Duration of Dust Emission
Demolition	Imperceptible	Momentary
Excavations	Slight	Temporary
Construction	Not Significant	Short-term
Construction Traffic	Not significant	Short-term

This assessment shows that the most significant potential impacts are those associated with excavation work which is very dependent on weather conditions. Damp weather and low wind speeds will reduce the level of impact experienced at the receptor locations. There will be a temporary, slight impact on the closest receptors during the excavation programme and a short-term, not significant impact on the closest receptors during the construction works. Construction traffic impacts will be not significant and experienced in the short-term. In the absence of mitigation measures, the overall impact of dust arising during the construction phase is considered to be short term in duration and its significance will vary from not significant to slight.

Raw materials required for the construction will be delivered to the sites using conventional Heavy Goods Vehicles (HGVs) and any wastes requiring removal from the site will be removed using HGVs. The principal substances that are emitted from the vehicles are fine particulate matter, nitrogen oxides and carbon monoxide. Dust and particulate matter impacts associated with the passage of vehicles on roads has already been assessed as part of the dust and particulate matter impacts. The level of traffic movements has been reviewed in the context of potential contributions to air quality in the area.

The traffic impact assessment calculates that during peak construction activity, the site will engage approximately 150 construction personnel for the Flexgen project, 100 construction workers for the ESS Project and 50 construction workers for the GIS Project. As a worst-case assessment, it is assumed that site works will generate 135 staff trips (one-way) during the peak hour periods. It is envisaged that peak hour heavy goods vehicle (HGV) traffic will depend on the construction activities active on the site when considering the worst-case construction scenario. Most construction vehicles will stay on site for the duration of construction.

The fundamental requirement in respect of eliminating *Aspergillus* infection from construction works is first to minimise the dust generated during construction. It is considered that in the absence of mitigation measures the potential construction phase impact of Aspergillus is short term and imperceptible.

In the absence of mitigation measures the construction phase activities will range from an imperceptible to slight impact on local air quality depending on the activities occurring and, in all cases, will be short-term in duration.

8.5.2 OPERATION PHASE IMPACT ASSESSMENT

8.5.2.1 LEL Flexgen Castlelost - Operational Impact Assessment

The only predicted air quality impacts associated with operation of the proposed development are emissions to atmosphere from the OCGT units and the Black Start Diesel units. The assessment of the impact of the emissions from these sources is carried out by dispersion modelling. A detailed modelling assessment was undertaken using the current version of the United States EPA's model AERMOD Prime model in accordance with the guidance offered by the Environmental Protection Agency (EPA) in their AG4 Guidance Note. The dispersion model computes average ground-level concentrations of pollutants emitted from either elevated or ground-level emission sources. Separate utilities associated with the dispersion modelling software allow for computation of ground-level concentrations of pollutants over defined statistical averaging periods, and additional features permit suitable consideration to be given to building downwash effects and the effects of elevated terrain near the proposed development.

The Air Dispersion Model considered information relating to topography at the site and in the surrounding areas, design details for the building structures and emission sources and five years of meteorological data. The output from the Dispersion Model is the predicted ambient concentrations of substances emitted from the proposed development at locations beyond the site boundary for every hour of the five-year meteorological data sets. In addition to predicting concentrations in the broader environment, the Model predicted concentrations at 31 individual sensitive human and ecological receptors as discussed in section 8.3.1. A detailed description of the Model and methodology is provided in Appendix 8.4.

The emissions to atmosphere arise due to the combustion process. The five (No) Open Cycle Gas Turbines (OCGT) are intended to run on natural gas, but provision is made to use diesel as a back-up fuel for emergencies. Consequently, both scenarios are considered in the assessment. In addition, the Black Start Diesel Units may be required in emergency situations to start the turbines in which case they would be used to start the first turbine which will then be used for the remaining starts; their operation is therefore very limited. The dispersion model considered a number of possible operating scenarios as follows.

(i) LEL Flexgen Castlelost Operating Scenario #1: Natural gas fuel (Normal Operation)

A conservative assumption of 1,000 operating hours per year was made with units expected to run for much shorter times. An assumption of 2 hours operation per day during the morning (06:00 – 08:00) or evening (16:00 – 19:00) peak demand periods was made. The turbines start very quickly and reach steady state normal operation in approximately 10 minutes. The assessment assumes that 30% of the operating hours are start-up or shut down for the purpose of modelling. The use of diesel fuel is tested every month and a run time of 2 hours per month is assumed for the testing.

(ii) LEL Flexgen Castlelost Operating Scenario #2: Natural gas fuel (Worst Case)

A conservative assumption of full-time operation using natural gas as fuel was made to ensure that all worst-case meteorological conditions were investigated. This is an unrealistic scenario and is not expected to occur. However, the test is a useful sensitivity test to test the sensitivity of the model predictions to the meteorological conditions for the short term one-hour averaging periods.

(iii) LEL Flexgen Castlelost Operating Scenario #3: Diesel fuel (Worst Case)

A conservative assumption of full-time operation of the turbines using diesel as fuel was made to consider what would occur in the event of a national gas distribution network outage and to ensure that all worst-case meteorological conditions were investigated. This is an unrealistic scenario and is not expected to occur. However, the test is a sensitivity test to test the sensitivity of the model predictions to the meteorological conditions for the short term one-hour averaging periods and to the use of diesel instead of natural gas.

(iv) LEL Flexgen Castlelost - Diesel Black Start Units

These units will run only in emergencies and will be tested once each year. For the purpose of this assessment a model run was executed with the units operating once a year for 8 hours. This run was assimilated into all of the main operating scenarios.

These operating scenarios represent conservative approaches and will lead to an overestimate of the predicted ambient concentrations beyond the site boundary. The stack height for the assessment was determined to be 30m and the detailed assessment as reported in Appendix 8.4 also considered alternative stack heights.

8.5.2.1.1 LEL Flexgen Castlelost - Impact Assessment for Normal Operation on Natural Gas (Scenario #1)

Full details of the modelled scenarios are given in Appendix 8.4. The most sensitive pollutant is nitrogen dioxide, so the detailed discussion presented here is for nitrogen dioxide; results for carbon monoxide are also presented as this is also a regulated pollutant under the Large Combustion Plant Directive. All other substances are emitted at lower concentrations and the impacts are less significant. The results of the runs are presented in Table 8.10 for NO_2 and in Table 8.11 for CO. The modelling predictions show that the predicted concentrations are all significantly lower than the relevant air quality standard. For the most sensitive pollutant, nitrogen dioxide, the predicted ambient concentrations expressed as the Process Contribution for the 99.8-percentile of 1-hour concentrations will not exceed 0.61% of the air quality standard.

The cumulative air quality impact expressed in terms of the Predicted Environmental Concentration (PEC) is assessed by considering the background air quality in the area and the incremental contribution to ambient concentrations from the proposed process. The modelling predictions indicate that the cumulative impact of the operation of the turbines with existing activities will not exceed the Air Quality Standards. As is evident from the contour plot presented in Figure 8.5, the highest predicted Process Contributions (PCs) are close to the facility with concentrations reducing with distance from the source as expected.

Table 8.10 Predicted NO_2 concentrations for Normal Operation on Natural Gas

Met data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2016	99.8th %ile of 1-hour means	0.43	9.8	10.2	200	0.22%
	Annual mean	0.22	4.9	5.1	40	0.55%
2017	99.8th %ile of 1-hour means	0.44	9.8	10.2	200	0.22%
	Annual mean	0.24	4.9	5.1	40	0.60%
2018	99.8th %ile of 1-hour means	1.22	9.8	11.0	200	0.61%
	Annual mean	0.29	4.9	5.2	40	0.73%
2019	99.8th %ile of 1-hour means	0.32	9.8	10.1	200	0.16%
	Annual mean	0.21	4.9	5.1	40	0.53%
2020	99.8th %ile of 1-hour means	0.32	9.8	10.1	200	0.16%
	Annual mean	0.23	4.9	5.1	40	0.58%

NOTE

1. The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 8.11 Predicted CO concentrations for Normal Operation on Natural Gas

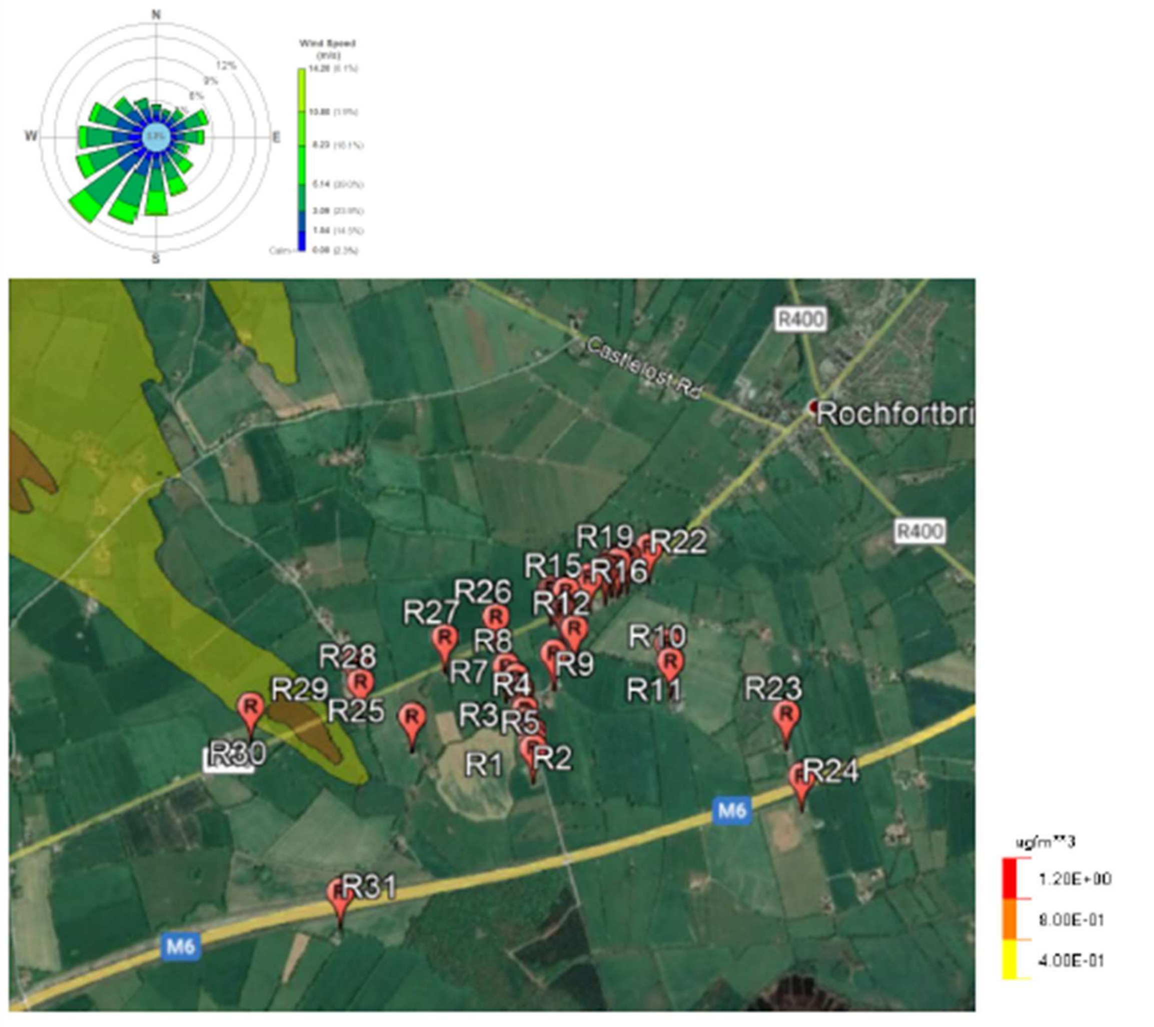
Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2016	Maximum 8-hour mean	29.7	100	129.7	10,000	0.30%
2017	Maximum 8-hour mean	27	100	127.0	10,000	0.27%
2018	Maximum 8-hour mean	30.4	100	130.4	10,000	0.30%
2019	Maximum 8-hour mean	19.7	100	119.7	10,000	0.20%

Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2020	Maximum 8-hour mean	19.7	100	119.7	10,000	0.20%

NOTE

1. The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Figure 8.5 99.8-%ile of 1-hour nNO2 concentrations for Normal Operation on Natural Gas



tms environment ltd 53 Broomhill Drive, Tallaght, Dublin 24 Tel: +353-1-4626710	Client	Halston / Lumcloon Energy Ltd
	Project	FlexGen Castlelost
	Figure Ref	Figure 8.5
	Title	99.8-%ile of 1-hour NO_2 concentrations for Normal Operation on Natural Gas

8.5.2.1.2 LEL Flexgen Castlelost - Impact Assessment for Worst Case Operation on Natural Gas (Scenario #2)

Results are presented for nitrogen dioxide and carbon monoxide as both are regulated pollutants under the Large Combustion Plant Directive. All other substances are emitted at lower concentrations and the impacts are less significant. The results of the runs are presented in Table 8.12 for NO_2 and in Table 8.13 for CO.

The modelling results show that even if the plant were to run full time (24 hours per day, 365 days per year) on natural gas, which is not proposed, the predicted ambient concentrations for the most sensitive pollutant, nitrogen dioxide, expressed as the Process Contribution will not exceed 9.1% of the air quality standard for the 99.8 percentile of one-hour concentrations.

The cumulative air quality impact expressed in terms of the Predicted Environmental Concentration (PEC) is assessed by considering the background air quality in the area and the incremental contribution to ambient concentrations from the proposed process. The modelling predictions indicate that the cumulative impact of the operation of the turbines with existing activities will not exceed the Air Quality Standards. As is evident from the contour plot presented in Figure 8.6, the highest predicted Process Contributions (PCs) are close to the facility with concentrations reducing with distance from the source as expected.

Table 8.12 Predicted NO_2 concentrations for Worst Case Operation on Natural Gas (Scenario #2)

Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2016	99.8th %ile of 1-hour means	16.6	9.8	26.4	200	8.30%
	Annual mean	0.42	4.9	5.3	40	1.05%
2017	99.8th %ile of 1-hour means	18.2	9.8	28.0	200	9.10%
	Annual mean	0.35	4.9	5.3	40	0.88%
2018	99.8th %ile of 1-hour means	15.6	9.8	25.4	200	7.80%
	Annual mean	0.31	4.9	5.2	40	0.78%
2019	99.8th %ile of 1-	15.6	9.8	25.4	200	7.80%

Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
	hour means					
	Annual mean	0.26	4.9	5.2	40	0.65%
2020	99.8th %ile of 1-hour means	15.6	9.8	25.4	200	7.80%
	Annual mean	0.29	4.9	5.2	40	0.73%

NOTE

1. The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

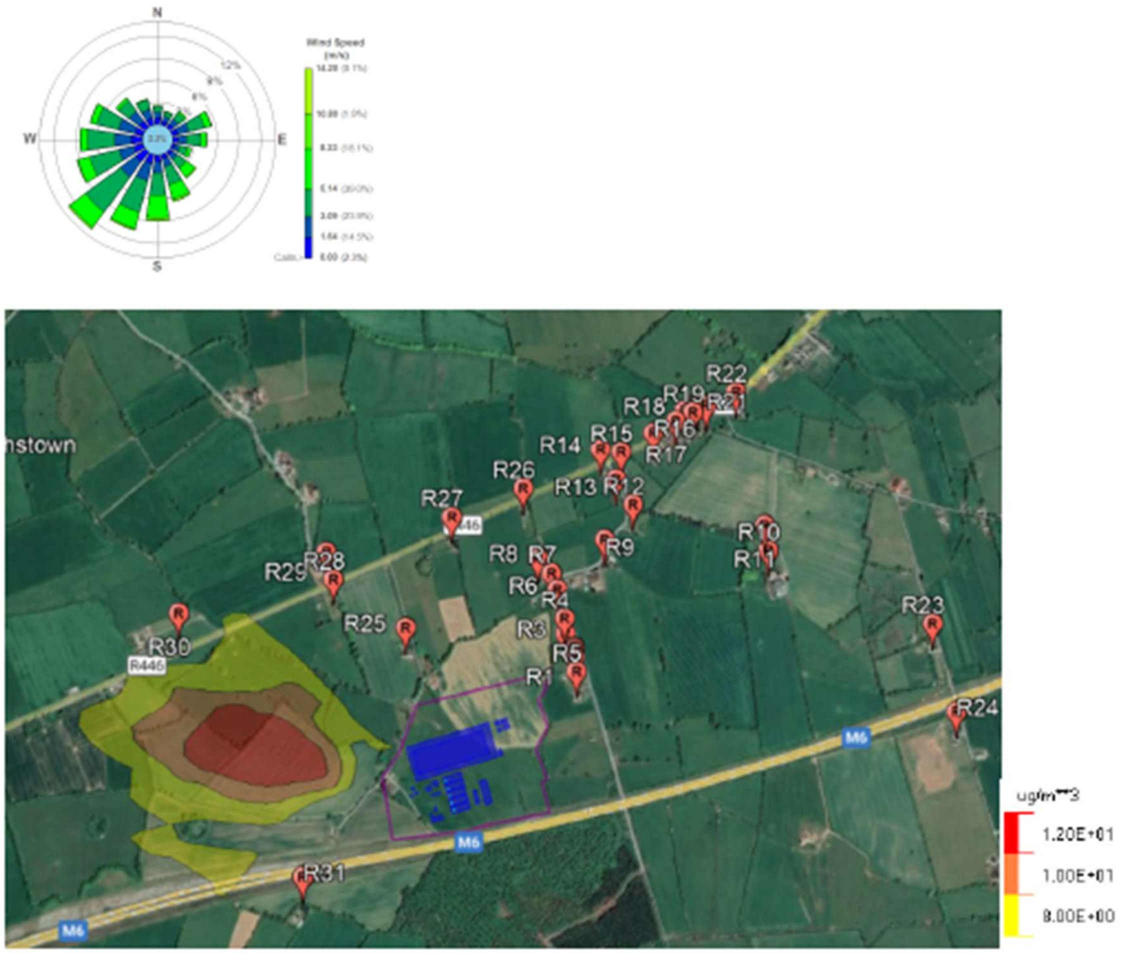
Table 8.13 Predicted CO concentrations for Worst Case Operation on Natural Gas (Scenario #2)

Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2016	Maximum 8-hour mean	29.7	100	129.7	10,000	0.30%
2017	Maximum 8-hour mean	27	100	127.0	10,000	0.27%
2018	Maximum 8-hour mean	30.4	100	130.4	10,000	0.30%
2019	Maximum 8-hour mean	34.5	100	134.5	10,000	0.35%
2020	Maximum 8-hour mean	24.4	100	124.4	10,000	0.24%

NOTE

1. The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Figure 8.6 99.8-%ile of 1-hour NO_2 concentrations for Conservative Worst Case Operation on Natural Gas (Scenario #2)



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	Project	FlexGen Castlelost
	Figure Ref	Figure 8.6
	Title	99.8-%ile of 1-hour NO_2 concentrations for Conservative Worst Case Operation on Natural Gas

8.5.2.1.3 LEL Flexgen Castlelost - Impact Assessment for Worst Case Operation on Diesel (Scenario #3)

Results are presented for nitrogen dioxide and for carbon monoxide as both are regulated pollutants under the Large Combustion Plant Directive. Results are also presented for sulphur dioxide as the sulphur content of diesel is higher than that in natural gas although the emission are still relatively low. The results of the runs are presented in Table 8.14 for NO_2, Table 8.15 for CO and in Table 8.16 for SO_2.

The modelling results show that even if the plant were to run full time on diesel, which is not proposed, the predicted ambient concentrations for the most sensitive pollutant, nitrogen dioxide, expressed as the Process Contribution will not exceed 9.7% of the air quality standard for the 99.8 percentile of one-hour concentrations.

The cumulative air quality impact expressed in terms of the Predicted Environmental Concentration (PEC) is assessed by considering the background air quality in the area and the incremental contribution to ambient concentrations from the proposed process. The modelling predictions indicate that the cumulative impact of the operation of the turbines with existing activities will not exceed the Air Quality Standards.

Table 8.14 Predicted NO_2 concentrations for Unrealistic Worst-Case Operation on Diesel (Scenario #3)

Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2016	99.8th %ile of 1-hour means	16.1	9.8	25.9	200	8.05%
	Annual mean	0.28	4.9	5.2	40	0.70%
2017	99.8th %ile of 1-hour means	16.4	9.8	26.2	200	8.20%
	Annual mean	0.36	4.9	5.3	40	0.90%
2018	99.8th %ile of 1-hour means	19.4	9.8	29.2	200	9.70%
	Annual mean	0.28	4.9	5.2	40	0.70%
2019	99.8th %ile of 1-hour means	16.4	9.8	26.2	200	8.20%
	Annual mean	0.26	4.9	5.2	40	0.65%
2020	99.8th %ile of 1-hour means	16.3	9.8	26.1	200	8.15%
	Annual mean	0.25	4.9	5.2	40	0.63%

NOTE

1. The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 8.15 Predicted CO concentrations for Unrealistic Worst-Case Operation on Diesel (Scenario #3)

Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2016	Maximum 8-hour mean	84.9	100	184.9	10,000	0.85%
2017	Maximum 8-hour mean	77.2	100	177.2	10,000	0.77%
2018	Maximum 8-hour mean	160	100	260.0	10,000	1.60%
2019	Maximum 8-hour mean	98.6	100	198.6	10,000	0.99%
2020	Maximum 8-hour mean	69.7	100	169.7	10,000	0.70%

NOTE

1. The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

Table 8.16 Predicted SO_2 concentrations for Unrealistic Worst-Case Operation on Diesel (Scenario #3)

Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2016	99.7th %ile of 1-hour means	35.2	3.6	38.8	350	10.06%
	99.2 %ile of 24-hour means	7.7	1.8	9.5	125	6.16%
	Annual mean	0.42	1.8	2.2	20	2.10%
2017	99.7th %ile of 1-hour means	38.1	3.6	41.7	350	10.89%
	99.2 %ile of 24-hour means	11.8	1.8	13.6	125	9.44%
	Annual mean	0.79	1.8	2.6	20	3.95%
2018	99.7th %ile of 1-hour means	54.4	3.6	58.0	350	15.54%
	99.2 %ile of 24-hour means	19.1	1.8	20.9	125	15.28%
	Annual mean	0.52	1.8	2.3	20	2.60%

Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2019	99.7th %ile of 1-hour means	42.3	3.6	45.9	350	12.09%
	99.2 %ile of 24-hour means	19.1	1.8	20.9	125	15.28%
	Annual mean	0.4	1.8	2.2	20	2.00%
2020	99.7th %ile of 1-hour means	20.5	3.6	24.1	350	5.86%
	99.2 %ile of 24-hour means	9.7	1.8	11.5	125	7.76%
	Annual mean	0.38	1.8	2.2	20	1.90%

NOTE

1. The background concentration is the annual mean when evaluating annual or daily predictions. The background concentration is twice the annual mean when evaluating hourly predictions.

8.5.2.1.4 Impact of Emissions on Ecosystems

The impact of nitrogen oxides (NOx) emissions on sensitive ecosystems was assessed by modelling the NOx emissions from the worst-case gas scenario with the turbines operating full time on natural gas. The impact predictions are presented in Table 8.17.

Table 8.17 Predicted NO_x concentrations for Worst Case Operation on Natural Gas

Met Data	Averaging interval	Process Contribution (PC) µg/m³	Background concentration µg/m³	Predicted Environmental Concentration (PEC) µg/m³	Air Quality Standard µg/m³	PC as % of Air Quality Standard
2016	Annual mean	0.32	6.7	7.02	30	23.4%
2017	Annual mean	0.41	6.7	7.11	30	23.7%
2018	Annual mean	1.1	6.7	7.8	30	26.0%
2019	Annual mean	0.51	6.7	7.21	30	24.0%
2020	Annual mean	0.30	6.7	7	30	23.3%

NOTE

1. The background concentration is the annual mean when evaluating annual or daily predictions.

The maximum predicted Process Contributions are considered with the background concentrations to arrive at a PEC. The background concentration selected is for the areas closest to the site where maximum predicted PCs arise which is likely to be conservative given the surrounding land uses and the dominating influence of traffic from the motorway on ambient air quality.

The results indicate that the cumulative impact of the proposed development with existing activities will not exceed the air quality standard. The results therefore indicate that the emissions from the LEL Flexgen Castlelost Project will not exert a significant adverse impact on ecosystems. The maximum values predicted for the representative ecological receptors identified in Section 8.3.1 are even lower than the values quoted in Table 8.17; the actual predictions for the ecological receptors are presented in Appendix 8.4.

8.5.2.2 LEL GIS Castlelost Assessment

There are no significant operational phase emissions associated with the operational phase of the GIS Project. The air quality impacts of this project are considered to be long-term and imperceptible.

8.5.2.3 LEL ESS Castlelost Assessment

There are no significant operational phase emissions associated with the operational phase of the ESS Project. The air quality impacts of this project are considered to be long-term and imperceptible.

8.5.2.4 Operational Traffic Impact Assessment

The operational traffic impacts were considered in the context of projected vehicle movements during the operational phase. The projected traffic volumes are low and lead to an imperceptible change in air quality. The impacts are assessed as long term and imperceptible.

8.5.3 CLIMATE IMPACT

8.5.3.1 Construction Phase Climate Impact assessments

The principal greenhouse gas (GHG) emissions associated with construction are carbon dioxide from transport and machinery utilised in construction. The construction phase climate impacts of the Flexgen, ESS and GIS projects are all assessed as short term and imperceptible in either a regional or national context. For the *Do-Nothing* Scenario, if the proposed development does not proceed then the emissions of GHGs in the area are projected to remain the same with some relatively minor increases as activity in the area develops.

8.5.3.2 Operational phase impact assessment

The operation of the development will lead to carbon dioxide emissions. As noted in section 8.3.3, the proposed scheme is part of the Emission Trading Scheme therefore greenhouse gas emissions from the proposed facility are exempt from consideration in terms of the targeted reduction in emissions from the non-ETS sector. Consequently, the proposed facility will not affect Ireland's obligations to meet the EU Effort Sharing Decision in relation to reduction of greenhouse gas emissions.

8.6 MITIGATION MEASURES

A Dust Management Plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions. The principal objective of the Plan is to ensure that dust emissions do not cause significant nuisance at receptors in the vicinity of the site. The most important features of the Dust Management Plan are summarised in Table 8.18 Table of Mitigation Measures.

The design of the construction programme and the location and layout of the construction compound and the storage of materials will be carefully planned to ensure that air quality impacts are minimised. Table 8.18 presents a summary of the main mitigation features of the project and the specific mitigation measures which will be employed in order to minimise emissions from the activity and the associated impacts of such emissions.

Table 8.18 Table of Mitigation Measures

Character of potential impact	Mitigation measure
Construction Phase	
Dust	A designated Site Agent will be assigned overall responsibility for Dust Management;
Dust	Implementation of the Construction and Environmental Management Plan.
Dust	The design of the site and Construction programme considers dust impact management and chooses design approaches to minimise dust emissions;
Dust and general air quality	An effective training programme for site personnel will be implemented for the duration of the Construction Programme;
Dust and general air quality	A strategy for ensuring effective communication with the local community will be developed and implemented;
Dust	A programme of dust minimisation and control measures will be implemented and regularly reviewed;
Dust	A monitoring programme will be implemented.

Character of potential impact	Mitigation measure
Dust	Activities with potential for significant emissions will wherever possible be located at a position as far as possible removed from the nearest residential and commercial receptors;
Dust	The areas on site which vehicles will be travelling on will generally be hard-surfaced or compressed ground thus significantly reducing the potential for dust emissions from the vehicles;
Dust	The construction compound area will have hard standing areas to minimize dust generation from windblow.
Dust	In order to minimise the potential for wind-generated emissions from material storage bays, these bays will be oriented away from the dominant wind direction to minimise the effects of wind on release of dust and particulate.
Dust	Fixed and mobile water sprays will be used to control dust emissions from material stockpiles and road and yard surfaces as necessary in dry and/or windy weather.
Dust	A daily inspection programme will be formulated and implemented in order to ensure that dust control measures are inspected to verify effective operation and management.
Dust	A dust deposition monitoring programme will be implemented at the site boundaries for the duration of the construction phase in order to verify the continued compliance with relevant standards and limits.
Aspergillus Risks	The National Guidelines will be followed with regard to the effective management of Aspergillus risks.

8.7 CUMULATIVE EFFECTS

The cumulative impacts of the proposed development in conjunction with current and future developments in the vicinity of the subject site are considered in this report. The cumulative impacts of the LEL Flexgen Castlelost, LEL ESS Castlelost and LEL GIS Castlelost projects have been considered in this assessment with various overlapping activities considered in the assessment. The connection to the gas pipeline will be managed and undertaken by Gas Networks Ireland and is not discussed in detail here. The nature of that work is such that the works in the immediate vicinity of the site would be temporary and very short term and the additional construction phase impacts are assessed as short-term and imperceptible in the overall site context.

8.8 DO NOTHING SCENARIO

There will be no significant change in air quality impacts if the proposed development does not proceed.

8.9 HUMAN HEALTH IMPACTS

Air Quality Standards (AQS) are set to protect vulnerable people, such as those with respiratory illnesses, the old and infirm. Hence, the human health impact assessment has relied on compliance with the AQS to determine whether significant impacts will arise on human health or not.

The air quality impact assessment notes that dust and particulate matter are the primary sources of construction related impacts for all of the Proposed Project elements. A short-term Slight adverse impact is predicted for the closest receptors during the Construction Phase with potential short-term impacts from traffic on the surrounding roads within approximately 50m of the proposed Project site. There will be no lasting impact, and the short-term impact will be managed by means of an effective Construction Environmental Management Plan (CEMP) incorporating the mitigation measures outlined in Section 8.7 of this EIAR. The CEMP will include a specific Dust Minimisation Plan which will ensure that dust impacts are prevented or minimised during the Construction Phase of the Proposed Project. The CEMP will be prepared by the appointed contractor.

The predicted impact on air quality is short term and not significant hence the potential human health impact during construction is imperceptible.

There will be no significant emissions to atmosphere during the Operation Phase and the impact has been assessed as imperceptible. Therefore, the potential human health impact during Operation is imperceptible.

8.10 RESIDUAL IMPACTS OF THE DEVELOPMENT

During the construction phase of the proposed development there will be some dust impacts experienced at the nearest receptors to the subject site. It is predicted that the mitigation measures proposed will ensure that the air quality impacts are kept to a minimum. The predicted air quality impacts on the receiving environment during the construction phase are considered to be not significant and short-term and may affect a small number of properties.

The only predicted air quality impacts associated with operation of the development are emissions to atmosphere from the turbines and traffic associated with the development.

The change in traffic movements and the emissions will have a slight negative impact on air quality. The predicted air quality and climate impacts on the receiving environment during the operational phase are considered to be imperceptible and long-term.

Due to the size and nature of the development and the nature and volume of the potential emissions, the construction phase activities will have a not significant impact on climate and will be short-term in duration while the operational phase activities will have an imperceptible impact on climate and will be long-term in duration.

8.11 INTERACTIONS

The main interactions with air quality are in relation to human beings and flora and fauna. The impact of air quality on human beings living in the area of the proposed development has been addressed above for both the construction and operational phase of the proposed development. The impact assessment shows that the air quality impacts that will be experienced by human beings in the vicinity of the proposed development are all within the prescribed criteria. This interaction is described as negative for the construction phase and neutral for the operational phase and is quantified as Not Significant for both phases.

In relation to the interaction of emissions to atmosphere from the proposed development with flora and fauna, Table 8.3 sets out Air Quality Standards for the protection of vegetation and ecosystems. This assessment has shown that the emissions generated from the development are very limited and do not have potential to generate a significant adverse impact on the local ecosystems including birdlife and wildlife. Air Quality in the area is good as shown in Section 8.5 and the Air Quality Standards will not be exceeded as a result of the development thereby ensuring that no significant adverse impact on ecosystems arises. This interaction is described as neutral and quantified as Not Significant.

8.12 MONITORING AND FURTHER WORKS

In order to mitigate against air quality effects at receptors during the Construction Phase, Best Practice Measures will be adopted. These measures will include techniques such as those outlined in the IAQM's (2014a) *Guidance on the Assessment of Dust from Demolition and Construction*.

The Contractor will be required to produce an Air Quality and Dust Management Plan including Best Practice Measures to control dust and, in particular, measures to prevent dust nuisance. The principal objective of the Air Quality and Dust Management Plan will be to ensure that dust emissions do not cause significant nuisance at receptors near the

Proposed Project. The Air Quality and Dust Management Plan will include a daily inspection programme which will be formulated and implemented in order to ensure that dust control measures are being operated and managed effectively. A dust deposition monitoring programme will be implemented during the Construction Phase in order to verify the continued compliance with relevant standards and limits.

8.13 ACCIDENTS OR UNPLANNED EVENTS

There are no accidents or unplanned events as a result of the proposed project that could occur that will have an adverse or significant impact on air quality or climate that have not already been considered in this chapter.

8.14 REFERENCES

- Environmental Protection Agency (2017). Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- Environmental Protection Agency. Air Quality in Ireland 2016, 2007 and 2018: Indicators of Air Quality.
- Health Protection Surveillance Centre (2018). National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities.
- Institute of Air Quality Management (2014). Guidance on the Assessment of Dust from Demolition and Construction.
- Institute of Air Quality Management (2014). Guidance on the Assessment of Odour for Planning.
- Institute of Air Quality Management (2017). Land-Use Planning and Development Control: Planning for Air Quality.
- European Union (1996). Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management [1996].
- European Union (2004). Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air [2004].
- European Union (2008). Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe [2008].
- Climate Action and Low Carbon Development Act 2015
- Air Quality Standards Regulations 2011 – S.I. No. 180 of 2011
- Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 – S.I. No. 58 of 2009

9 MATERIAL ASSETS

9.1 INTRODUCTION

This Section evaluates the impacts, if any, which the development will have on material assets. In the EPA draft advice notes on current practice in the preparation of Environmental Impact Assessments, 2017, material assets are defined as "built services and infrastructure". This includes roads and traffic, electricity, telecommunications, gas, water supply infrastructure and sewerage (built infrastructure).

Material assets of *natural origin* and the existing quality of natural resources such as air, water, soils, landscape, lands and soil, etc., are discussed in depth in earlier Chapters of the EIAR along with those of human origin such as traffic and transport infrastructure, land and soils, archaeological /architectural heritage and flood protection.

Material assets of natural and human origin which are included in this assessment are the following

- Ownership and access
- Land Use
- Services
- Demolition works

The objective of the assessment is to ensure that these assets are used in a sustainable manner, so that they will be available for future generations, after the development of the project.

9.2 DESCRIPTION OF THE PROJECTS

The following provides a summary of understanding of the development proposals on the c. 21.3-hectare site at Kiltotan & Collinstown and Oldtown, Rochfortbridge, Co. Westmeath. A detailed description of the projects is provided in Chapter 2.

- <u>LEL Flexgen Castlelost</u>**:** Proposed gas-fired reserve generator of 275MW electrical capacity. The project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system. The proposal includes the installation of five (5no.) dry low emission (DLE) gas turbines, associated stack(s), raw water/fire water tank, fire water retention basin, back-up fuel tank, emergency generator, gas receiving station (AGI), low, medium and high voltage transformers, customer control room, and all ancillary electrical plant and delivery systems. GNI will separately manage the process of managing and delivering the underground natural gas pipeline to the proposed site.

- LEL GIS Castlelost Project**:** Proposed 220kV Gas Insulated Switchgear (GIS) Electrical Substation. The project will involve installation of two (2 no.) 220 kV underground circuits forming a connection to the existing Shannonbridge-Maynooth 220 kV overhead line (located within the development boundary) and two (2no.) 220 kV underground circuits and associated low voltage and communication underground cabling connecting the proposed substation with electricity transformers on the adjacent reserve gas-fired generator (Project 1) and ESS (Project 3) sites, and all associated and ancillary site development works. The GIS substation itself includes a two storey, 17m high building (housing electrical switchgear, a battery room, a workshop room, and WC), transformer bay(s), access roadway and all ancillary site development works.
- LEL ESS Castlelost Project**:** Proposed Energy Storage System (ESS) using vanadium flow battery (VFB) technology and synchronous condenser. The battery energy storage system (BESS) will comprise a cluster of battery modules positioned within a dedicated BESS outdoor compound. Each module will consist of (i) a battery container (6.1m long container) housing pumps and heat exchangers positioned on top of two (ii) tank (electrolyte) enclosures (12.2m long containers). An associated battery management system (BMS) and medium voltage power station (MVPS) enclosure will also form part of the battery module. The BMS will monitor and control electrolyte circulation and the MVPS is provided to condition the power generated. The synchronous condenser comprises a rotating generator positioned within a building. The generator is connected to the transmission system via a step-up transformer. When the generator has reached an operating speed that is synchronous to the system frequency, it is synchronised with the transmission network and acts as a motor providing reactive and short circuit power to the electricity network. A customer (IPP) building will also be installed within the ESS compound, and it will house electrical switchgear, store, control room, welfare facilities and administration facilities.

9.3 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

9.3.1 DESKTOP STUDY

A desk study of the proposed development area and the surrounding study area was completed in advance of undertaking the walkover survey. This involved consultation with publicly available environmental and planning datasets:

- Environmental Protection Agency database https://gis.epa.ie/EPAMaps/;
- Geological Survey of Ireland database (www.dcenr.maps.arcgis.com);
- Ordnance Survey Ireland https://store.osi.ie/ http://map.geohive.ie/mapviewer.html;
- Catchments website (https://www.catchments.ie/maps/);
- Westmeath County Council Planning database (http://www.westmeathcoco.ie/en/ourservices/planning/planningapplications/viewaplanningapplication/)
- Property Registration Authority (PRA) land registry services (https://www.landdirect.ie/)

9.3.2 FIELD WORK

A walkover survey of the Proposed Development Site was undertaken by Halston on the 16th June 2021 and again on the 22nd July 2021 to verify the findings of the desk study and to obtain an understanding of the local site and wider area.

9.4 DESCRIPTION OF RECEIVING ENVIRONMENT

The proposed development lands is a c. 21.3-hectare greenfield site located at Kiltotan & Collinstown and Oldtown, Rochfortbridge, Co. Westmeath. The site is currently used for agricultural purposes. The southern boundary of the site is defined by the existence of the M6 which connects Dublin and Galway. The development lands are currently accessed via the R446 and the L51251. The 220kV Shannonbridge-Maynooth overhead transmission line transects the southern area of the development lands. Development of the proposed projects will not involve the installation of new infrastructure for the extraction of natural resources. A detailed description of receiving environment is provided in Chapter 2 of the EIAR.

9.4.1 OWNERSHIP AND ACCESS

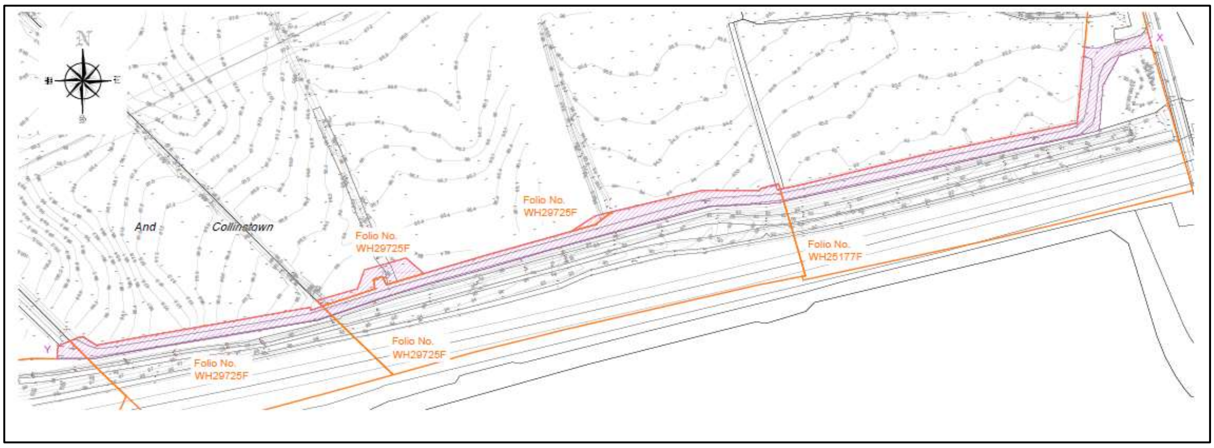
Lumcloon Energy Limited is applying for full planning permission for three separate energy related projects (LEL Flexgen Castlelost, LEL ESS Castlelost and LEL GIS Castlelost Projects). There will be no severance of land as a result of the proposed development or loss of rights of ways or amenities. Relevant landowner consents letters associated with the proposal are provided in Appendix 1.1.

The proposed development lands are currently accessed via a private land serving the (existing landowner's residence) from the R446 and the L51251 local road which routes from the R446 to the south-eastern area of the development lands. It is proposed to construct a new primary access to the development lands and associated projects.

Figure 14.1 Site Location showing Proposed Development Lands (purple boundary)

The vast majority of the proposed development lands are privately owned. A narrow east-west aligned parcel of land containing a "farmer's lane" runs west from the L51251 along part of the southern boundary of the development lands. Ownership of the farmers lane is vested in Westmeath County Council under two folio numbers.

Figure 14.3 Farmers Lane along the southern boundary



9.4.2 LANDUSE

The proposed Projects are being developed on lands which are currently in agricultural use (mainly grazing of cattle and horses with some fields within the development area being used for tillage). Siting and selection of the development proposals was undertaken following consideration of alternative sites (refer to Chapter 2). The development proposals conform with overriding policy and best practice in relation to the siting of such infrastructure. Selection of the preferred site was informed by various criteria including the location of the existing electricity transmission infrastructure and the natural gas transmission pipeline.

9.4.3 SERVICES

9.4.3.1 Water and Wastewater

There are readily available municipally owned infrastructure serving the proposed development lands – water supply pipe or sewer network. The existing on farm residence and farm activity is served by a groundwater well on site. Similarly foul wastewater from the existing residence is management and treatment by an on-site wastewater treatment system.

The existing groundwater well will be used to serve the water requirements of the development proposals which are very low. The existing residence on the farm will be served by a second existing well within the landowner's boundary. Foul wastewater which will be generated from the projects will be managed and treated using an onsite proprietary package wastewater treatment plant (domestic wastewater treatment system with a population equivalent ≤ 10). Due to the nature, type of projects and future occupancy levels during operation, the volume of foul wastewater which will be generated is low.

In accordance with best practice, stormwater arising from development of impermeable surfaces (e.g., roof of buildings, roadways) stormwater will be collected and infiltrated to ground. Storm water generated from oil risk areas (e.g., certain impermeable areas within the LEL Flexgen Castlelost Project such as the secondary fuel storage bund) will pass through a Class 1 bypass petrol interceptor and grit trap prior to discharge to ground.

Minimal process wastewater will be generated during the operational phase. Any process wastewater (e.g., that from the demineralisation plant) will be collected and disposed of at a suitably waste authorised facility.

9.4.3.2 Electricity

The 220kV Shannonbridge-Maynooth overhead transmission line transects the southern area of the development lands. The proposed LEL Flexgen Castlelost and LEL ESS Castlelost projects will connect the electricity transmission system via a proposed 220kV Gas Insulated Switchgear (GIS) electrical substation (referred to as the LEL GIS Project), which will be located within the development lands boundary and adjacent to the standalone LEL Flexgen Castlelost and LEL ESS Castlelost projects.

9.4.4 DEMOLITION WORKS

The development proposals will involve demolition and removal of a farm shed, farm workshop, feed silo and a silage clamp. The onsite farm outbuilding, farm sheds, feed silo and silage clamp will be demolished and removed from site in accordance with best practice. Works will involve careful decommission and removal of all farm structures at the site. Anticipated wastes which will be generated include soils, bricks and blocks; concrete and reinforced concrete; timber; metal sheeting and steel. Materials arising from this process will be recycled /disposed of at authorised waste management facilities. Further information on waste management is detailed in Chapter 2 of this EIAR.

9.4.5 SETTLEMENTS

Impacts and mitigation measures associated with population are detailed in Section 4 (Population and Human Health) as outlined previously.

9.5 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

9.5.1 LEL FLEXGEN CASTLELOST ASSESSMENT

Development of the project will result in change of use of lands from agricultural to industrial use. Soils excavated as part of development works will be used within the overall development boundary to create landscaped berms in the northern and north-western areas of the site. The planted berm will be constructed to enhance the terrestrial ecosystem. Stormwater arising from newly constructed impermeable area will be dealt with using percolation infiltrations areas designed to manage and discharge stormwater to ground during the operational stage.

It is proposed to locate the proposed project on lands under the ownership of one landowner (currently under private ownership). It is also proposed to develop a secondary access to the operational stage of the project from the L51251 and along the farmer's lane which runs parallel to the motorway. Whilst ownership is vested in Westmeath County Council, the existing gravel surfaced farmers lane is currently used to access the lands by the existing landowner and landowner to the east of the proposed development lands. The development will not impact access rights associated with the farmers laneway. Ownership of the proposed AGI compound once developed will transfer to GNI (as a transmission asset). GNI will access the AGI via the proposed primary access to the development lands.

There are no direct or indirect negative effects on material assets. The LEL Flexgen Castlelost Project will positively benefit the electricity transmission system by providing a low carbon secure and resilient supply of energy which is critical to a well-functioning economy. The Project will also support and promote sustainable improvement and expansion of the electricity transmission and distribution network and gas transmission network.

9.5.2 LEL ESS CASTLELOST ASSESSMENT

Development of the project will result in change of use of lands from agricultural to industrial use. Soils excavated as part of development works will be used within the overall development boundary to create landscaped berms in the northern and north-western areas of the site. The planted berm will be constructed to enhance the terrestrial ecosystem. Stormwater arising from newly constructed impermeable area will be dealt with using percolation infiltrations areas designed to manage and discharge stormwater to ground during the operational stage.

It is proposed to locate the proposed project on lands under the ownership of one landowner (currently under private ownership). It is also proposed to develop a secondary access to the operational stage of the project from the L51251 and along the farmer's lane which runs parallel to the motorway. Whilst ownership is vested in Westmeath County Council, the existing gravel surfaced farmers lane is currently used to access the lands by the existing landowner and landowner to the east of the proposed development lands. The development will not impact access rights associated with the farmers laneway.

There are no direct or indirect negative effects on material assets. The LEL ESS Castlelost Project will positively benefit the electricity transmission system by providing a carbon free secure and resilient supply of energy which is critical to a well-functioning economy. The Project will also support and promote sustainable improvement and expansion of the electricity transmission and distribution network.

9.5.3 LEL GIS CASTLELOST ASSESSMENT

Development of the project will result in change of use of lands from agricultural to industrial use. Soils excavated as part of development works will be used within the overall development boundary to create landscaped berms in the northern and north-western areas of the site. The planted berm will be constructed to enhance the terrestrial ecosystem. Stormwater arising from newly constructed impermeable area will be dealt with using percolation infiltrations areas designed to manage and discharge stormwater to ground during the operational stage.

It is proposed to locate the proposed project on lands under the ownership of one landowner (currently under private ownership). It is also proposed to develop a secondary access to the operational stage of the project from the L51251 and along the farmer's lane which runs parallel to the motorway. Whilst ownership is vested in Westmeath County Council, the existing gravel surfaced farmers lane is currently used to access the lands by the existing landowner and landowner to the east of the proposed development lands. The development will not impact access rights associated with the farmer's laneway. Once developed, ownership of the proposed LEL GIS Castlelost Project will transfer to ESB Networks (ESBN) (as transmission asset owner (TAO)). The GIS will form a new node on the electricity system and will be operated by Eirgrid (as transmission system operator (TSO)). It is proposed that ESBN and Eirgrid will access the asset via the proposed primary access roadway to the development lands. Secondary access is also provided from the L51251.

There are no direct or indirect negative effects on material assets. The LEL Flexgen Castlelost Project will positively benefit the electricity transmission system by assisting with identified network reinforcement requirements in the Midlands of Ireland. Construction of the proposed GIS electrical substation at Castlelost accords with policy objectives CPO 10.169, CPO 10.173 and CPO 10.174 of the Westmeath CDP 2021-2027 (which deal with electricity infrastructure) and will simplify and minimise potential effects associated with connection of the LEL Flexgen Castlelost and LEL ESS Castlelost projects to the electricity transmission system. In terms of potential environmental effect once operational, the impact on the environment will be long-term, neutral and imperceptible.

9.6 MITIGATION MEASURES

Construction of the proposed projects will require connections to infrastructure and services but will not require any connections outside the proposed development land boundary.

9.7 RESIDUAL IMPACTS OF THE DEVELOPMENT

Development of the three projects at Castlelost will result in temporary short-term effects on material assets examined in this chapter during construction and no negative impact on the material assets once operational. The overall predicted residual environmental impact is neutral, slight, long-term

9.8 CUMULATIVE EFFECTS

The LEL Flexgen Castlelost project will also require construction of an underground natural gas pipeline from the existing gas transmission system to the north. Construction of the underground pipeline will be undertaken by GNI (non-contestable work). The potential impacts during construction are short term, negative and not significant. The operational phase of the underground pipeline project is long-term neutral and imperceptible impact.

Overall, the cumulative effect of development of the three projects at Castlelost is a positive, significant, long-term synergistic effect on material assets.

9.9 SUMMARY OF SIGNIFICANT EFFECTS

There are no predicted significant adverse impacts arising from the proposed development of the LEL Flexgen Castlelost, LEL ESS Castlelost and LEL GIS Castlelost Projects on material assets. The potential effects of the three projects at Castlelost are deemed to be positive, significant, long-term, and synergistic.

10 NOISE AND VIBRATION

10.1 INTRODUCTION

This chapter identifies and assesses the potential noise and vibration impacts and related effects arising from both the construction and long-term operational phases of the three proposed separate energy developments at Castlelost, Co. Westmeath.

Key issues to be addressed in this chapter include identification and assessment of potential temporary/short-term construction noise and vibration impacts arising from the construction and site development phases and potential long-term noise impact and effects at nearby Noise Sensitive Receptors (NSRs) arising from the operational phase of each of the three proposed separate developments. The cumulative impacts and effects have also been assessed for both phases.

10.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

10.2.1 CHARACTERISATION OF THE RECEVING ENVIRONMENT

The receiving sound environment or existing soundscape has been characterised by field survey and desk-based study.

A site reconnaissance visit was completed on 8th July 2021 by Redkite Environmental Ltd. to inform the overall noise monitoring programme. The programme was designed to establish ambient sound levels at the nearest Noise Sensitive Receptors (NSRs) to the overall main Development Site and to the proposed options for the gas supply line installation.

Halston Environmental and Planning Ltd. personnel completed the environmental noise surveys based on the sampling plan provided. Noise surveys were completed on various dates from 5th – 29th July 2021.

Both short-term attended and longer-term unattended monitoring was conducted in the vicinity of the overall Development Site, proposed pipeline options and the nearest NSRs.

The measurement methodology followed was in accordance with the recommendations of the following:

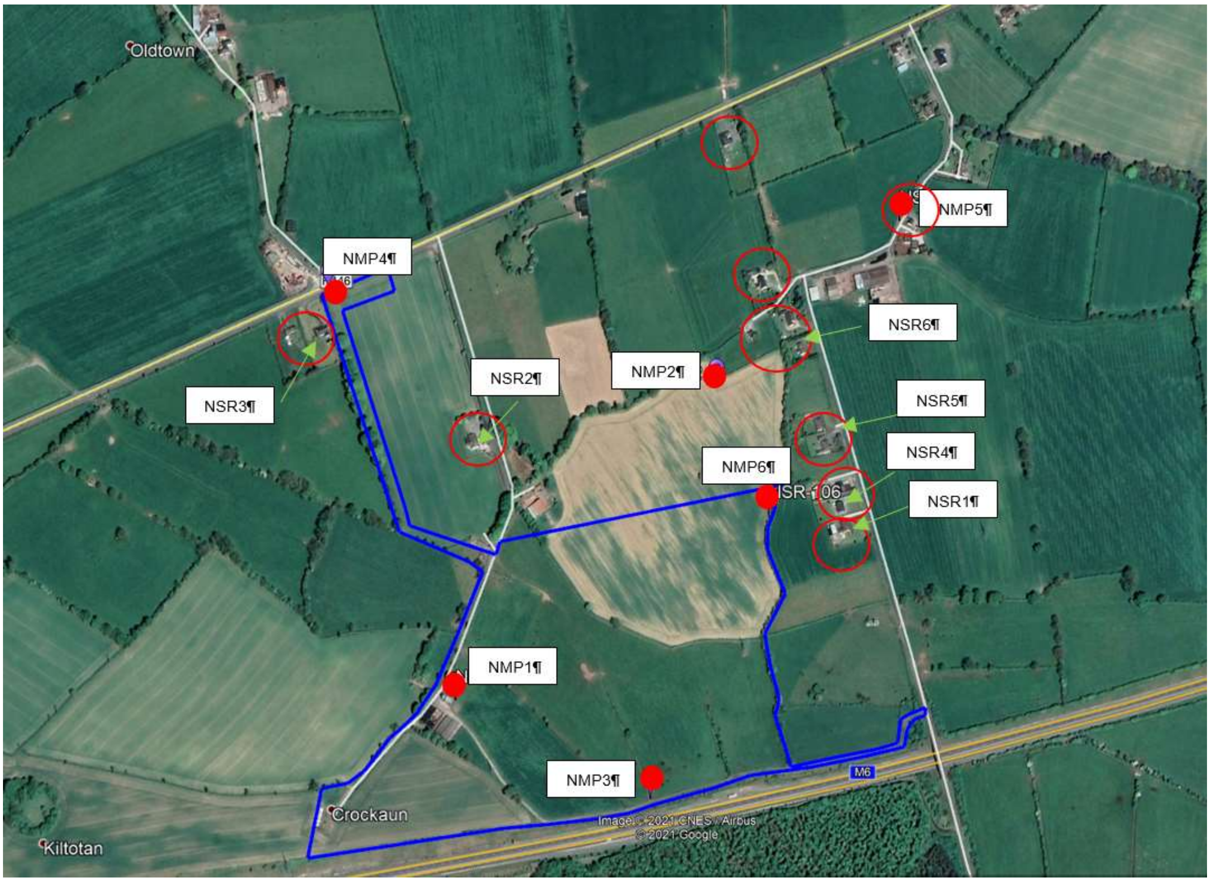
- International Standards Organisation Document: ISO 1996 Acoustics – Description, Measurement and Assessment of Environmental Noise, Part 1, Basic Quantities and

Assessment Procedures (2016) and Part 2 Determination of Environmental Noise Levels (2017), and,

- The EPA Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities, (NG4), revised January 2016.

Ambient noise monitoring was undertaken at the Noise Monitoring Points (NMP) as illustrated in Figures 10.1, 10.2 and 10.3 below and as described in Table 10.1.

Figure 10.1 Noise Monitoring Points (NMP 1- 6)



Source: Google Maps; Nearest NSRs circled in red. Site boundary in blue (approximate).

Unattended monitoring was conducted at the following NMPs and for the following durations:

- 7- day period at NMP1 from 19.34 hrs on the 5th, July 2021 to 13.15 hrs on the 12th, July 2021, and,
- 24-hour period at NMP2 from 13.49 hrs on the 13th, July 2021 to 14.00hrs on the 14th, July 2021.

Short term attended measurements were conducted at NMPs 3 – 6 on the 22nd – 23rd July 2021.

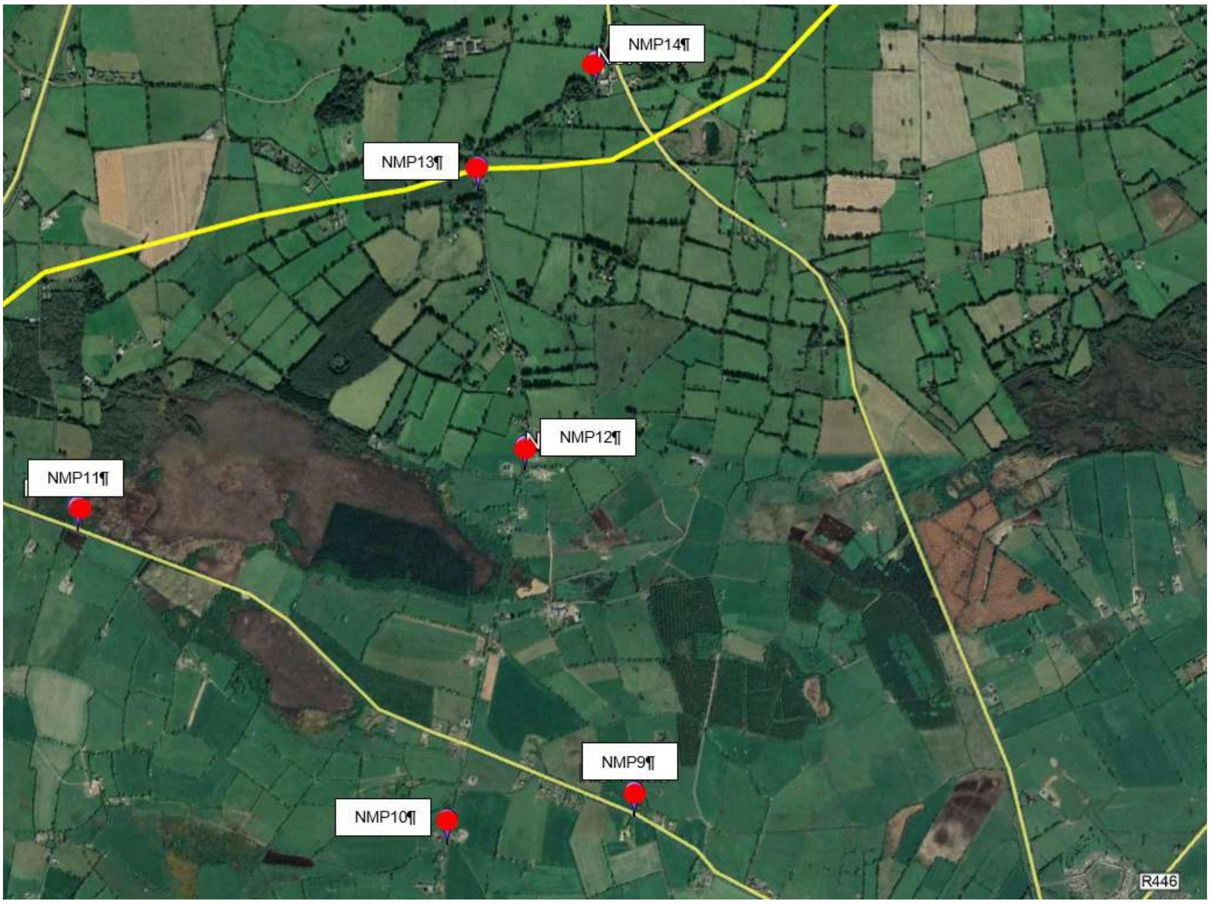
A minimum of 3no. 15-minute repeat measurements were completed at each attended measurement point.

Figure 10.2 Noise Monitoring Points (NMP 2 – 10, excluding NMP3 [Figure 10.1)

Short term attended measurements were conducted at NMPs 7 – 10 on the 27th – 28th July 2021.

A minimum of three x 15-minute repeat measurements were completed at each attended measurement point.

Figure 10.3 Noise Monitoring Points (NMP 9 – 14)



Source: Google Maps

Short term attended measurements were conducted at NMPs 11 – 14 on the 28th - 29th, July 2021.

A minimum of three x 15-minute repeat measurements were completed at each attended measurement point.

Table 10.1 Noise Monitoring Points

Location	Grid Ref.	Description
Un-Attended Long-term		
NMP1	244914E, 238895N	Farm-yard location on western Development Site boundary.
NMP2	245280E, 239332N	Agricultural field location, 184m north of site boundary and approx. 66m from boundary of residential property to north.
Attended Short-term		
NMP3	245189E, 238757N	Southern site boundary. Approx. 32m from centreline of M6 motorway.
NMP4	244733E, 239453N	On R446 roadside at proposed Development entrance.
NMP5	245528E, 239564N	On existing country road access to east of proposed Development Site, approx. 400m northeast of site boundary.
NMP6	245354E, 239151N	Eastern site boundary, approx. 59m west from the boundary of the nearest NSR.
NMP7	245440E, 240875N	Castlelost Road, roadside location close to residential NSR. In vicinity of proposed gas line excavation.
NMP8	243962E, 24042N	Castlelost Road, roadside location close to residential NSR. In vicinity of proposed gas line excavation.
NMP9	244824E, 241458N	L1127, roadside location close to residential NSR. In vicinity of proposed gas line excavation.
NMP10	244056E, 241333N	Castlelost West, country roadside location close to residential NSR. In vicinity of proposed gas line excavation.
NMP11	242501E, 242616N	Carrick, L1127 roadside location close to residential NSR. In vicinity of proposed gas line excavation.
NMP12	244367E, 242878N	Baughna, roadside location close to residential NSR. In vicinity of proposed gas line excavation.
NMP13	244164E, 244031N	Carrick, roadside location close to residential NSR. In vicinity of proposed gas line excavation.
NMP14	244644E, 244495N	Carrick, roadside location close to residential NSR. In vicinity of proposed gas line excavation. Approx. 5km north of proposed Development Site. 85m from R400 to east.

Ambient monitoring was conducted during the day, evening and night - time periods at unattended locations, NMP1 and NMP2.

Attended measurements, conducted at NMP3 – 14 were completed during daytime hours only as this monitoring was mainly conducted to inform the short-term construction noise impact assessment.

The parameters measured at both attended and unattended locations included L_{Aeq}, L_{A90}, L_{A10}, L_{Amax} and L_{Amin}. The unattended meter was set to record in continuous 15-minute intervals.

Survey personnel noted all primary noise sources contributing to the ambient sound environment during the set-up and collection of the meter at unattended locations and during attended measurements.

Overall weather conditions prevailing during the surveys were suitable for noise monitoring. Some data from unattended monitoring undertaken at NMP1 and 2 was discarded following review and identification of unsuitable weather data from the nearby Met Eireann station at Corcloon, approximately 6.5km northeast of the proposed Development Site.

5th – 12th July 2021

Temperatures ranged from 11.3 – 19.5°C and windspeeds ranged from 0 - 5.4m/sec (average <1 m/sec) during the period of unattended monitoring at NSR101 from 5th - 12th July 2021. Lowest temperatures occurred during the night-time. Rainfall occurred on the 5th of July 2021 from 20.15–20.45, intermittently during the day and evening on 6th July 2021 and intermittently on 11th July 2021 from 11.45 – 17.00hrs. Data from the periods of rainfall have been discarded.

13th – 14th July 2021

Temperatures ranged from 12.2 – 19.8°C and windspeeds ranged from 0 – 3.5m/sec (average <1 m/sec) during the period of unattended monitoring at NSR102 from 13th - 14th July 2021. Lowest temperatures occurred during the night-time. No rainfall occurred.

Equipment

Sound measurement was carried out using a Type 1 Sound Level Meter and associated hardware (calibrator, tripod, outdoor kit etc) and software. The meter was placed in open areas >3.5m from reflecting surfaces and a minimum of 1.2m above ground level at all locations. The meter was calibrated before and after use at each location. The observed drift during measurement was within acceptable limits. The sound levels were measured using the A-weighted network, and a fast-sampling interval. Sample intervals for attended measurements were 15 minutes. Further details of the monitoring equipment used are set out in Table 10.2 below.

Table 10.2 Monitoring Equipment

Instrument Type	Manufacturer	Model Numbers	Serial Numbers
Sound Level Meter	Cirrus	CR171C	G301705
Acoustic Calibrator	Bruel & Kjaer	4231	1795641

The meters and calibrators are all externally calibrated by Cirrus Research PLC in accordance with recommended standards. Appendix 10.2 contains copies of the external calibration certificates.

10.2.2 DESK-BASED STUDY

Traffic noise mapping in accordance with the requirements of the Environmental Noise Directive 2002/49/EC and available on the EPA Mapping Website https://gis.epa.ie/EPAMaps/ was reviewed as part of the characterisation of the baseline soundscape.

10.2.3 IMPACT ASSESSMENT

The following guidance and standards have been used in the setting of suitable noise and vibration criteria or assessment of impacts and effects on human beings:

- BS5228-1:2009 +A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites: Part 1: Noise and Part 2: Vibration;
- BS 7385: 1993: Evaluation and Measurement for Vibration in Buildings Part 2: Guide to damage levels from ground borne vibration;
- BS6472-1:2008: Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting;
- Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, March 2014; and
- BS4142:2014+A1:2019: Methods for Rating and Assessing Industrial and Commercial Sound.

The predicted source specific noise levels at the nearest NSRs arising from the long-term operational phases for each of the proposed developments and cumulatively were calculated in accordance with ISO 9613-2-1996 - Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation. DGMR iNoise 2021 software was used to predict free-field noise levels at the façade of the nearest NSRs.

10.2.4 CRITERIA FOR ASSESSMENT OF NOISE IMPACT AND DETERMINATION OF SIGNIFICANCE

The EPA draft document entitled Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2017 contains general guidance on the assessing of environmental effects in terms of quality, significance, duration, magnitude and type. This document has also been considered in defining noise and vibration impacts.

In addition, the following noise related criteria have been used, where appropriate, to assess noise impacts described in this report:

Table 10.3 Criteria for Noise Impact Assessment

Criteria for Extent of Noise	Noise Impact	Magnitude Rating
>10	Severe	Very high
5 to 10	Substantial	High
3 to 5	Moderate	Medium
1 to 3	Slight	Low
<1	Negligible	Very Low

The above table describes the noise impact, i.e., the change in noise levels before and after implementation of a Proposed Development. The table does not however describe whether the change in noise levels is significant. Relying solely on change in noise level is not appropriate because it risks ignoring the context of the noise change. The actual effect on NSRs and hence significance takes account of other relevant factors such as receptor sensitivity, time of day of occurrence, averaging periods, nature of source, frequency spectra, frequency of occurrence and absolute level. The linking of magnitude of impact to likely effects and significance is described in Table 10.4 below. The above assessment procedure is generally in line with recently published methodologies set out in BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound and Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment, 2014.

Table 10.4 Significance of Effects

<table>
<tr><th>Impact Magnitude</th><th>Receptor Perception (adverse)</th><th>Significance</th></tr>
<tr><td>Negligible</td><td>No discernible effect</td><td>Not significant</td></tr>
<tr><td>Slight</td><td>Non-intrusive. Noise impact can be heard but no change in behaviour or perceived change in quality of life.</td><td rowspan="3">Less likely to be significant (greater justification needed, based on impact magnitude and receptor sensitivity to justify a significant effect)

(greater justification needed, based on impact magnitude and receptor sensitivity to justify a non-significant effect)
More likely to be significant</td></tr>
<tr><td>Moderate</td><td>Intrusive. Noise Impact can be heard and causes change in behaviour. Affects the character of the area and there is a perceived change in quality of life.</td></tr>
<tr><td>Substantial</td><td>Disruptive. Causes material change in behaviour and/or attitude. Avoiding certain activities during periods of intrusion. Quality of life diminished due to change in character of the area.</td></tr>
<tr><td>Severe</td><td>Physically harmful (e.g. sleep disturbance, cardio-</td><td>Significant</td></tr>
</table>

Impact Magnitude	Receptor Perception (adverse)	Significance
	vascular and psychological effects)	

10.2.5 DEFINITIONS

The following definitions apply in this chapter:

- LAeq is the A – weighted equivalent continuous sound level – the sound level of a steady sound having the same energy as a fluctuating sound over a specified measurement period.
- LA10 is the A-weighted noise level which is exceeded for 10% of the specified measurement period. This gives an indication of the upper limit of fluctuating noise such as that from road traffic.
- LA90 is the A-weighted noise level exceeded for 90% of the measurement period and is useful in providing an indication of the background noise level experienced over the measurement period.
- LAFmax is the maximum A-weighted noise level measured during a cycle with a fast time weighting.
- LAFmin is the minimum A-weighted noise level measured during a cycle with a fast time weighting.
- LAr,T The Rated Noise Level is equal to the LAeq during a specified time interval (T), plus specified adjustments for tonal character and/or impulsiveness of the sound.
- Lden Day-evening-night level. It is a descriptor of noise level based on energy equivalent noise level (Leq) over a whole day with a penalty of 10 dB(A) for night-time noise (23.00-07.00) and an additional penalty of 5 dB(A) for evening noise (i.e.19.00-23.00).
- Lnight Night equivalent level: Leq. A-weighted, Sound Level, measured overnight 23.00 – 07.00 hours.
- Lw Sound power level is the sound power measured on a decibel scale. Sound power is the sound energy radiated per unit time by a sound source measured in watts. It is an absolute value associated with a sound source.
- Residual sound – ambient sound remaining at an assessment location when the specific sound source (source under assessment) is absent.
- Specific sound source – source under assessment.
- Tonal sounds are defined as sounds which cover a range of only a few Hz which contains a clearly audible tone, i.e., distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being ‘tonal’.

- The "A" suffix denotes sound levels that have been "A-weighted" in order to account for the non-linear nature of human hearing to sounds of different frequencies.
- All sound levels in this report are expressed in terms of decibels (dB) relative to 2x10-5 Pa.

10.3 DESCRIPTION OF RECEIVING ENVIRONMENT

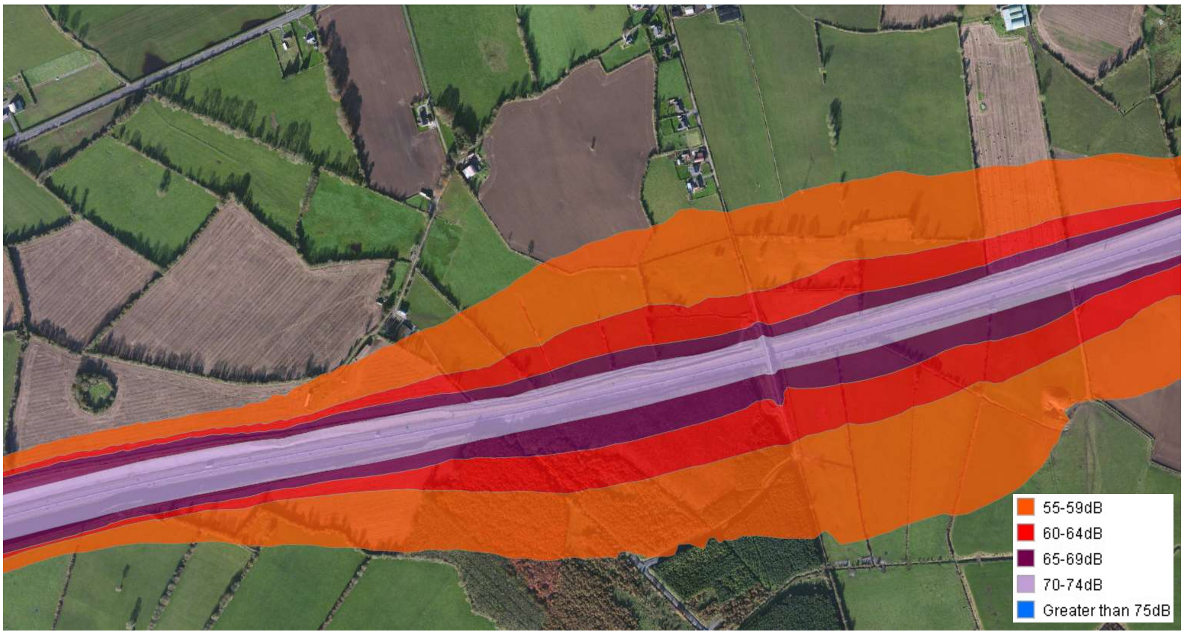
10.3.1 SITE CONTEXT

The overall proposed development site lies off the R446 between the two villages of Rochfortbridge to the east and Tyrrellspass to the west. The site and surrounding lands are in agricultural use with detached residential dwellings located off local roads. The main noise source in the area is the M6 motorway close to the southern site boundary.

Transportation noise mapping is available on the EPA's website https://gis.epa.ie/EPAMaps/.

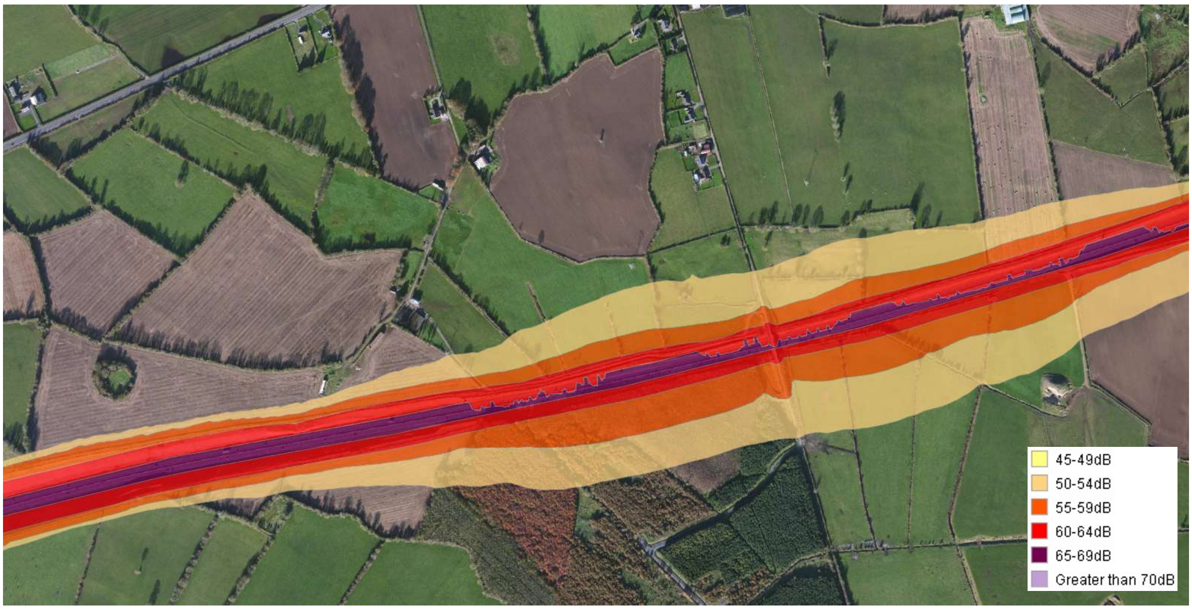
Figures 10.4 and 10.5 re-produce the road noise mapping in the vicinity of the site for the M6.

Figure 10.4 Latest Round 3 Road Noise Mapping L_{den}



Source: https://gis.epa.ie/EPAMaps/

Figure 10.5 Latest Round 3 Road Noise Mapping L_{night}



The R446 and other roads in the area are not heavily trafficked with intermittently frequent passing vehicles. Overall, the site and surrounding lands comprise a typical rural soundscape.

The nearest NSRs to the overall proposed development site are existing detached dwellings some 60m east of monitoring point NMP6 (Refer to Figure 10.1). Additional receptors lie off the proposed main access to the overall proposed development site. The site and the surrounding area rise gently up and away from the M6 motorway. Part of the M6 motorway is in cut close to the overall proposed development site which provides some attenuation of existing road traffic transportation noise to NSRs to the north.

10.3.2 AMBIENT SOUND SURVEY SUMMARY RESULTS

Tables 10.5 and 10.6 below present the summary results for unattended measurements at monitoring points NMP1and NMP2.

Table 10.7 overleaf outlines the summary findings of monitoring at monitoring points NMPs 3 – 14.

More comprehensive logged field data for each individual 15-minute interval is contained in Appendix 10.3. The data in Appendix 10.3 is provided for each 15-minute interval as $L_{Aeq,15min}$, L_{Amax} and percentiles from L_{n1} – L_{n7}. L_{n3} is $L_{A10,\ 15min}$ while L_{n5} is $L_{A90,15min}$.

Table 10.5 Summary Results NMP1

L_{Aeq}	Range			Description of Ambient Noise Environment
	L_{A10}	L_{A90}[20]	L_{AFmax}	
Daytime (07.00 – 19.00 hrs)				
52	43 - 63	45[1] 35 - 56	48 - 87	Motorway audible in background. Birdsong, farm vehicles and livestock other typical sources affecting values.
Evening time (19.00 – 23.00 hrs)				
49	37 - 57	38[1] 23 - 51	43 - 65	Motorway audible in background. Birdsong other typical sources affecting values.
Night-time (23.00 – 07.00 hrs)				
46	33 - 59	32[1] 20 - 53	39 - 74	Traffic on motorway significantly reducing at night. The lowest $L_{A90,t}$ values generally occur between from 00.30 – 04.00 hrs.

Table 10.6 Summary Results NMP2

L_{Aeq}	Range			Description of Ambient Noise Environment
	L_{A10}	L_{A90}[1]	L_{Amax}	
Daytime (07.00 – 19.00 hrs)				
44	43 - 50	39[1] 34 - 42	55 - 68	Birdsong, farm vehicles and infrequent traffic on the L51251 are typical sources affecting values. Machinery noise (metal cutting or similar) also audible from one of the residences garage fronts onto the L51251.
Evening time (19.00 – 23.00 hrs)				
42	41 - 47	34[1] 31-38	50 - 63	Birdsong, and general activity around houses fronting onto the L51251 are typical sources affecting values
Night-time (23.00 – 07.00 hrs)				
39	38 - 46	28[1] 20 - 39	47 - 64	Faint sound of distant infrequent traffic from surround road network.

The results for NMP2 indicate that some NSRs to the immediate north-east of the overall proposed development site may be in an area of low background noise as defined in Section 4.4.2 of NG4 as follows:

- Average Daytime Background Noise Level ≤ 40dB L_{AF90}, and;
- Average Evening Background Noise Level ≤ 35dB L_{AF90}, and;
- Average Night-time Background Noise Level ≤ 30dB L_{AF90}.

[20] NG4 requires that the average background noise levels for a specific period is calculated as the arithmetic average of the measured L_{AF90} noise levels during the relevant period to determine if an area is defined as low background. The values in Tables 10.5 and 10.6 for L_{A90} are presented as arithmetic means with a range also presented. The L_{Aeq} values are logarithmic averages.

Distance from the M6 is likely to dictate as to whether an individual NSR is within an area of low background noise. NMP1 is closer to the M6 compared to NMP2.

The summary results for short-term attended measurements at other NMPs during the daytime hours are presented in Table 10.7 overleaf.

Table 10.7 Summary Results for NMPs 3 - 14

No.	Range				Description of Ambient Noise Environment
	$L_{Aeq,15min}$	$L_{A10,15min}$	$L_{A90,15min}$	L_{AFmax}	
3	64-69	67-72	59-62	79	Dominated by continuous motorway traffic noise.
4	70-72	69-74	41-42	91	On the R446. L_{Aeq} values dominated by intermittent passing vehicles. Much lower L_{A90} values indicating traffic is not continuous.
5	51-59	51-56	39-44	81	Country access road. L_{Aeq} likely to affected by occasional sounds such as farming activities and some semi-continuous sources such as farm machinery which is likely to explain the range for the L_{A90} values.
6	43-46	45-48	40-42	67	Northern site boundary. L_{A90} likely to be indicative of continuous motorway traffic noise.
7	44-58	35-49	26-27	82	Castlelost Road. Quiet country road. Low background noise levels.
8	37-52	40-41	32-33	79	Castlelost Road. Quiet country road. Low background noise levels.
9	62	52-58	32-36	87	L1127 busier route but low background noise levels as vehicles are infrequent.
10	49-56	47-50	34-41	84	Castlelost west. Quiet country road. Low background noise levels.
11	60-63	48-59	38-47	89	L1127 busier route but low background noise levels as vehicles are infrequent.
12	54-61	50-52	37	89	Lightly trafficked roads. Occasional vehicles.
13	58-61	43-48	34-35	90	Lightly trafficked roads. Occasional vehicles.
14	50-58	49-54	34-35	84	Lightly trafficked roads. Occasional vehicles.

The attended measurements provide a snapshot of daytime ambient sound levels in the general vicinity of the proposed pipeline installation options and extend to a distance of approximately 5km from the site boundary. Overall results of monitoring indicate low background noise levels except in close proximity to the motorway and the R446. L_{Aeq} values are influenced by occasional sources such as individual vehicles in the area. L_{A90}

values may at times be elevated where semi-continuous sources are in operation such as grass cutting etc. but these are not long-term continuous sources.

10.3.3 VIBRATION

No existing sources of vibration were noted during the site visits.

10.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

As noted in Chapter 1 and 2 of the EIAR, three separate projects requiring assessment as follows:

- LEL Flexgen Castlelost Assessment
- LEL ESS Castlelost Assessment
- LEL GIS Castlelost Assessment

Detailed descriptions of the projects is provided in Chapter 2 of the EIAR. This section of the EIAR assess each project separately and then cumulatively for both short-term construction and site development impacts and effects and also long-term operational impacts and effects on human beings in terms of noise and vibration.

10.4.1 SITE DEVELOPMENT & CONSTRUCTION PHASE EFFECTS (SHORT-TERM)

The site development and construction phases for each project can potentially give rise to temporary significant noise and vibration impact and effects at the nearest NSRs through the use of mobile and non-mobile heavy machinery and equipment.

The duration of the overall proposed construction programme 28 months with an envisaged start date of October 2022. As can be seen in the description of construction provided in Chapter 2, there will be overlap of the construction programmes associated with each project.

10.4.1.1 Applicable Noise Criteria

There is no definitive published Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project.

BS5228:2009 + A1:2014: *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise* describes applicable noise level thresholds not to be exceeded at noise sensitive receptors, depending upon existing ambient levels, as described in Table 10.8 overleaf. This table is based upon report E3.2, Table E.1 of BS5228:2009 + A1:2014 Part 1.

Table 10.8 Threshold of Significant Effect at Dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A	Category B	Category C
Night-time (23:00-07:00)	45	50	55
Evening and Weekends	55	60	65
Daytime (07:00-19:00) and Saturday (07:00-13:00)	65	70	75

NOTE 1: A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2: If the ambient noise level exceeds the threshold values given, in the table (i.e., the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3dB due to construction activity.

NOTE 3 Applied to residential receptors only.

A) Cat A: Threshold values to use when ambient noise levels (rounded to nearest 5dB) are less than these values

B) Cat B: Threshold values to use when ambient noise levels (rounded to the nearest 5dB) are the same as Cat A values

C) Cat C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Cat A values

D) 19:00-23:00 weekdays, 13:00-23:00 Saturday and 07:00-23:00 Sunday is deemed 'evening and weekend' period.

Generally, the Category A daytime threshold value can be applied to NSRs in the area based on the ambient sound levels recorded during the daytime baseline survey. Higher $L_{Aeq,t}$ values were recorded at NMP4 however this monitoring location was directly on the R446 roadside. Most dwellings, even with access directly off the R446, are set back from the road. It should be noted that this assessment method is only valid for residential properties. The threshold values apply to the sum of both the ambient and construction noise levels.

In addition to the above, the following acceptable levels are described in the Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, March 2014. These limits are applied during the construction of road infrastructure projects at the facades of NSRs:

Table 10.9 TII Acceptable Levels for Construction

Day	Working Hours	Level dB ($L_{Aeq,1hr}$)	Level dB (L_{Amax})
Mon-Fri	07.00 – 19.00	70	80
Mon-Fri	19.00 – 22.00	60*	65*
Saturday	08.00 – 16.30	65	75
Sundays & Bank Holidays	08.00 – 16.30	60*	65*

Note *: Construction activity at these times, other than emergency works, will normally require specific permission from the local authority.

It is unlikely that there will be a requirement for higher levels specified by the TII.

Overall, the following limits are deemed to be applicable:

- 65 dB $L_{Aeq,1hr}$, Mon-Fri (07.00 – 19.00hrs) and Saturday (07.00 -13.00 hrs) at existing NSRs.

Sunday, public holidays, evening (19.00-23.00hrs) and night-time (23.00 -07.00 hrs) works are not proposed.

10.4.1.2 Applicable Vibration Criteria

Vibration impacts can typically potentially occur during site development and construction phases of development through the use of equipment such as rock breakers or piling. Vibration can affect both human beings and buildings. Accordingly, there are separate criteria for both.

Guidance relevant to the protection of building structures is contained in the following documents:

- British Standard BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration, and;
- British Standard BS 5228: 2009+A1 2014: Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.

Both standards contain similar guidance relating to building damage criteria. The standards note that the risk of cosmetic damage to residential buildings starts at a Peak Particle Velocity (PPV) of 15mm/s at 4Hz rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above for unreinforced or light framed structures. The standard also notes that below 12.5mm/s PPV the risk of damage tends to zero. This is for transient or intermittent vibrations. The criteria should be reduced by half for more sustained or continuous vibration which may occur during activities such as piling.

- Humans are particularly sensitive to vibration stimuli and responses typically occur well below the order of magnitude for building damage. BS5228-2 also provides the following range of vibration values and associated potential effects on humans.

Table 10.10 Vibration Criteria – Human Beings

Vibration Level mm/sec PPV	Effect
0.14	Vibration might just be perceptible in the most sensitive in the most sensitive situations for most vibration frequencies.
0.3	Vibration might just be perceptible in residential environments.
1	A vibration level of this magnitude is likely to cause complaint.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

BS6472:2008 Guide to evaluation of human exposure to vibration in buildings: Part 1: Vibration sources other than blasting also provides guidance in terms of vibration dose value (VDV) where time varying exposure is likely. The daytime dose values relative to the likelihood of adverse comment are presented in Table 10.11 below.

Table 10.11 Applicable Vibration Dose Values

Building Type	Low probability of adverse impact	Adverse comment possible	Adverse comment probable
	VDV (m/sec$^{-1.75}$)		
Residential building - day	0.2 - 0.4	0.4 – 0.8	0.8 – 1.6

10.4.2 PREDICTION OF SITE DEVELOPMENT AND CONSTRUCTION PHASE IMPACTS

10.4.2.1 LEL Flexgen Castlelost Project

Noise

For the purposes of construction noise impact assessment, the proposed access route into the overall proposed development site, the proposed pipeline construction and the proposed landscaping works including a 3m high berm have been considered as part of the LEL Flexgen Castlelost project. It is understood that up to 72,000m^3 of soils and subsoils will be excavated and/or filled.

The short-term site development and construction phase will mainly involve earthmoving/excavation works and the preparation of level surfaces for siting of the gas turbines, transformers, gas receiving station, administration building, liquid fuel tanks and other ancillary equipment such as the fire pump skid and air compressor. The excavation and stockpiling of soils and sub-soils presents the highest risk of noise impact as the loudest machinery such as tracked excavators, lorries and dump trucks will be used during this period.

In addition, the movement of Heavy Goods Vehicles (HGVs) on and off the site via the proposed access route off the R446 can give rise to short term noise impacts.

Piling will not be required.

Prediction of likely noise impact has been completed using data from BS5228:1. However, with regard to prediction of construction noise at NSRs the following factors are relevant:

- The sound power ratings used for each piece of equipment in the assessment, as taken from BS5228, may vary from the actual equipment used on site (Annex C of the Code of Practice outlines various noise levels for each type of equipment);
- It is not possible to outline for definite the exact type of equipment which will be in use, or the duration of time each piece of equipment will be in use, and,
- Noise emissions from construction vary in intensity and character but also in location and over time. Therefore, a conservative estimate has been completed.

The nearest NSRs to the proposed LEL Flexgen Castlelost construction site and access route are circled in red on Figure 10.1 as NSRs 1, 2 and 3. The distance from the proposed project area and access route is estimated as follows:

Table 10.12 Nearest NSRs to Site Development and Construction Works

Location	Approximate Distance (m)
NSR1	400 (built footprint) 105 (proposed berm)
NSR2	365 (built footprint) 137 (proposed berm) 128 (access route)
NSR3	623 (built footprint) 380 (proposed berm) 10 (access route)

Based on the distances alone, it is not likely that the site development works and construction phase within the main built footprint will cause significant adverse impact on the nearest NSRs, 1 and 2, due to the intervening distance. The berm construction and other excavation works on the perimeter are likely to potentially cause the highest noise impact. Table 10.13 below provides an indication of noise levels assuming 3 sets of (1 x excavator and 1 x lorry) are in operation simultaneously on different parts of the berm within distances of 105, 115 and 250m from NSR1.

Table 10.13 Potential Noise Levels Arising from LEL ESS Castlelost Site Development at NSR1

Source	LAeq,t @10m	Predicted LAeq,1hour* (dB)
Site Development		
Tracked Excavator 1	77	@ façade of NSR1 @ 105, 115 and 250m distant from sources **61**
Tracked Excavator 2	80	
Tracked Excavator 3	77	
Lorry 1	80	
Lorry 2	77	
Lorry 3	80	

**Assume excavators are on continuously for 66% of hour and each lorry on for 15 minutes. Conservative* estimate as no attenuation from ground or included. Total includes existing ambient.

Existing ambient sound levels at NSR1 are likely to be represented by NMP1. Therefore, predicted noise levels, as conservatively estimated, are likely to be +9 decibels above existing ambient noise levels at times during the berm construction but lower than the noise threshold values typically applied to site development and construction works due to their short-term nature as presented in Table 10.8. Therefore, in accordance with BS5228, significant effects are not predicted to occur.

The construction of the proposed main access road to the projects from the R446 is within 10m of NSR3. Noise monitoring was not completed directly at NSR3 which is set-back 40m from the R446. Ambient noise levels are estimated as being within 50 -55 dB(A). During construction of the access route, noise levels are likely to be elevated above existing ambient noise levels at NSR3 especially when works take place directly opposite i.e., within 10m. This element of works will be brief to short-term in nature; however, the route will also be used by construction traffic including HGVs delivering materials, etc., over the duration of each project. Therefore, in order to reduce the impact magnitude and potential adverse effects, mitigation in the form of temporary screening is proposed for NSR3 to ensure that, at a minimum, the limits as set out in Table 10.8 are complied with.

10.4.2.2 <u>Gas Pipeline</u>

Three indicative proposed underground gas pipeline routes which will serve the LEL Flexgen Castlelost Project are illustrated and described in Chapter 2 of the EIAR. The potential noise impacts and effects associated with the short-term excavation and installation of a connecting gas pipeline on each of these routes has been considered. In general, it can be stated that the routes are not located in close proximity to a large number of NSRs as they pass through agricultural land however the following is noted:

- The purple route to the west passes closer to more NSRs off quiet country roads compared to the green and orange routes. NSRs are within 50 -100m and, are generally represented by existing ambient noise levels measured at NMP5 - 8.
- The green route is generally located at much greater distances from NSRs except where it traverses the L1127. NSRs on the L1127 are represented by existing ambient noise levels measured at NMPs 9 and 11.
- The orange route is similar to the green route with NSRs on the L1127 located 50 -100m distant from the proposed route.

From a noise perspective, the green and orange routes are marginally preferable due to distance from NSRs however, this may not be the only deciding factor in choosing the preferred route.

As with the main earthworks, the pipeline route excavation will involve the use of an excavator to dig out trenches and refill material once the pipeline is laid. This element of the works is linear in nature therefore works will not be static in one location and will progress relatively quickly. In summary, elevated noise levels above existing ambient noise levels may occur at times however they will be very brief in nature. Additionally, the construction noise limits, as set out in Table 10.8, recognise the brief to temporary nature of construction works and therefore allow for higher permitted levels during this stage of development. Broad - based mitigation measures to minimise the impact of construction noise on the nearest NSRs and to ensure compliance with construction noise limits are set out in Section 10.5.

10.4.2.3 LEL ESS Castlelost Project

Alone, the ESS project is expected to result in a much lower noise impact due to increased distance attenuation. Assuming the same number of sources operating in 3 sets at distances of 200, 350 and 500m from NSR1, the predicted noise level including ambient is $L_{Aeq,1hr}$ 56 dB or +4 decibels above existing ambient levels. The predicted value does not assume that the berm from Project 1 has been constructed and is therefore conservative in nature.

10.4.2.4 LEL GIS Castlelost Project

The LEL GIS Castlelost Project is approximately 330m distant from NSR1. Site development noise levels are not expected to be above existing ambient levels at NSR1 during the development of this site due to the smaller footprint and distance.

Vibration (All Projects)

Based on the intervening distance to NSRs close to all 3 projects, it is unlikely that vibration impacts on human beings or buildings could occur. Additionally piling will not be required.

The access route and potentially the pipeline construction are closer to existing NSRs however it is unlikely that vibration impacts will occur as piling will not be required during the construction of the access route or pipeline installation.

No further assessment of potential short-term construction related vibration impact is deemed necessary.

10.4.3 OPERATIONAL PHASE

10.4.3.1 LEL Flexgen Castlelost Assessment

The following noise source data was provided by the design team for prediction of the noise impact on existing ambient noise levels for the LEL Flexgen Castlelost Project.

Table 10.14 LEL Flexgen Castlelost Noise Source Data

Source	Frequency (Hz)									Total L_{WA}
	31.5	63	125	250	500	1000	2000	4000	8000	
Gas Turbine Stack Emission	84	93	94	87	81	49	72	62	72	97
Cooling Fans (x 2)	58	71	81	89	94	91	89	86	82	98
Step-up Transformers	55	55	70	77	82	79	75	70	61	85
Station Service Transformer	43	43	58	64	70	67	63	58	50	73

The following was also supplied:

- SCR fans – Total L_{WA} – 100 dB

Pumps for the fire-fighting water and the back-up diesel generators were not modelled as these are not likely to be used (emergency use only).

Air compressors will be housed and were therefore not modelled.

The overall sound pressure level from each gas turbine unit with abatement is expected to be 80 dB(A) at 1m.

The following number of sources were modelled:

- 5 No. gas turbine exit stack noise emission points;
- Main body of each turbine modelled as an emitting roof, assuming a frequency profile similar to the exit stacks giving 80 dB(A) at 1m;
- 5 No. cooling fans;
- 3 No. transformers modelled as step-up transformers.
- 2 No. transformers modelled as station service transformers.
- 5 No. SCR fans modelled assuming a frequency profile similar to the cooling fans.

The gas turbines and associated sources are expected to operate over approximately 250 hours annually (10.4 days in total) and will not operate during night-time hours (i.e. they will operate during periods of system demand).

The predicted sound pressure levels for the LEL Flexgen Castlelost Project for NSRs indicated on Figure 10.1, range from 40 - 49 $L_{Aeq,t}$ for all sources running i.e. all 5 turbines and associated sources. Therefore, the predicted sound pressure levels at the nearest NSRs are lower than the standard limits for day and evening applied by the EPA during the day and evening time as follows:

Table 10.15 EPA Recommended Noise Limit Criteria

Scenario	Daytime Noise Criterion, dB $L_{Ar,T}$ (07.00 -19.00 hrs)	Evening time Noise Criterion, dB $L_{Ar,T}$ (19.00 – 23.00 hrs)	Night-time Noise Criterion, dB $L_{Aeq,T}$ 23.00 -07.00hrs)
Areas of Low Background Noise	45	40	35
All other Areas	55	50	45

It is noted that, some NSRs to the north and northeast (represented by NSRs 2 and 6 on Figure 10.1) may be in an area of low background noise based on the monitoring at NMP2. Therefore, it could be expected that the lower limits for day and evening are applicable. However, as the turbines are expected to be operational over a very short duration of 250 hours in total on an annual basis, it is considered that the standard limits should be applied. Furthermore, the exceedance of 45 dB(A) is only predicted to occur at NSRs 1, 2, 4 and 5 as indicated on Figure 10.1. and for all 5 turbines running. In reality all 5 turbines are unlikely to be running. As noted earlier, the gas turbines are not expected to operate during the designated night-time hours.

10.4.3.2 LEL ESS Castlelost Assessment

The following noise source data was provided by the design team for prediction of the noise impact on existing ambient noise levels for the LEL ESS Castlelost Project.

Table 10.16 LEL BESS Noise Source Data

Source	Frequency (Hz)									Total
	31.5	63	125	250	500	1000	2000	4000	8000	L_{WA}
Battery Fan System	-	42	49	58	66	70	72	64	58	75

A total of 264 of these fan systems will be installed. The equipment (principal noise sources) associated with the synchronous condenser will be enclosed.

The BESS fans will operate as needed to cool the units. Therefore, it is unlikely that all fans will be on simultaneously however for the purposes of modelling, all fans on continuously for 24 hours have been assumed.

The predicted sound pressure levels for the LEL ESS Castlelost Project for NSRs as indicated on Figure 10.1, ranges from 20 - 32 $L_{Aeq,t}$. The highest value is at NSR2 which is occupied by the current landowner. The predicted noise levels are well below the limits applied to low background areas. Existing night-time background L_{A90} values ranged from 28 – 32 dB. The lower value represents NSRs 2 and 5. As a worst-case scenario, the operation of all 264 battery fans will increase night-time background levels by 4 decibels at NSR2. In reality this is unlikely to occur as all 264 fans will not be operational concurrently. The impact magnitude is therefore expected to be slight, and the effect will be insignificant. For most other NSRs the impact magnitude is expected to be negligible with no increases above background for the majority.

10.4.3.3 LEL GIS Castlelost Assessment

The equipment associated with this project will be housed internally. Two external transformers have been modelled using the data for the step-up transformers indicated in Table 10.14.

The predicted sound pressure levels for the GIS Project for NSRs indicated on Figure 10.1, ranges from 12 - 23 $L_{Aeq,t}$. The predicted noise levels are well below the limits applied to low background areas and existing background levels.

10.5 MITIGATION MEASURES

10.5.1 SITE DEVELOPMENT AND CONSTRUCTION PHASES

The following specific measures shall be implemented during the works for each project:

- A Site Representative shall be appointed for matters related to noise and vibration.
- Any complaints received shall be thoroughly investigated.
- A written complaints log shall be maintained by the Site Manager. This shall, at a minimum, record complainant's details (where agreed) the date and time of the complaint, details of the complaint including where the effect was observed, corrective and preventative actions taken and any close-out communications. This will ensure that the concerns of local residents who may be affected by site activities are considered during the management of activities at the site.
- Noise monitoring with capability for real-time review both on-site and remotely shall be conducted at nearby NSRs throughout site development and construction. Monitoring shall be conducted at NSRs 1, 2 and 3 at a minimum.
- In the event of exceedance of the limits specified in Section 10.4.1. at NSRs, works shall be ceased and measures implemented immediately to ensure that the limits are complied with.
- The operation of certain pieces of equipment, where substitution etc cannot be carried out shall be managed through monitoring and timing of use to ensure that the threshold values/criteria specified are complied with.
- During the construction phase all equipment shall be required to comply with noise limits set out in EC Directive 2000/14/EC and the 2005/88/EC amendment on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors. The directive covers equipment such as compressors, welding generators, excavators, dozers, loaders and dump trucks.
- Temporary acoustic screening/hoarding shall be erected along the boundary of NSR3 with the construction access route. As a general rule of thumb, it is recommended that temporary screening break the *"line of sight"* from the sources to the windows. The hoarding surface density shall be a minimum 10kg/m^2.

10.5.2 OPERATIONAL PHASES

The standard limits as specified in Table 10.15 for "*all other areas*" as defined in NG4 shall be applied as follows to the LEL Flexgen Castlelost project:

- Daytime (07:00 to 19:00hrs) – 55dB $L_{Ar,T}$; [21]
- Evening (19:00 to 23:00hrs) – 50dB $L_{Ar,T}$;
- Night-time (23:00 to 07:00hrs) – 45dB $L_{Aeq,T}$.

The LEL ESS Castlelost and LEL GIS Castlelost projects shall comply with the lower limits assigned to low background areas as follows:

- Daytime (07:00 to 19:00hrs) – 45dB $L_{Ar,T}$;
- Evening (19:00 to 23:00hrs) – 40dB $L_{Ar,T}$;
- Night-time (23:00 to 07:00hrs) – 35dB $L_{Aeq,T}$.

The following, also stated in NG4, will be complied with:

> *During daytime and evening periods rigorous efforts should be made to avoid clearly audible tones and impulsive noise at all sensitive locations. A penalty of 5dB for tonal and/or impulsive elements is to be applied to the daytime and evening measured LAeq,T values to determine the appropriate **rating level** (LAr,T)*
>
> *During the night-time period no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL.*
>
> *In addition to the foregoing recommended licence limit values, the noise from the licensed facility shall not be so loud, so continuous, so repeated, of such duration or pitch and it should not occur at such times, as to give reasonable grounds for annoyance. In this regard, for contentious cases, an assessment by a competent person will be required.*
>
> *All reasonably practicable measures should be adopted at licensed facilities to minimise the noise impact of the activity, and BAT should be used in the selection and implementation of appropriate noise mitigation measures and controls.*

Specifically with regards to the LEL Flexgen Castlelost project, the following applies:

- The gas turbine packs shall be mitigated to a sound pressure level of 80 dB(A) at 1m;
- The units will not be operated at night-time and will be operational over an anticipated 250 hours annually.

[21] Refer to Section 10.2.5 of this chapter for definitions.

In the long term, and for all projects, regular preventative maintenance will be completed on all equipment to ensure that source noise levels are minimised, and that tonal noise is not subsequently introduced by faulty motors etc.

10.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

As mitigation measures are precautionary and/or already included in the assessment, the residual impacts and effects are as described earlier in Sections 10.5.1 and 10.5.2.

10.7 CUMULATIVE EFFECTS

10.7.1 CONSTRUCTION PHASE

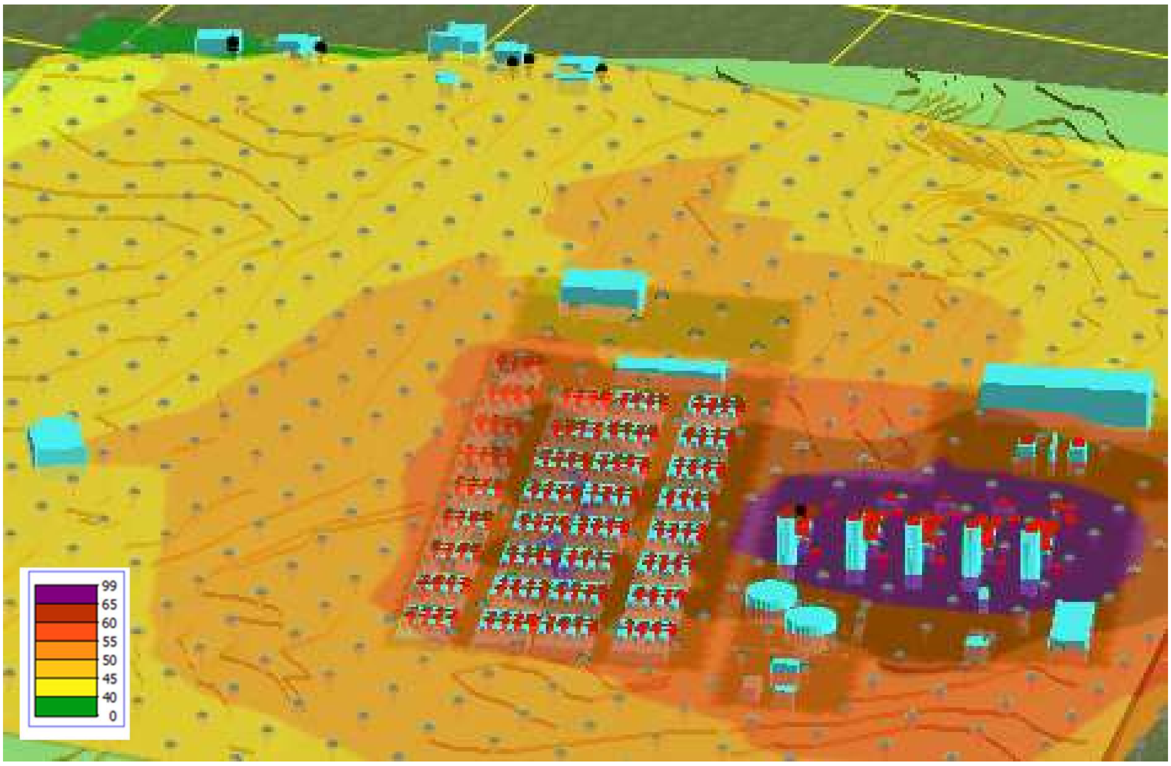
Given that it is envisage that there will be overlap during the construction programmes for the three projects, it would be reasonable to expect that formation of the berms will result in some of the sources being at a greater distance from NSR1 then previously calculated. Therefore, the cumulative impact and effect is expected to be the same as described earlier under LEL Flexgen Castlelost.

The site preparation, earthworks and construction programmes for all three projects are expected to overlap at times. For example, if the berm element of Project 1 and levelling of the site for Project 2 occurred at the same time, the total calculated $L_{Aeq,1hr}$ is expected to be 62 dB or a 1 decibel increase on the predicted noise impact of the berm construction alone which represents the greatest potential for noise impact due to closer proximity to receptors. Therefore, overall, the cumulative impact during the site development and construction is not expected to be significantly different from that the value predicted for Project 1 (LEL Flexgen Castlelost). The limits as specified in Section 10.4.1 shall apply cumulatively.

10.7.2 OPERATIONAL PHASE

The predicted sound pressure levels for all 3 projects operating simultaneously for NSRs indicated on Figure 10.1, ranges from 40 - 49 $L_{Aeq,t}$ i.e. the LEL Flexgen Castlelost project dictates the cumulative impact as illustrated on Figure 10.6. below.

Figure 10.6 3D Visual of Noise Contours



10.8 MONITORING AND FURTHER WORKS

Real-time and continuous construction noise monitoring at locations representative of the closest NSRs shall be conducted throughout all development stages to ensure that the relevant criteria are not exceeded.

A noise survey shall be completed during the commissioning phase for each project to ensure that the proposed limits are not exceeded and that conditions regarding tones and impulsive noise are complied with. Measures shall be implemented in the event that the limits and conditions are not complied with fully.

10.9 REFERENCES

- BS5228:2009 +A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites: Part 1: Noise and Part 2: Vibration.
- BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound.
- BS 7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.
- BS6472-1:2008: Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.
- BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings.

- Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) as published by the Environmental Protection Agency in January 2016.
- ISO 1996 Acoustics – Description, Measurement and Assessment of Environmental Noise, Part 1, Basic Quantities and Assessment Procedures (2016) and Part 2 Determination of Environmental Noise Levels (2017).
- ISO 9613.-2 – 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.

11 LANDSCAPE & VISUAL

11.1 INTRODUCTION

This chapter of the EIAR and comprises of a Landscape and Visual Impact Assessment. This considers the existing landscape setting of the proposed development site and assesses likely landscape and visual impacts of the proposed development on the receiving environment in the context of proposed mitigation measures to reduce any likely adverse potential visual impacts on the receiving environment. Although closely linked, landscape and visual impacts are assessed separately.

- **Landscape Impact Assessment (LIA)** relates to assessing effects of a development on the landscape as a resource in its own right and is concerned with how the proposed development will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.
- **Visual Impact Assessment (VIA)** relates to assessing effects of a development on specific views and on the general visual amenity experienced by people. This deals with how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements. Visual impacts may occur from; Visual Obstruction (blocking of a view, be it full, partial or intermittent) or; Visual Intrusion (interruption of a view without blocking).
- **Cumulative landscape and visual impact assessment** is concerned with additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future.

11.1.1 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The following provides a summary description and understand of the proposed development. A detailed description of development proposals in provided in Chapter 2 of the EIAR.

<u>LEL Flexgen Castlelost Project</u>: Proposed gas-fired reserve generator of 275MW electrical capacity. The project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system. The proposal includes the installation of five (5no.) dry low

emission (DLE) gas turbines, associated stack(s), raw water/fire water tank, fire water retention basin, back-up fuel tank, emergency generator, gas receiving station (AGI), low, medium and high voltage transformers, customer control room, and all ancillary electrical plant and delivery systems. GNI will separately manage the process of delivering the underground gas transmission pipeline to the proposed site.

LEL GIS Castlelost Project: Proposed 220kV Gas Insulated Switchgear (GIS) Electrical Substation. The project will involve installation of two (2 no.) 220 kV underground circuits forming a connection to the existing Shannonbridge-Maynooth 220 kV overhead line (located within the development boundary) and two (2no.) 220 kV underground circuits and associated low voltage and communication underground cabling connecting the proposed substation with electricity transformers on the adjacent reserve gas-fired generator (Project 1) and ESS (Project 3) sites, and all associated and ancillary site development works. The GIS substation itself includes a two storey, 17m high building (housing electrical switchgear, a battery room, a workshop room, and WC), transformer bay(s), access roadway and all ancillary site development works.

LEL ESS Castlelost Project: Proposed Energy Storage System (ESS) using vanadium flow battery (VFB) technology and synchronous condenser. The battery energy storage system (BESS) will comprise a cluster of battery modules positioned within a dedicated BESS outdoor compound. Each module will consist of (i) a battery container (6.1m long container) housing pumps and heat exchangers positioned on top of two (ii) tank (electrolyte) enclosures (12.2m long containers). An associated battery management system (BMS) and medium voltage power station (MVPS) enclosure will also form part of the battery module. The BMS will monitor and control electrolyte circulation and the MVPS is provided to condition the power generated. The synchronous condenser comprises a rotating generator positioned within a building. The generator is connected to the transmission system via a step-up transformer. When the generator has reached an operating speed that is synchronous to the system frequency, it is synchronised with the transmission network and acts as a motor providing reactive and short circuit power to the electricity network. A customer (IPP) building will also be installed within the ESS compound, and it will house electrical switchgear, store, control room, welfare facilities and administration facilities.

11.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

This LVIA uses methodology as prescribed in the following guidance documents:

- Environmental Protection Agency (EPA) publication 'Guidelines on the Information to be contained in Environmental Impact Statements (updated August 2017) and the accompanying Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (updated 2015); and,

- Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment (2013).

This assessment has involved:

- A desktop study to establish an appropriate study area, relevant landscape and visual designations in the current Westmeath and Offaly County Development Plans, as well as other sensitive visual receptors. This stage culminates in the selection of a set of potential viewpoints from which to study the effects of the proposed development;
- Fieldwork to establish the landscape character of the receiving environment and to confirm and refine the set of viewpoints to be used for the visual assessment stage;
- Assessment of the significance of the landscape impact of the development as a function of landscape sensitivity weighed against the magnitude of the landscape impact;
- Assessment of the significance of the visual impact of the development as a function of visual receptor sensitivity weighed against the magnitude of the visual impact. This aspect of the assessment is supported by photomontages prepared in respect of the selected viewpoints and,
- Incorporation of mitigation measures to reduce potential impacts and estimation of residual impacts once mitigation has become established.

11.2.1 LANDSCAPE IMPACT ASSESSMENT CRITERIA

When assessing the potential impacts on the landscape resulting from a proposed development, the following criteria are considered:

- Landscape character, value and sensitivity;
- Magnitude of likely impacts; and,
- Significance of landscape effects.

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area (LCA) or feature) can accommodate changes or new elements without unacceptable detrimental effects to its essential characteristics. Landscape Value and Sensitivity is classified using the following criteria set out in Table 11.1.

Table 11.1 Landscape Value and Sensitivity

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes, which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically, this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the proposed development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the site boundary that may have an effect on the landscape character of the area. See Table 11.2.

Table 11.2 Magnitude of Landscape Impacts

Magnitude of Impacts	Description
Very High	Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
High	Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
Medium	Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to changes in landscape character, and quality.

Low	Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements.
Negligible	Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable.

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix set out in Table 11.3.

Table 11.3 Impact Significance Matrix

	Sensitivity of Receptor				
Scale/Magnitude	**Very High**	**High**	**Medium**	**Low**	**Negligible**
Very High	Profound	Profound-substantial	Substantial	Moderate	Minor
High	Profound-substantial	Substantial	Substantial-moderate	Moderate-slight	Slight-imperceptible
Medium	Substantial	Substantial-moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate-slight	Slight	Slight-imperceptible	Imperceptible
Negligible	Slight	Slight-imperceptible	Imperceptible	Imperceptible	Imperceptible

Note: Judgements deemed 'substantial' and above (orange shading) are considered to be 'significant impacts' in EIA terms.

11.2.2 VISUAL IMPACT ASSESSMENT CRITERIA

As with the landscape impact, the visual impact of the proposed development will be assessed as a function of sensitivity versus magnitude. In this instance the sensitivity of the visual receptor, weighed against the magnitude of the visual effect.

11.2.3 SENSITIVITY OF VISUAL RECEPTORS

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape. A list of the factors considered by the assessor in estimating the level of sensitivity for a particular visual receptor is outlined below and used in Table 11-6 below to establish visual receptor sensitivity at each VRP:

1. **Susceptibility of Receptors** - In accordance with the Institute of Environmental Management and Assessment ("IEMA") Guidelines for Landscape and Visual Assessment (3rd edition 2013) visual receptors most susceptible to changes in views and visual amenity are;

   - *"Residents at home;*
   - *People, whether residents or visitors, who are engaged in outdoor recreation, including use of public rights of way, whose attention or interest is likely to be focussed on the landscape and on particular views;*
   - *Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience;*
   - *Communities where views contribute to the landscape setting enjoyed by residents in the area; and,*
   - *Travellers on road rail or other transport routes where such travel involves recognised scenic routes and awareness of views is likely to be heightened".*

Visual receptors that are less susceptible to changes in views and visual amenity include:

   - *"People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape; and,*
   - *People at their place of work whose attention may be focussed on their work or activity, not their surroundings and where the setting is not important to the quality of working life".*

2. **Recognised scenic value of the view** (County Development Plan designations, guidebooks, touring maps, postcards etc). These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Developments Plans, for example, a public consultation process is required;
3. **Views from within highly sensitive landscape areas**. Again, highly sensitive landscape designations are usually part of a county's Landscape Character Assessment, which is then incorporated within the County Development Plan and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them;
4. **Primary views from dwellings**. A proposed development might be seen from anywhere within a particular residential property with varying degrees of sensitivity. Therefore, this category is reserved for those instances in which the design of dwellings or housing estates, has been influenced by the desire to take in a particular

view. This might involve the use of a slope or the specific orientation of a house and/or its internal social rooms and exterior spaces;

5. **Intensity of use, popularity**. This relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at county or regional scale;
6. **Connection with the landscape**. This considers whether or not receptors are likely to be highly attuned to views of the landscape i.e., commuters hurriedly driving on busy national route versus hill walkers directly engaged with the landscape enjoying changing sequential views over it;
7. **Provision of elevated panoramic views**. This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas;
8. **Sense of remoteness and/or tranquillity.** Receptors taking in a remote and tranquil scene, which is likely to be fairly static, are likely to be more receptive to changes in the view than those taking in the view of a busy street scene, for example,
9. **Degree of perceived naturalness**. Where a view is valued for the sense of naturalness of the surrounding landscape it is likely to be highly sensitive to visual intrusion by distinctly manmade features;
10. **Presence of striking or noteworthy features.** A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle;
11. **Historical, cultural and / or spiritual significance.** Such attributes may be evident or sensed by receptors at certain viewing locations, which may attract visitors for the purposes of contemplation or reflection heightening the sense of their surroundings;
12. **Rarity or uniqueness of the view**. This might include the noteworthy representativeness of a certain landscape type and considers whether the receptor could take in similar views anywhere in the broader region or the country;
13. **Integrity of the landscape character**. This looks at the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components;
14. **Sense of place**. This considers whether there is special sense of wholeness and harmony at the viewing location; and,
15. **Sense of awe**. This considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations which are deemed to satisfy many of the above criteria are likely to be of higher sensitivity. Overall sensitivity may be a result of a number of these factors or, alternatively, a strong association with one or two in particular.

11.2.4 VISUAL IMPACT MAGNITUDE

The magnitude of visual effects is determined on the basis of two factors: the visual presence (relative visual dominance) of the proposal, and its effect on visual amenity. The magnitude of visual impacts is classified in Table 11.4.

Table 11.4 Magnitude of Visual Impact

Criteria	Description
Very High	The proposal intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. A high degree of visual clutter or disharmony is also generated, strongly reducing the visual amenity of the scene.
High	The proposal intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual clutter or disharmony is also likely to be generated, appreciably reducing the visual amenity of the scene.
Medium	The proposal represents a moderate intrusion into the available vista, is a readily noticeable element and/or it may generate a degree of visual clutter or disharmony, thereby reducing the visual amenity of the scene. Alternatively, it may represent a balance of higher and lower order estimates in relation to visual presence and visual amenity.
Low	The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene.
Negligible	The proposal would be barely discernible within the available vista and/or it would not detract from, and may even enhance, the visual amenity of the scene.

11.2.5 VISUAL IMPACT SIGNIFICANCE

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the same significance matrix and applies the same EPA definitions of significance as used earlier in respect of landscape impacts (Table 11.3 refers).

11.2.6 EXTENT OF STUDY AREA

Though potentially visible from reasonable distances, it is anticipated that the proposed development is not likely to give rise to significant landscape or visual impacts beyond approximately 2km. In the interests of a comprehensive appraisal, a 3km radius study area is used in this instance. Furthermore, out of an abundance of caution, the important feature of Croghaun Hill in County Offaly, which is over 5km away, has also been specifically included within the study without extending the entire, predominantly flat, study area to such distances.

Figure 11.1 Extent of Study Area

11.3 DESCRIPTION OF RECEIVING ENVIRONMENT

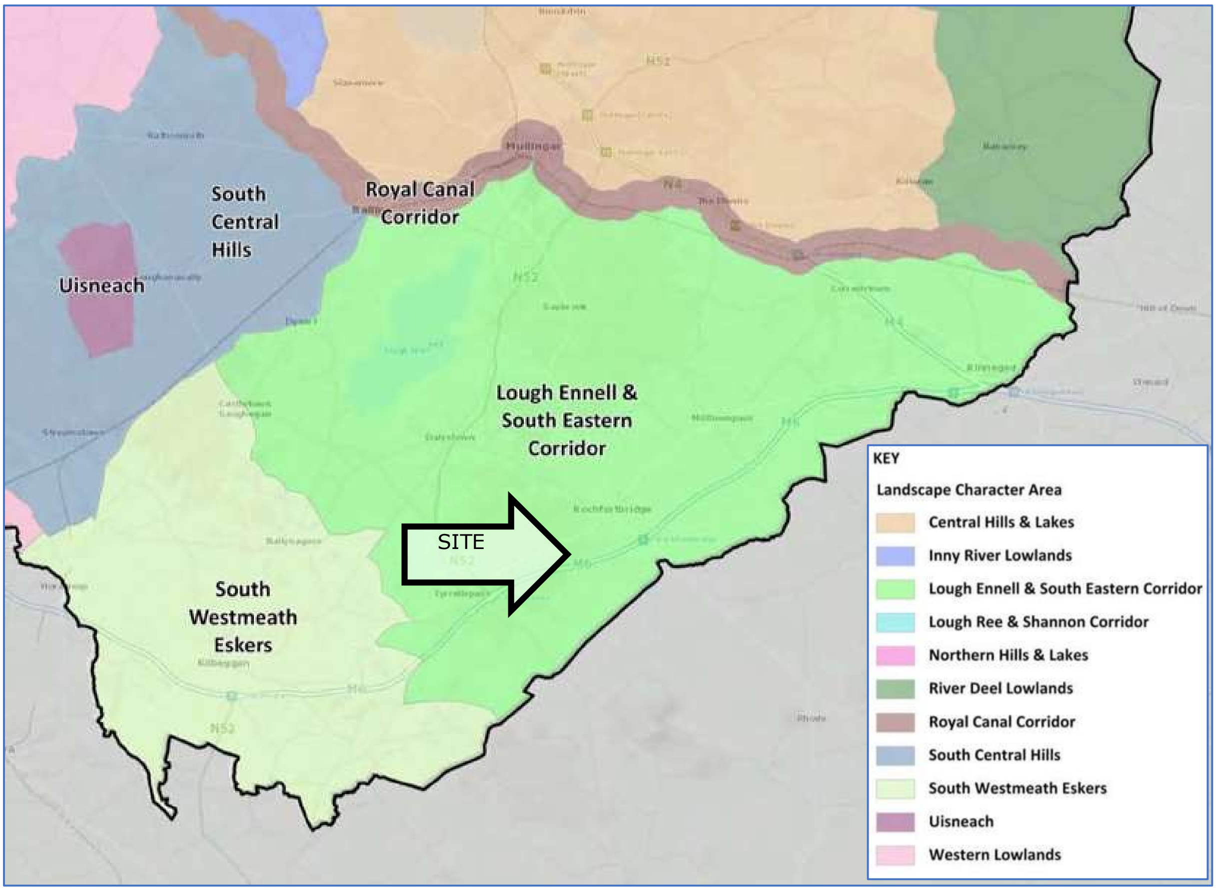
Consideration of the receiving environment will first include relevant landscape and visual policy within the context of the Westmeath and Offaly County Development Plans. This will be followed by a description of the landscape setting and visual receptors.

11.3.1 LANDSCAPE AND VISUAL POLICY CONTEXT AND DESIGNATIONS

11.3.1.1 <u>Westmeath County Development Plan 2021-2027</u>

A landscape character assessment for County Westmeath was carried out as part of the 2008-2014 County Development Plan and is included within the current development plan

(2021-2027). The landscape character assessment divides the county into 11 landscape character areas (LCAs) with the site situated in 'LCA 10 – Lough Ennell. This LCA *"comprises pasture land of mixed productivity. Lough Ennell is situated to the western side of this Landscape Character Area (LCA) and is designated as an Area of High Amenity, SPA and SAC. A number of preserved views are listed from the R446 between Tyrrellspass and Rochfortbridge…… The bog areas in this LCA are mainly exploited but some have been left intact. This area has a large number of old demesnes, which are easily recognisable in the landscape with the existence of fine mature hardwood trees and estate walls in some cases."*

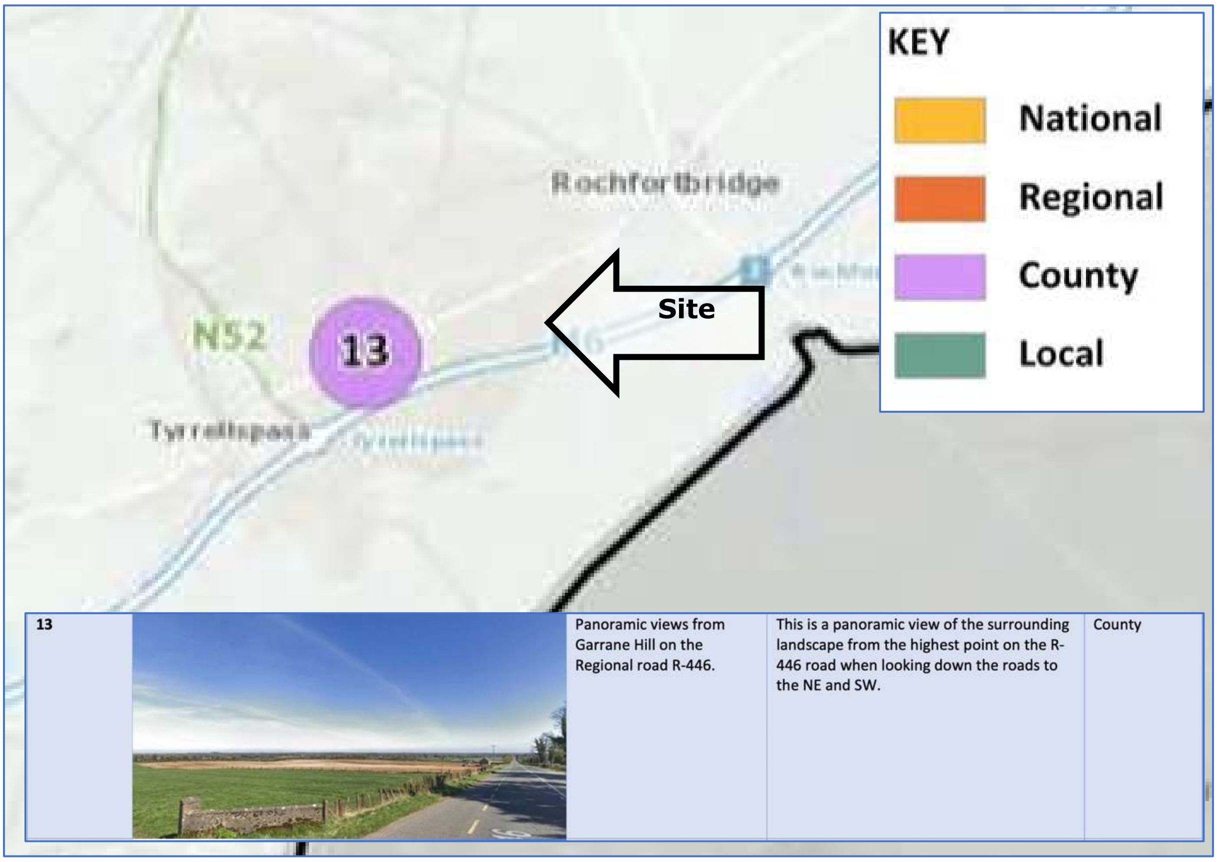


A number of 'Areas of High Amenity' are also designated in County Westmeath and mainly relating to key lakes, however, none of these are located within the study area.

<u>Westmeath Scenic Designations</u>

The Westmeath County Development Plan includes designated scenic routes and views, which are included on the Heritage Map 7 of Volume 2 (CDP maps).The nearest and only relevant designation is View 13, which although it is indicated on Map 67 as being 360° is described in Appendix 5 as being to the northeast and southwest from the R446 from the hilltop at Garrane. The subject view towards the site is to the east and is relatively enclosed by vegetation. Three of the viewpoints used in the visual impact assessment represent are from the R446 in relatively close proximity to the designation but it is VP6 that is actually from Garrane Hilltop and is most applicable.

Figure 11.2 Excerpt from Map 67 and Appendix 5 showing the Proposed Development site in relation to the only relevant scenic view designation in County Westmeath (of 'County' level importance)



11.3.1.2 <u>Offaly County Development Plan 2014-2020 (and imminent Draft CDP 2021-2027)</u>

Only a small portion of County Offaly is contained within the south-eastern periphery of the 3km radius study area, but the development plan is still relevant. Although a landscape character assessment has not currently been completed for County Offaly, Chapter 7 – Heritage and Landscape in the current Offaly County Development Plan (CDP) 2014-2020 identifies a number of general landscape units and their associated sensitivity designations (Figure 11.3 refers).

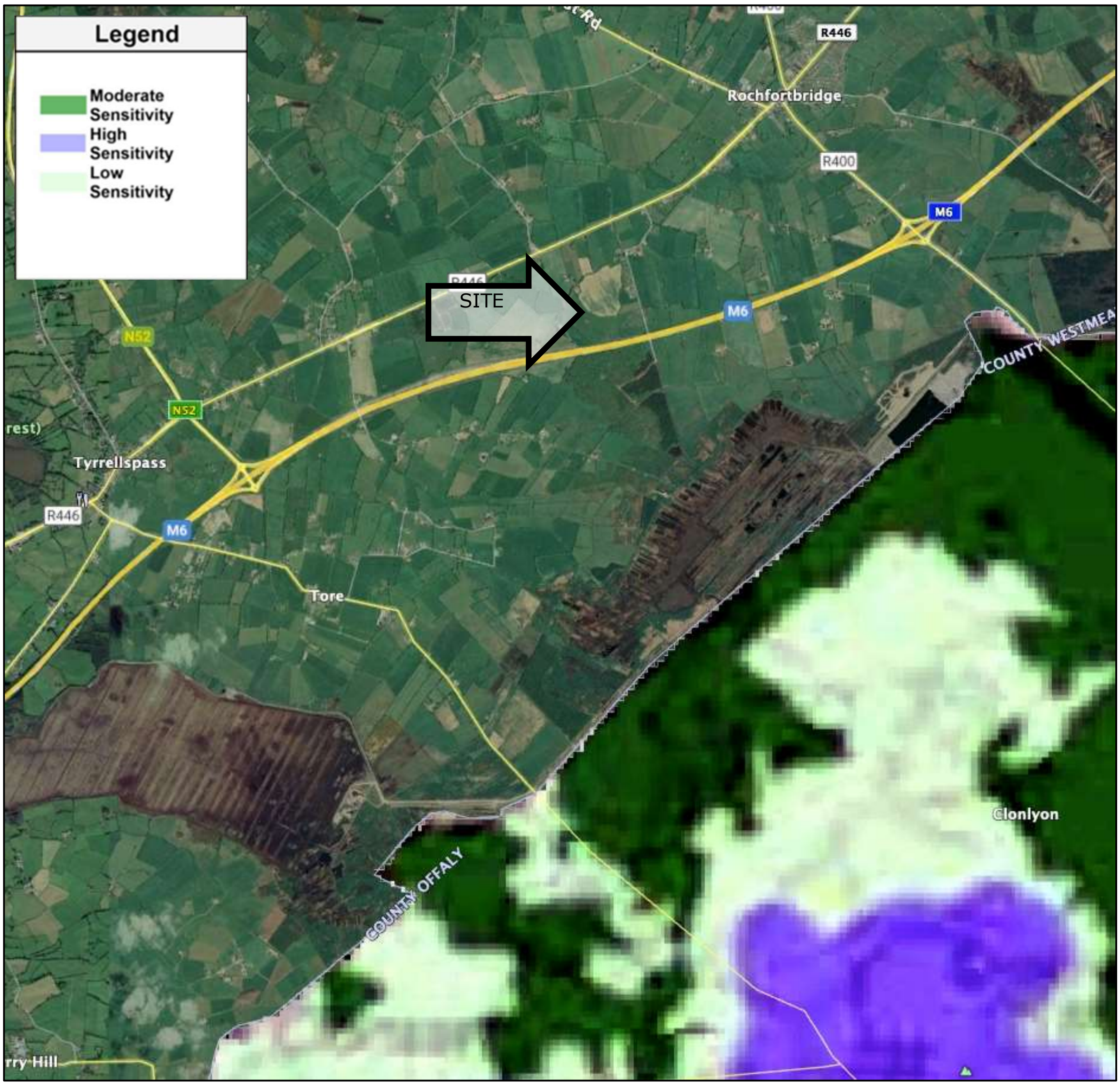
<u>Offaly CDP Sensitivity Classification:</u>

> *"**Low sensitivity areas:** This class largely encompasses the county's main urban and farming areas. These areas comprise natural enclosing features (e.g., topography, vegetation) which have the capacity to absorb a range of new development.*

> ***Moderate Sensitivity areas:*** *Areas which are generally 'open' in character with intrinsic quality and moderate capacity to absorb new development.*
>
> ***High sensitivity areas:*** *Identified features or areas of natural beauty or interest which have extremely low capacity to absorb new development. Areas included within this class are designated Areas of High Amenity."*

The nearest portions of county Offaly to the proposed development site are identified as being Moderate and Low sensitivity areas, with the former relating to open, cutaway peatland areas and the latter to lowland farming areas. Whilst outside of the principal 3km radius study area, Croghan Hill and its surrounds are identified as being of High sensitivity. This area is also subject of a High Amenity designation. See Figure 11.3 below.

Figure 11.3 Map showing the Proposed Development site in relation to landscape sensitivity areas in County Offaly



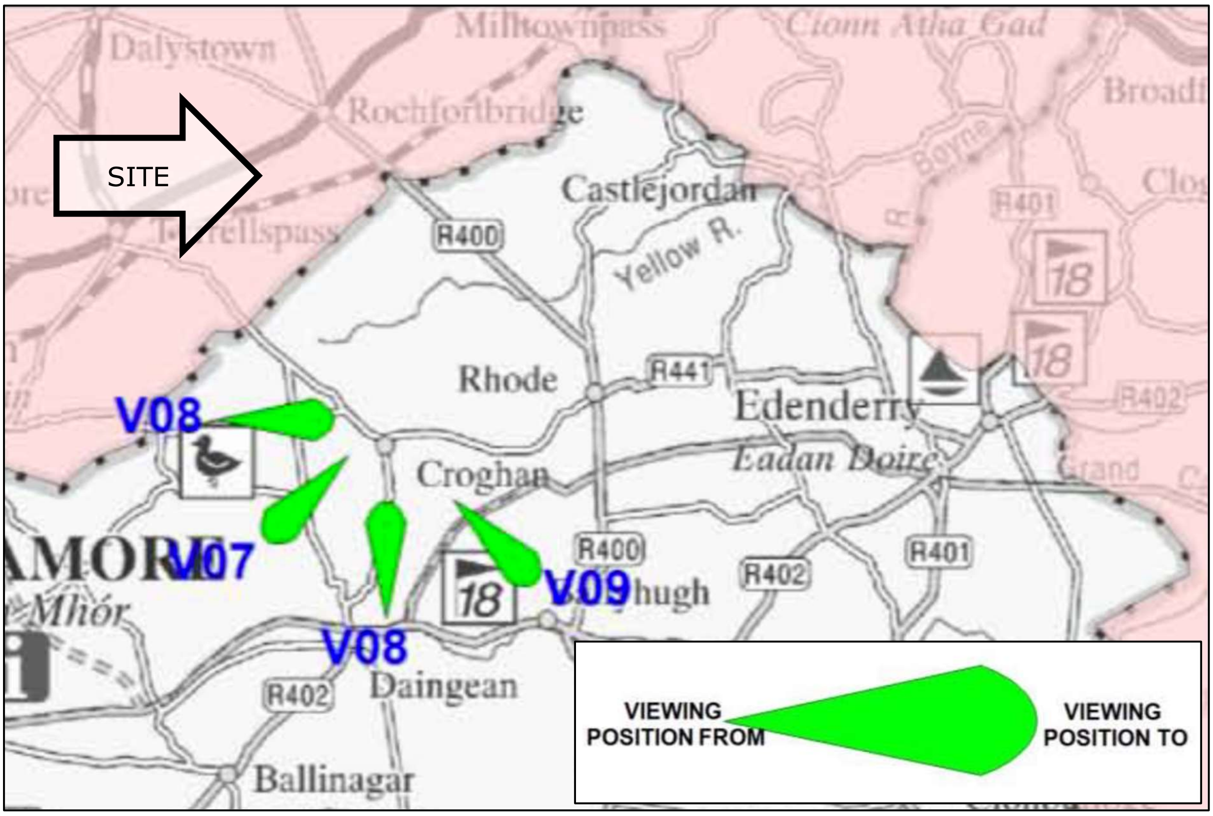
<u>Offaly Scenic Designations</u>

According to Section 7.12.1 Views and Prospects of the current Offaly CDP:

> *"The designation of Areas of High Amenity and scenic amenity routes within County Offaly provide a basis for the protection of views and prospects of certain visually vulnerable features."*

As can be noted from Figure 11.4 below, the nearest protected view to the proposed development site is located some 5.8km south of the proposed development, which is well outside of the 3km study area, and will therefore not be included within the appraisal. This scenic view is one a series of views to and from Croghan Hill, but notably there are no designated views northwards from Croghan Hill. Nonetheless, due to the sensitivity of this landscape feature and because there are vast northward views afforded from it, a viewpoint has been selected from a local road high on the northern slopes of Croghan Hill.

Figure 11.4 Extract of Map No. 7.18 Protected Views of the Offaly CDP.



11.3.2 LANDSCAPE BASELINE

The landscape baseline represents the existing landscape context and is the scenario against which any changes to the landscape brought about by the development will be assessed. A description of the landscape context of the site and wider study area is provided below. Although this description forms part of the landscape baseline, many of the landscape elements identified also relate to visual receptors i.e. places and transport routes from which viewers can potentially see the proposed development. The visual resource will be described in greater detail in the Visual Impact Assessment in Section 9.6.

11.3.2.1 Landform and Drainage

The landform of the study area is characterised by flat to low rolling terrain which is typical of the midlands of Ireland. The site ascends gently to the north from the M6 Motorway, which is in cut or close to grade as it passes south of the site. There is a low hill in the northwest of the study area at Garrane as well as a subtle ridge to the east of the site. The landscape of the southern study area is flat with the exception of Croghan Hill which is outside of the principal study area but one of the few prominent hills within this part of the midlands.

Figure 11.5 Immediate site context

11.3.2.2 Vegetation and Land Use

The predominant land use within the study area is that of agricultural farmland which comprises of medium to large sized geometric fields that are often bound by dense mature tree lined hedgerows. Another notable land cover within the study area is large cutaway peat bogs, the nearest and largest of which are situated in the southern half of the study area within County Offaly. Several conifer forest plantations are also dotted throughout the study area and are often found on the periphery of the large scale peatbogs. A number of large overhead transmission lines also traverse the site and study area and are evidence of the power generation heritage (peat fired power stations) of this area.

11.3.2.3 Centres of Population and Houses

The most notable centre of population in relation to the proposed development is the settlement of Rochfortbridge near the north-eastern periphery of the study area. The similar sized settlement of Tyrrellspass is just beyond the western border of the study area and there is a small hilltop settlement at Garrane approximately 2.2km to the northwest of the site. There is also a dispersed linear group of houses to the south of the M6 motorway at Rahincuill lining a local road. Otherwise, the study area is relatively sparsely settled with occasional farmsteads and rural dwellings.

11.3.2.4 Transport Routes

The most notable transport route in relation to the proposed development is the M6 motorway corridor which is situated almost immediately adjacent to the south of the site and dissects the study area east to west. The R446 runs parallel to the M6 about 700m to the north of the site as it passes between Rochfortbridge and Tyrrellspass. The R400 links between the M6 motorway and Rochfortbridge at the eastern periphery of the study area. The nearest road to the site is quiet local road that runs between the R400 and the M6 motorway but passes over rather than connecting to the latter.

11.3.2.5 Public Amenities, Facilities and Heritage Features

Other than local sports grounds at the likes of Rochfortbridge, there are no particular recreational amenity features within the study area.

11.3.3 VISUAL BASELINE

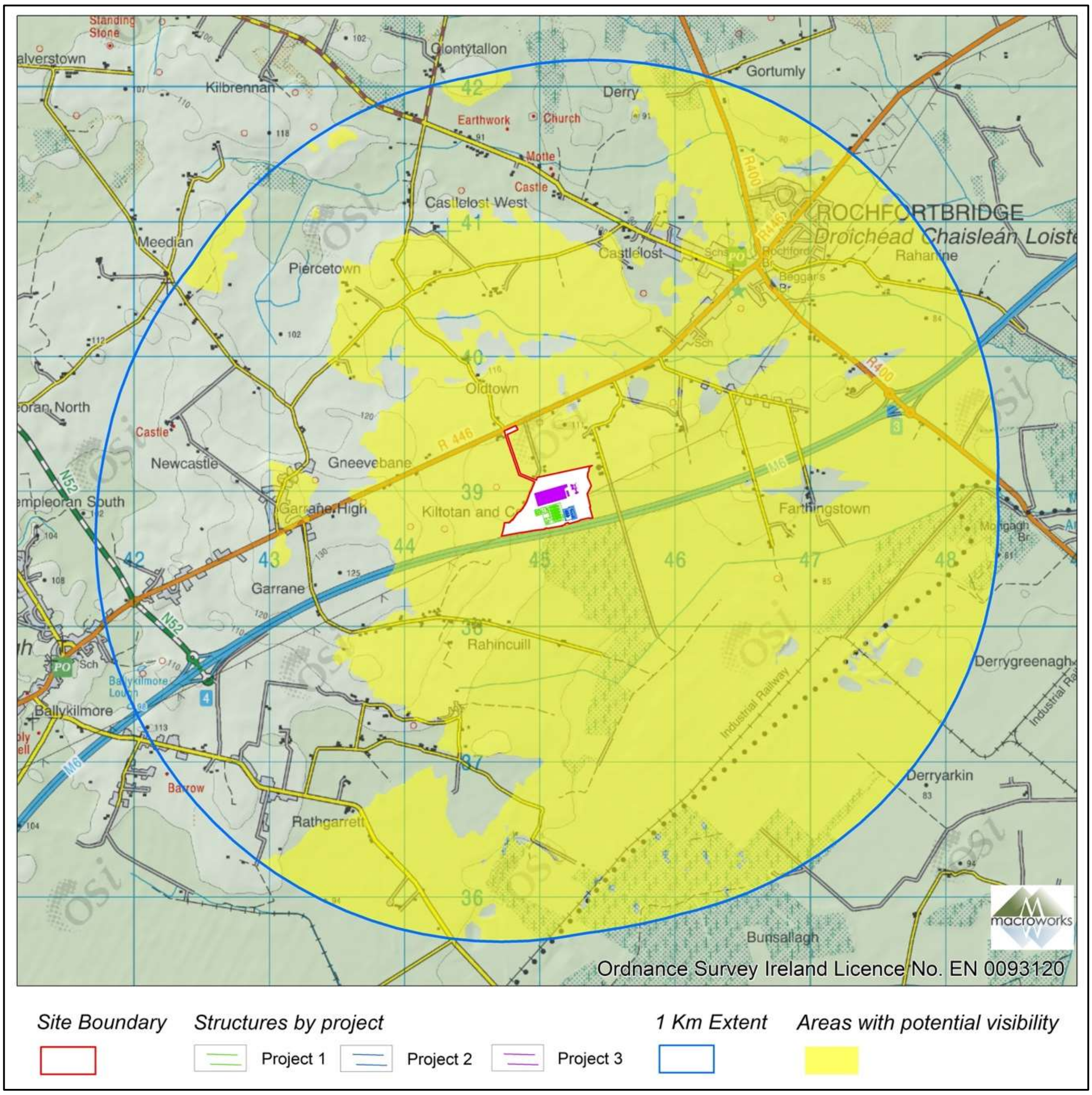
Only those parts of the receiving environment that potentially afford views of the proposed development are of concern to this section of the assessment. A computer-generated Zone of Theoretical Visibility (ZTV) map has been prepared to illustrate where the proposed development is potentially visible from. The ZTV map is based solely on terrain data (i.e. bare ground visibility), and ignores features such as trees, hedges or buildings, which may screen views. Given the complex vegetation patterns within this landscape, the main value of this form of ZTV mapping is to determine those parts of the landscape from which the proposed development will definitely not be visible, due to terrain screening, within the 3km study area. See Figure 11.6 below.

The following key points are illustrated by the above 'bare-ground' ZTV map:

- The proposed development/s have the potential to be extensively visible throughout the central and eastern quarters of the study area where the terrain is generally flatter and/or lower lying than the site.
- To the west beyond 1km and to the northwest and southwest beyond approximately 2km, there is no potential for scheme visibility due to a band of higher ground.

The most important point to make in respect of this 'bare-ground' ZTV map is that it is theoretical. The proposed structures, although substantial in scale are relatively enclosed by surrounding vegetation, resulting in a much lesser degree of actual visibility. Thus, it is necessary to compare the terrain based ZTV map (Figure 11.6 above) to the terrain and land cover based ZTV maps (Figure 11.7).

Figure 11.6 Standard (bare-ground) ZTV map to extent of 3km radius Study Area



The second form of ZTV mapping relies on Digital Surface Model ("DSM") data, which also maps the terrestrial land cover elements such as hedgerows and buildings with a high degree of accuracy. This is of far more value in determining the likely visibility of the proposed development. A more consolidated area incorporating the surrounding network of roads and dwellings within 1km of the site was the focus of this more intensive level of spatial data capture. Analysis of this second form of ZTV mapping is provided below (Figure 11.7.

Figure 11.7 Digital Surface Model (DSM) based ZTV map accounting for screening by surface elements such as hedgerows and trees lines.

Figure 11.8 Digital Surface Model (DSM) based ZTV map accounting for screening by surface elements such as hedgerows and trees lines.

As can be seen from the Digital Surface Model based ZTV map:

- The existing vegetation in the vicinity of the site has a substantial screening effect, reducing the potential to see the proposed development beyond 1-2 fields from the site(c. 500m);
- Where residual visibility remains beyond 500m from the site it tends to be in a shard pattern which indicates intermittent visibility through and between hedgerows and treelines rather than comprehensive visibility above them.
- Relatively open visibility still occurs from the M6 motorway, but very restricted visibility is afforded to the R446, which is the more sensitive of these routes as it is a designated scenic route and lined by residential houses.
- Visibility from the direction of Rochfortbridge (NE) appears to be precluded by intervening vegetation.

11.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

In accordance with the GLVIA-2013, this section will address landscape effects and visual effects separately.

11.4.1 LANDSCAPE EFFECTS

11.4.1.1 <u>Landscape Value & Sensitivity</u>

The landscape of the study area comprises of a mix of agricultural farmland and large-scale peatbogs. The major road corridors, cutaway peatland, intensive farming, forestry and high voltage lines all identify the study area as a utilitarian working landscape. The site and its immediate surrounds are characterised by typical rural land uses such as agricultural farmland and small blocks of conifer forest plantations. A minor sense of rural tranquillity is apparent in some aspects of the study area that are sparsely populated and enclosed by vegetation; however, this is a landscape where landscape values are more typically associated with productivity and rural subsistence rather than any sense of distinctiveness, scenic value or the naturalistic. The terrain within the study area is generally flat and therefore views are generally restricted by the layers of dense hedgerow vegetation except where relative elevation affords longer distance views.

The study area is typical of much of the midlands and is not particularly rare or vulnerable. This is reflected in the current Westmeath County Development Plan in the fact that there are no parts of the study area identified as 'Areas of High Amenity'. Instead, the site is contained within the large LCA 10 - Lough Ennell and Southeast corridor, albeit with the southeast transport corridor having a far greater influence on the receiving landscape character than the distant Lough Ennell, which occurs on the other (northern) side of the LCA some 8km away.

Overall, this is a landscape heavily influenced by human activity both in the past by harvesting of peat for fuel, and at present through agricultural and forestry activities as well as transport corridors. This is principally a productive rural landscape of reasonable integrity and one that contributes to the rural subsistence and amenity of the surrounding rural population. On balance of the above reasons, the sensitivity of the receiving landscape is considered to be **Medium-low.**

11.4.1.2 Magnitude of Landscape Impacts

For the purposes of the landscape impact assessment, a 'whole project' approach will be taken rather than dividing the development into the three composite projects. This is on the basis that all aspects of the development will contribute relatively equally and in a similar manner to physical changes in the prevailing land cover and the effects on surrounding landscape character. Consequently, unnecessary repetition will be avoided.

11.4.1.3 Construction stage

In terms of physical landscape effects, the proposed development will result in the permanent stripping of the prevailing agricultural grassland landcover as well as the permanent removal of some remnant hedgerow sections. There will also be some minor levelling of the landform to facilitate the various aspects of the development, albeit minor terracing will occur between the three projects to minimise and balance the amount of cut and fill required across the site. Surplus cut will be formed into perimeter embankments around the north and northeast perimeter of the site. These will also be planted as part of the mitigation strategy for landscape and visual effects as well as noise effects.

There will be a much higher intensity of site activity during the construction phase of the proposed development than during the operational phase. Such activity will include the movement of construction machinery on-site, as well as trucks travelling to and from the site. The construction phase will also include temporary site lighting and the temporary storage of construction materials. The highest level of construction stage impact will occur near scheme completion when the substantially completed structures are in place in-combination with the clutter and movement of workers, machinery and temporary structures associated with construction activities.

The construction of the development is expected to take place in 2-3 stages over a period of 28 months. Construction related effects are, therefore, relatively brief and intermittent in nature and will only result in 'short-term' landscape and visual impacts in accordance with EPA definitions.

On the basis of the factors outlined above, the construction stage landscape impacts are deemed to be **High-medium** within the site and its immediate setting (<c. 500m), thereafter reducing to Medium and Low at increasing distances and with a higher degree of screening.

11.4.1.4 Operational Phase

Following completion of the construction phase for the proposed development, the main landscape effects remaining to be considered at the operational phase relate to permanent changes in landscape character regarding the physical impact on the landscape, the introduction of above-ground elements and any permanent removal of vegetation.

The main effect of the proposed development will be an increased sense of industrialisation and intensity of built development within this predominantly rural setting albeit where a major transport corridor (The M6 motorway) and high voltage power lines already coincide. The scale and intensity of the proposed development will have a noticeable influence on the landscape of the immediate surrounds of the site as the tallest structures within the proposed development will rise to a height of c. 30m and 36m (OCGT stacks and GIS communications tower respectively); however, as these tallest components comprise of relatively narrow stacks and a thin lattice steel structure, their potential to be a visually prominent feature over distances beyond 1km is diminished.

In terms of duration, the operational stage landscape impacts will be long term or permanent in accordance with EPA definitions

On the basis of the factors discussed above, it is considered that the magnitude of landscape impact at operational stage is also **High-medium** within the site and its immediate surrounds, being those lands contained within approximately 500m of the proposed development. Thereafter, the magnitude of landscape impact is deemed to reduce to **Medium** and **Low,** as the proposed development becomes a progressively smaller component of the overall multifaceted landscape fabric and also become screened from view.

11.4.1.5 Significance of Landscape Effects

With reference to the significance matrix (**Table 11.3**) above, the **Medium-low** landscape sensitivity judgement attributed to the site and the study area, coupled with a **High-medium** magnitude of landscape impact in the near vicinity (within approx. 500m) of the proposed development, is considered to result in an overall significance of **Moderate**, with the rest of the 5km radius study area likely to experience 'Moderate-slight' or 'Slight' landscape impacts.

11.4.2 VISUAL IMPACTS

This section is a summary of the visual impact assessment findings and should be read in conjunction with Appendix 11.1 which contains the full visual impact assessments at each of the selected viewpoints. Whereas the visual impact assessments in Appendix 11.1 take a 'whole project approach to the assessment, the summary sections below are divided per constituent project.

11.4.2.1 Identification of Viewshed Reference Points as a Basis for Assessment

Viewshed Reference Points (VRP's) are the locations used to study the visual impacts of a proposal in detail. It is not warranted to include each and every location that provides a view of a development as this would result in an unwieldy report and make it extremely difficult to draw out the key impacts arising from the proposed development. Instead, the selected viewpoints are intended to reflect a range of different receptor types, distances and angles. The visual impact of a proposed development was assessed using up to 6 no. categories of receptor type as listed below:

- Key Views (from features of national or international importance);
- Designated Scenic Routes and Views;
- Local Community views;
- Centres of Population;
- Major Routes; and,
- Amenity and heritage features.

VRP's might be relevant to more than one category and this makes them even more valid for inclusion in the assessment. The receptors that are intended to be represented by a particular VRP are listed at the beginning of each viewpoint appraisal. The Viewshed Reference Points selected in this instance are set out in the Table 11.5 and Figure 11-9 below.

Table 11.5 Outline Description of Selected Viewshed Reference Points (VRPs)

VRP No.	Location	Direction of view
VP1	Local road northeast of site	SW
VP2	Local road east of site	W
VP3	Local road overpass of M6 motorway southeast of site	NW

VRP No.	Location	Direction of view
VP4	R446 north of site	S
VP5	R446 northwest of site	SE
VP6	R446 at Garrane High	E
VP7	Local road overpass of M6 motorway at Garrane	NE
VP8	Local road at Rahincuill	NE
VP9	Local road on Croghan Hill	NW
VP10	Layby on M6 motorway	NW

Figure 11.8 Viewpoint Location Map - Impact Assessment

11.4.2.2 LEL Flexgen Castlelost Visual Impact Assessment

By far the most visible aspect of the LEL Flexgen Castlelost is its five stacks, which will rise up to 30m above ground level and have a reasonable circumference resulting in noticeable bulk. These stacks tend to rise just beyond the Project 2 GIS substation building when seen from the east and southeast where the most open views of the overall development are afforded from the nearby local road and the M6 motorway corridor. These are not particularly sensitive receptors as there are no dwellings on this very minor local road that lie due east of the proposal. The nearest lies to the northeast and is represented by VP1 where the view of the proposed development is relatively restricted and the significance of impact is deemed to be 'Moderate-slight'. Whilst two of the LEL Flexgen Castlelost stacks are visible through a gap in the vegetation in the pre-mitigation scenario, they will be fully screened once this gap is consolidated by proposed planting. In this regard, the contribution of the LEL Flexgen Castlelost to residual visual impact will be Imperceptible at VP1.

Two LEL Flexgen Castlelost stacks are also visible from VP2 further south along the local road, but mitigation planting will not screen them in this case. Nonetheless, as with VP1 the stacks present with a low degree of contrast against a backdrop of sky due to their light tone. Further south again, at VP3 on an overpass above the motorway, one of the proposed stacks is substantially visible. The other four will rise directly above the intervening Project 2 GIS building where they will almost appear to rise from its flat roof. The light tone colour scheme will aid visual recession against the sky and given the low sensitivity of this receptor the LEL Flexgen Castlelost Project features only contribute in a modest way to an overall impact significance of 'Moderate slight'.

The elements of the LEL Flexgen Castlelost are not readily visible, or visible at all between VP4 and VP9, which wrap around the study area to the north, west and south at increasing distances. Indeed, the LEL Flexgen Castlelost will only have a material bearing on the visual impact at VP10, which is at a low sensitivity M6 motorway layby. At this location the stacks will be a prominent feature decreasing in scale and becoming screened by vegetation and the GIS building as they run away from the motorway corridor. Though slightly less prominent in terms of scale and slightly more screened than the GIS building they contribute to High-medium magnitude of visual impact at this receptor. Nonetheless, the significance of impact is only deemed to be Moderate-slight due to the balance of low sensitivity of this receptor.

For the reasons outlined above, the LEL Flexgen Castlelost is not considered to give rise to significant visual impacts in its own right or in combination with the other projects that comprise this development.

11.4.2.3 LEL GIS Castlelost Visual Impact Assessment

The GIS substation building which rises as a geometric 17m high block will make the highest contribution to visual impact of any of the components contained within the three projects that comprise this development. This is due to a combination of it height and bulk as well as its positioning in the south-eastern corner of the overall site. This corner is the most exposed to views from the east and southeast, which are comparatively more open than other aspects and do not avail from the screening benefits of the proposed mitigation planting that wraps the northern portion of the site for the benefit of the nearest residential receptors.

It should be noted that the proposed 220kV pylon will be a near like-for-like replacement of an immediately adjacent existing pylon and this element is not considered to have a material consequence for visual amenity.

The visual impact at VP1 and VP2 relates to relatively open views of principally the GIS building and communications mast and although there are other elements of LEL Flexgen Castlelost Project and the LEL ESS Castlelost Project that are partially visible, the respective 'Moderate-slight' and 'Moderate' significance of visual impact is largely attributable to the GIS building. Indeed, even though the stacks from the LEL Flexgen Castlelost project become screened by proposed mitigation planting, the overall residual impact does not reduce because the GIS building remains substantially visible. Again, at VP3, the GIS building is the most prominent feature, but the overall significance of impact is only 'Slight' because of the low sensitivity of this receptor.

As with almost all elements of the combined development, there is very little visibility from the north, west and south as represented by VP4 to VP9 and visual impacts tend to be in the range of 'Slight-imperceptible' to 'Imperceptible' for these receptors. Only at VP10 from the adjacent M6 motorway layby is there another clear view of the proposed GIS substation building and communications mast. These will rise prominently above the planted embankment of the road corridor from a relatively short distance away. Although other elements of the development (notably the LEL Flexgen Castlelost stacks) will also be visible from here, the High-medium magnitude of visual impact is mainly attributable to the GIS building. This is balanced by a low sensitivity judgement for this receptor so that the overall significance is only deemed to be Moderate-slight.

For the reasons outlined above, the LEL GIS Castlelost Project is not considered to give rise to significant visual impacts in its own right or in combination with the other projects that comprise this development.

11.4.2.4 ESS Castlelost Visual Impact Assessment

The LEL ESS Castlelost Project component of the overall development is considered to have the least visual impact of the three projects, and this is for the opposite reasons that the Project 2 GIS building has the highest impact. Project 3 except for its tall and narrow lightening masts has relatively low-lying elements that are contained within the most enclosed part of the site away from the nearest receptors with potential for visibility (i.e. to the east and southeast. Even though it is comparatively closer to the nearest dwellings to the north and northeast, strong vegetation screening is afforded in this direction and this will be augmented by the planted berm that wraps around the northern side of the site. Whilst the upper sections of the lightning poles from Project 3 can be seen in a number of the photomontages, they are not seen in isolation to other more conspicuous elements of projects 1 and 2. They have a very fine form that is difficult to discern from distance. Overall, it is considered that the LEL ESS Castlelost Project contributes to an Imperceptible degree to the overall visual impact of the development.

The LEL ESS Project is not considered to give rise to significant visual impacts, either in its own right, or in combination with the other projects that comprise this development.

11.5 MITIGATION MEASURES

The main mitigation by avoidance measure employed in this instance is the siting of the proposed development in a robust, relatively flat to low rolling rural area that avails of a high degree of vegetative screening to avoid any open visibility of the site as a whole, so that the proposed development will not be a prominent feature within the surrounding landscape. It has also been deliberately sited alongside a motorway where its effects on landscape character are less than if it were placed into a wholly green-field scenario.

In addition to retaining the existing hedgerows / treelines around the site, broad 3m high earthen embankments will be formed around the northern side of the site in the direction of the nearest sensitive receptors (rural dwellings). This will aid both visual impacts and noise impacts. These embankments will be planted with a native woodland thicket that will be allowed to mature to at least 8m in height. For swift and effective establishment, this thicket will be planted as a combination of both semi-mature trees and whips and will include evergreen Holly (*Ilex aquifolium*) as shown in Figure 11.8 below. Other smaller opportunities for planting in the west and southeast of the site have also been used (See Appendix 11.2 – Landscape Mitigation Plan).

A colour scheme will also be applied to the proposed buildings that is designed to complement the mitigation screen planting and take advantage of the likely backdrop in terms of tonal contrast. For the lowest 5m of the main structures a dark olive-green plinth will be used to deemphasise the height of the building and to integrate is with dense lower sections of the surrounding vegetation network. The next 3m (i.e., up to 8m from floor level) will incorporate a mid-green intended to blend with the treetops of existing and proposed planting around the site. The upper sections of buildings (above 8m) will have a light green / grey that will recede against a light backdrop of sky in most instances.

Figure 11.8 Indicative perimeter berm planting

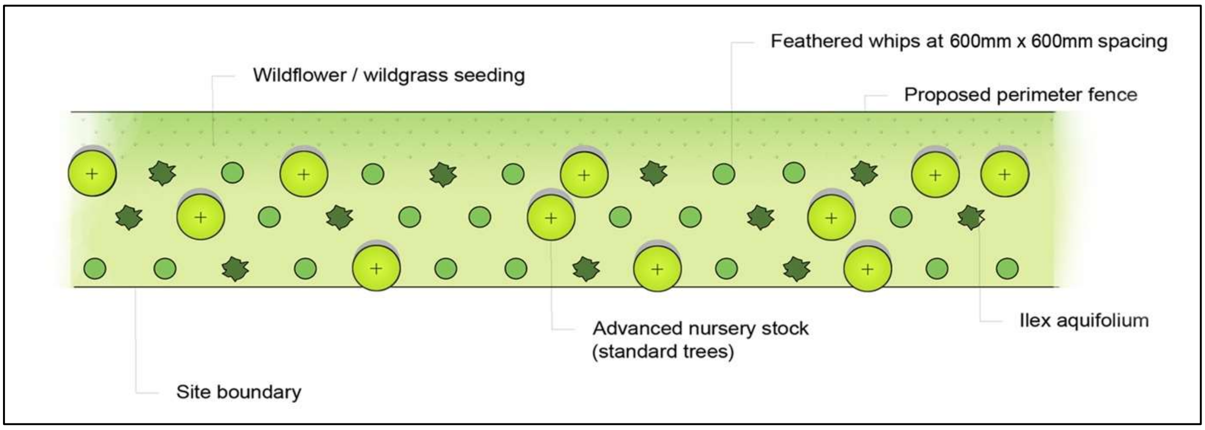


Figure 11.9 Excerpt from VP2 photomontages illustrating the proposed horizontally stratified colour scheme to take advantage of vegetation / sky backdrop

Note that for the visual impact assessment, the proposed colour scheme is deemed to be 'embedded' mitigation and is included in both the pre-mitigation and post-mitigation montages. Only the proposed screen planting is introduced for the 'mitigation' view in the photomontage set (Appendix 11.2).

11.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

As detailed above, only the proposed screen planting is introduced for the mitigation view in the photomontage set as the colour scheme is deemed to be *'embedded'* mitigation that is integral to the design. In this instance, the proposed mitigation screen planting is applied to a 3m high berm that envelops the northern aspects of the site, predominantly for the benefit of local residents to the north and northeast of the site. Given the degree of roadside screening in this direction there were few opportunities to select a viewpoint from the public domain to the northeast. VP1 is from the front of the southernmost dwelling that lines the local road to northeast and is the only representative view where the proposed mitigation screen planting makes a notable difference. It does this by screening the LEL Flexgen Castlelost stacks and LEL ESS Castlelost lightning poles that are otherwise visible through a gap in the intervening vegetation. However, in the context of clearer views of the more prominent GIS building (LEL GIS Castlelost Project) that will not be screened the residual impact is deemed to remain the same.

Aside from VP1 there are no instances in which the proposed planting reduces the predicted visual impact by a full assessment category so the potential impacts can also be considered the residual impacts in this instance. That is not to suggest the mitigation screen planting has no benefit. It will ensure that both views and noise effects of the development will be minimised from the dwellings to the northeast of the site. It will also help to integrate the development within its setting in a landscape fabric sense whilst adding to the quantum of woodland vegetation in the vicinity of the site.

11.7 CUMULATIVE EFFECTS

Cumulative impacts with each of the three projects that make up the overall development have been considered as an integral part of the assessment. This is done for the landscape impact assessment by taking a *'whole project'* approach to the assessment. The same approach was also taken for the visual impact assessment in the Appendix 11.1 viewpoint assessment with only the summary being divided per project in section 11.4 above. Thus, the assessments contained herein are cumulative in respect of the overall development proposed.

The only other cumulative impact of note is the proposed development in-combination with the adjacent M6 motorway and 220kV overhead line. In this regard, the siting of the proposed development was deliberately placed at the confluence of these features to take advantage of the robust and utilitarian landscape and visual setting (as well as physical proximity to the OHL). This is considered to be a preferable scenario to placing the development near a village, in a wholly 'green field' agricultural setting or an open peatland setting, which are the three main alternatives in this area. The fact that the landscape and visual effects of the proposed development are in the mid to low range of significance and very localised, is also testimony to it not generating significant cumulative effects in-combination with other surrounding forms of utilitarian development.

11.8 ASSESSMENT CONCLUSIONS

In terms of physical landscape impacts, the proposed development is considered to have substantial and permanent effects on the landcover and to a lesser degree the landform of the site. Construction stage landscape effects will relate to the clutter and movement of construction machinery on-site, HGVs travelling to and from the site and the temporary storage of excavated / construction materials. Thereafter, operational stage landscape effects will relate to change in the prevailing landscape character of the site and its surrounds. This change relates to the introduction of a diverse range of new, substantial scale industrial features into what is currently a predominantly agricultural setting, albeit strongly influenced by the motorway corridor and high voltage overhead lines.

In summary, the landscape impact of the proposed development is considered to result in an overall significance of **Moderate** in the immediate vicinity (<500m) of the proposed development, with the rest of the 3km radius study area likely to experience Slight and Imperceptible landscape impacts as the development becomes a proportionally smaller component of the wider landscape fabric.

In terms of **visual impacts**, the proposed development was assessed across 10 representative viewpoints from a wide range of locations within the study area. Of the 10 viewpoints assessed, the highest impacts occurred in close proximity to the east and southeast of the site (VP1, VP2, VP3 and VP10). These ranged between Moderate at VP2 and Moderate-slight at VP1, VP3 and VP10. At all other viewpoints, the significance of impact was either Slight-imperceptible or Imperceptible.

VP1 and VP2 represent views from the nearest local road to the east of the site and the partial views of the proposed development are dominated by the Project 2 GIS substation building riding above intervening vegetation at a modest distance. Whilst VP3 has a clearer elevated view across the site and the various components of the development and VP10 has the closest view, the sensitivity of these receptor locations is reduced (Low) by the motorway corridor. This serves to balance the significance of impact at '*Moderate-slight*'.

11.8.1 OVERALL SIGNIFICANCE OF IMPACT

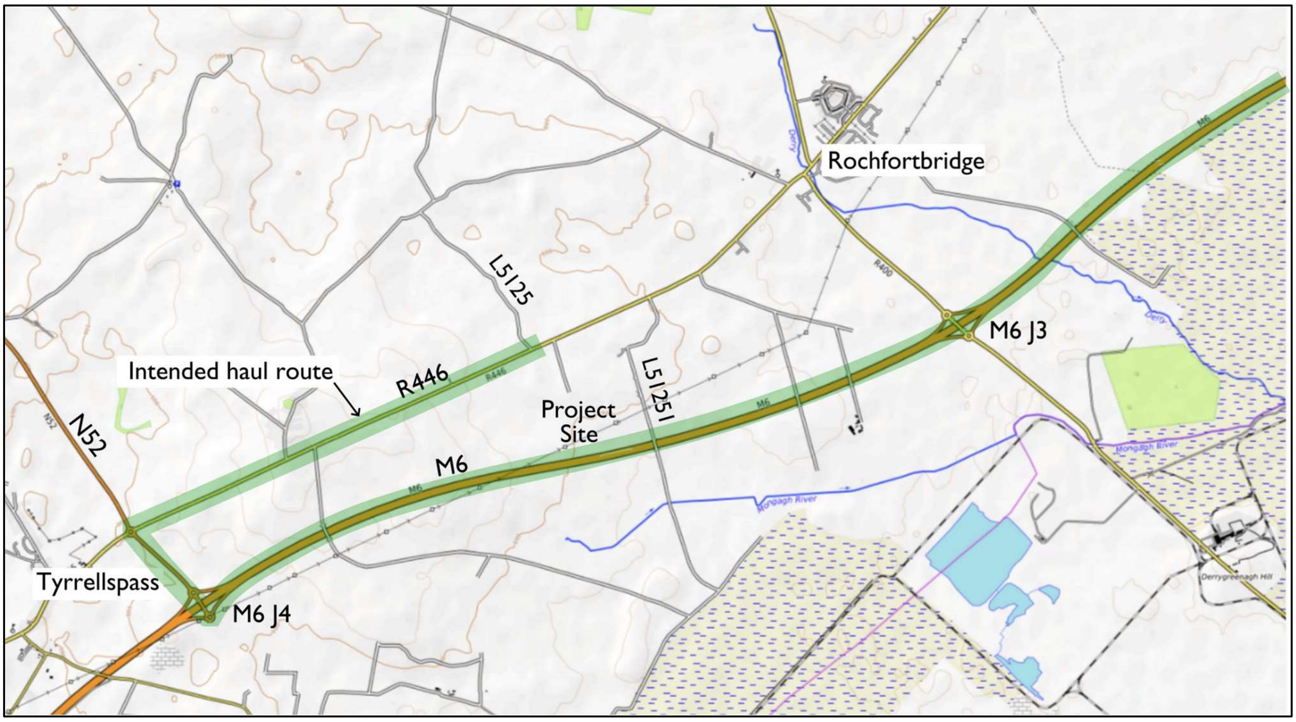
Based on the landscape and visual impact judgements provided throughout this LVIA, the proposed developments are not considered to give rise to any significant residual impacts. Instead, the proposed developments are generally well screened or otherwise well assimilated within the prevailing landscape pattern.

12 TRAFFIC & TRANSPORT

12.1 INTRODUCTION

This chapter of the EIAR provides an assessment of the traffic and transport related impacts of the proposed Castlelost project. It is proposed that the development lands (Figure 12.1) will be accessed off the R446 Regional Road approximately 3.1km to the east of the N52/R446 junction (located to the east of Tyrrellspass), and immediately to the east of the R446/L5125 junction. A secondary access point to the site is proposed from the L51251 for occasional /emergency attendance by, for example ESB/Eirgrid who as TAO/TSO would require access to the electricity substation and transmission infrastructure.

Figure 12.1 Project Site Location



12.1.1 OVERVIEW OF DEVELOPMENT PROPOSALS

The development proposals comprise the following three projects:

<u>LEL Flexgen Castlelost:</u> Proposed gas-fired reserve generator of 275MW electrical capacity. The project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system. The proposal includes the installation of five (5no.) dry low emission (DLE) gas turbines, associated stack(s), raw water/fire water tank, fire water retention basin, back-up fuel tank, emergency generator, gas receiving station (AGI), low, medium

and high voltage transformers, customer control room, and all ancillary electrical plant and delivery systems. GNI will separately manage the process of delivering the underground natural gas pipeline to the proposed site.

LEL GIS Castlelost Project: Proposed 220kV Gas Insulated Switchgear (GIS) Electrical Substation. The project will involve installation of two (2 no.) 220 kV underground circuits forming a connection to the existing Shannonbridge-Maynooth 220 kV overhead line (located within the development boundary) and two (2no.) 220 kV underground circuits and associated low voltage and communication underground cabling connecting the proposed substation with electricity transformers on the adjacent reserve gas-fired generator (Project 1) and ESS (Project 3) sites, and all associated and ancillary site development works. The GIS substation itself includes a two storey, 17m high building (housing electrical switchgear, a battery room, a workshop room, and WC), transformer bay(s), access roadway and all ancillary site development works.

LEL ESS Castlelost Project: Proposed Energy Storage System (ESS) using vanadium flow battery (VFB) technology and synchronous condenser. The battery energy storage system (BESS) will comprise a cluster of battery modules positioned within a dedicated BESS outdoor compound. Each module will consist of (i) a battery container (6.1m long container) housing pumps and heat exchangers positioned on top of two (ii) tank (electrolyte) enclosures (12.2m long containers). An associated battery management system (BMS) and medium voltage power station (MVPS) enclosure will also form part of the battery module. The BMS will monitor and control electrolyte circulation and the MVPS is provided to condition the power generated. The synchronous condenser comprises a rotating generator positioned within a building. The generator is connected to the transmission system via a step-up transformer. When the generator has reached an operating speed that is synchronous to the system frequency, it is synchronised with the transmission network and acts as a motor providing reactive and short circuit power to the electricity network. A customer (IPP) building will also be installed within the ESS compound, and it will house electrical switchgear, store, control room, welfare facilities and administration facilities.

12.2 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

The methodology adopted for the preparation of the assessment and chapter of the EIAR is detailed below.

12.2.1 LEGISLATION AND GUIDANCE

Relevant guidance on assessing the impact of a development on roads, traffic and transport is contained within: the TTA guidelines produced by Transport Infrastructure Ireland (TII)[1]; and, the Environmental Protection Agency (EPA) Guidelines on the information to be contained in Environmental Impact Assessment Reports[2]. The latter states that traffic impact should be assessed for the construction phase, operational phase, and for unplanned events such as traffic collisions (road safety).

12.2.2 APPROACHES TO ASSESSMENT

The roads, traffic and transport impacts of the proposed development have been assessed by utilising the following approach based on the prevailing (TII) guidelines on Traffic and Transport Assessment (TTA) (May 2014). The assessment combines:

- desktop study, for example of traffic collisions;
- site based field work, for example traffic counts and on-site geometric measurement;
- traffic modelling, including:
  - the factoring of traffic count data to construction, opening and future assessment years;
  - predicting the number of daily and peak hour trips during the construction and operational phases of the development;
  - using this aforementioned information to model the capacity of the site access junction using the PICADY traffic modelling software package;
- reviewing the environmental impact of traffic related to the operation and decommissioning of the proposed development, including road safety; and,
- developing a mitigation strategy to ensure that any potential roads, traffic and transport effects are kept to a minimum.

12.2.3 CONSULTATIONS

A technical scoping request in relation to the intended content of this chapter was issued to both Transport Infrastructure Ireland and Westmeath County Council on 8th August 2021. Transport Infrastructure Ireland responded on 10th August 2021 advising that '*Transport Infrastructure Ireland is not a planning authority*' and that '*accordingly, your request should be made to the planning authority concerned*'. No response was received from Westmeath County Council.

12.2.4 SIGNIFICANCE CRITERIA

The main significance criteria when assessing traffic impact is the performance of affected junctions. Other criteria include, for example: any increase in road traffic collisions (which may result in environmental impacts due to spillage); likely damage to the road structure; and measurable increases in noise and atmospheric pollutants.

12.2.4.1 Traffic Impact

Traffic impact is typically assessed in terms of the impact of the traffic generated by a development on the operation of the local road network. Threshold levels for an increase in traffic volumes requiring assessment are typically ten percent for local roads, although it is usual to assess the performance of any access junction as the point of maximum impact, to ensure that the junction is capable of operating within capacity inclusive of the traffic generated by the development. Traffic modelling software is used to facilitate this assessment. The assessment results in a Ratio of Flow to Capacity (RFC) which is a measure of junction performance in terms of saturation. A value of 1.00, which can also be considered as 100% saturation, represents an arm of the junction operating at maximum capacity, in that any increase in the rate of vehicles arriving on the link will result in significant additional queue lengths. Traditionally a figure of 0.85 or 85% is the maximum acceptable degree of saturation when assessing priority junctions, with anything above this level considered to be congested. The assessment also takes account of queue lengths, measured in Passenger Car Units (PCUs) which are primarily used to check for blocking back through, and therefore impact on, adjacent junctions.

12.2.4.2 Road Structure Impact

Road structure impact is initially assessed by a simple visual inspection for cracking, deformation, and disintegration in the vicinity of the site. If following this visual assessment and taking account of the types and volumes of traffic likely to be generated from a proposed development, the structural ability of the road to carry the traffic is in question, tests can be undertaken to determine the structural strength of the carriageway. Current guidance for such testing is detailed in the TII publication '*Pavement Assessment, Repair and Renewal Principles*' Ref. AM-PAV-06050[3] published in March 2020.

12.2.4.3 Traffic Noise Impact

The noise impact of the LEL Flexgen Castlelost project is presented in Chapter 10 of this EIAR.

12.2.4.4 Traffic Related Atmospheric Impact

The air quality impact of the projects is presented in Chapter 8 of this EIAR.

12.3 DESCRIPTION OF RECEIVING ENVIRONMENT

As noted with section 12.1, the project site is to be accessed from the R446 regional road. Prior to the opening of the M6 motorway, this section of the R446 was part of the N6 national road linking Dublin to Galway. The R446 has a sealed width of approximately 11.85m comprising eastbound and westbound running lanes and hard shoulders on both sides of the carriageway (Plate 12.1). The posted speed limit on this section of the R446 is 100km/h, which is consistent with current national guidelines on setting speed limits [7]. Rochfortbridge is located 2.1km to the east of the Castlelost project site and Tyrrellspass is located 3.7km to the west of the Castlelost project site. The intended haul route does not pass through either Rochfortbridge or Tyrrellspass.

Plate 12.1 The R446 Regional Road at the Location of the Proposed Project Access Junction

12.3.1 TRAFFIC VOLUMES

An automatic traffic count was undertaken on 9th and 10th September 2021 on the R446 at the location of the proposed project site access junction. This traffic count was undertaken by TTRSA using a Metrocount RoadPodVT vehicle classifier. In a 24-hour period, the traffic count recorded 1,021 vehicles in an eastbound direction and 1,022 vehicles in a westbound direction.

Video-based manual classified turning counts were also undertaken on 9th September 2021, at the R446/L5125 and R446/L51251 junctions, for the AM traffic peak hour of 08:00-08:59 and PM traffic peak hour of 17:00-17:59.

Summary traffic count data is provided within Appendix 12.1.

12.3.2 COMPARISON OF PERMANENT TRAFFIC COUNT DATA FOR FACTORING PURPOSES

Data from the permanent Transport Infrastructure Ireland traffic counter site on the N52 at Tyrrellspass (Site 20522) was compared for:

- the pre-COVID-19 period of 12th and 13th September 2019, and traffic survey period of 9th and 10th September 2021, revealing that traffic volumes on the N52 on the survey dates in 2021 was approximately 4% high than in 2019, similar to the change anticipated by TII growth factors for this period[8].
- the traffic survey period of 9th and 10th September 2021, and previous annual average daily traffic (AADT) volumes, revealing that traffic levels on the survey dates were approximately 20% higher than the 2019 AADT, the highest AADT recorded to date.

On this basis, the data collected on 9th and 10th September 2021 is considered to be robust and no additional factoring has been applied to take account of COVID-19 travel restrictions or seasonality.

12.3.3 BACKGROUND TRAFFIC GROWTH

The peak construction traffic impact for the LEL Flexgen Castlelost and LEL GIS Castlelost projects is predicted to be 2023, and for the LEL ESS Castlelost project is predicted to be 2024. Whilst it is predicted that the LEL Flexgen Castlelost and LEL GIS Castlelost projects will be operational in 2024, it is envisaged that the LEL ESS Castlelost project would not be operation until Q1 of 2025, therefore a common opening year of 2025 has been used for the traffic assessment contained within this chapter. Traffic count data has been factored from the base year of 2021, to the construction years of 2024 and 2025, the opening year of 2025, and future assessment years of 2030 and 2040, using central growth rates for County Westmeath, taking account of 2.1% heavy commercial vehicles, as included within the TII publication '*Traffic Demand Projections*' Ref. PE-PAG-02017[8] published in May 2019. The growth rates applied being:

- 2021 to 2023, a growth factor of 1.033;
- 2021 to 2024, a growth factor of 1.050;
- 2021 to 2025, a growth factor of 1.067;
- 2021 to 2030, a growth factor of 1.147; and,
- 2021 to 2040, a growth factor of 1.222.

12.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

12.4.1 LEL FLEXGEN CASTLELOST ASSESSMENT

This section assesses the impact of the LEL Flexgen Castlelost project in isolation from the LEL GIS Castlelost and LEL ESS Castlelost projects.

12.4.1.1 Construction phase impact

Traffic Impact

Construction related personnel vehicle movements associated with the LEL Flexgen Castlelost project have been assigned 50% to/from the east and 50% to/from the west on the R446 at the project access junction, representative of the overall traffic flow on the R446. A vehicle occupancy of 1.5 persons per vehicle has been assumed for construction related personnel and 75% of arrivals and departures have been assumed to occur within the peak hour. Heavy goods vehicle movements have been assigned on the R446 to and from the west, as per the intended haul route depicted in Figure 12.1, and 15% of such movement have been assumed to occur within the peak hour. As the traffic modelling is based on PCUs, heavy goods vehicles are factored by 2.3 within the data input into the traffic model. The trip generation of the construction and operational phases of the LEL Flexgen Castlelost project are detailed in Appendix 12.2, and the assigned peak hour turning movements are detailed in Appendix 12.3. The modelling output for LEL Flexgen Castlelost project site access junction in the 2023 AM and PM peak hours is summarised in Table 12.1 below and provided in detail in Appendix 12.4. The output shows that the proposed junction will have no material impact on the operation of the R446 at this location, the maximum queue being 0.2 PCUs with the proposed site access junction having 93% spare capacity in the AM peak hour and 86% spare capacity in the PM peak hour.

Table 12.1 LEL Flexgen Castlelost project access junction operation in 2023 with construction traffic

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2023 Flexgen Castlelost Construction									
Stream B-ACD	D1	0.0	0.00	0.00	A	D5	0.0	0.00	0.00	A
Stream AB-CD		0.1	5.54	0.07	A		0.0	5.08	0.01	A
Stream D-ABC		0.0	0.00	0.00	A		0.2	6.73	0.14	A
Stream CD-AB		0.0	5.20	0.01	A		0.0	5.01	0.01	A

Road Structure Impact

The R446 was constructed as a national road capable of withstanding higher than current traffic volumes. No significant visual defects within the immediate vicinity of the proposes site access junction were observed during a site visit on 9th September 2021. The level of traffic anticipated to be generated by the LEL Flexgen Castlelost project would not be anticipated to impact significantly on the road structure of the R446.

The Road Safety Authority collision mapping 'Collstats'[9] shows no collisions resulting in injury have been reported on the relevant section of the R446, nor the L51251, between the opening of the relevant section of the M6 motorway in 2006 and 2016 (the latest date for which information is available). The site access junction off the R446 has been subjected to a Stage 1 Road Safety Audit. The TII reference collision rate for two-lane rural roads is currently 6.797 collisions per 100 million km travelled [10]. Based on the number of trips generated by the project (Appendix 12.2), and the typical length of such trips, no measurable road safety impact is predicted to result from the LEL Flexgen Castlelost project subject to the recommendations within the Road Safety Audit, included as Appendix 12.5, being implemented.

Traffic Noise Impact

The noise impact of the LEL Flexgen Castlelost project is presented in Chapter 10 of this EIAR.

Traffic Related Atmospheric Pollutant Impact

The air quality impact of the LEL Flexgen Castlelost project has been considered further in Chapter 8 of this EIAR.

12.4.1.2 Operational Stage Impact

As there will be minimal traffic movements associated with the 20 operatives involved in the operation of the LEL Flexgen Castlelost project, assuming that the access road and access junction are maintained, there will be no measurable traffic related environmental impacts during the operational phase of the project.

12.4.2 LEL GIS CASTLELOST ASSESSMENT

This section assesses the impact of the LEL GIS Castlelost project in isolation from the LEL Flexgen Castlelost and LEL ESS Castlelost projects.

12.4.2.1 Construction Stage Impact

Traffic Impact

Construction related personnel vehicle movements associated with the LEL GIS Castlelost project have been assigned 50% to/from the east and 50% to/from the west on the R446 at the project access junction, representative of the overall traffic flow on the R446. A vehicle occupancy of 1.5 persons per vehicle has been assumed for construction related personnel and 75% of arrivals and departures have been assumed to occur within the peak hour. Heavy goods vehicle movements have been assigned on the R446 to and from the west, as per the intended haul route depicted in Figure 12.1, and 15% of such movement have been assumed to occur within the peak hour. As the traffic modelling is based on PCUs, heavy goods vehicles are factored by 2.3 within the data input into the traffic model. The trip generation of the construction and operational phases of the LEL GIS Castlelost project are detailed in Appendix 12.2, and the assigned peak hour turning movements are detailed in Appendix 12.3. The modelling output for LEL GIS Castlelost project site access junction in the 2023 AM and PM peak hours is summarised in Table 12.2 below and provided in detail in Appendix 12.4. The output shows that the proposed junction will have no material impact on the operation of the R446 at this location, the maximum queue being 0.5 PCUs with the proposed site access junction having 98% spare capacity in the AM peak hour and 95% spare capacity in the PM peak hour.

Table 12.2 LEL GIS Castlelost project access junction operation in 2023 with construction traffic

	AM					PM				
	Set ID	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**	**Set ID**	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**
	2023 GIS Castlelost Construction									
Stream B-ACD	D2	0.0	0.00	0.00	A	D6	0.0	0.00	0.00	A
Stream AB-CD		0.0	5.24	0.02	A		0.0	5.07	0.00	A
Stream D-ABC		0.0	0.00	0.00	A		0.1	6.09	0.05	A
Stream CD-AB		0.0	5.16	0.01	A		0.0	5.10	0.01	A

Road Structure Impact

The R446 was constructed as a national road capable of withstanding higher than current traffic volumes. No significant visual defects within the immediate vicinity of the proposes site access junction were observed during a site visit on 9th September 2021. The level of traffic anticipated to be generated by the LEL GIS Castlelost project would not be anticipated to impact significantly on the structure of the R446.

Traffic Noise Impact

The noise impact of the LEL GIS Castlelost project has been considered further in Chapter 10 of this EIAR.

Traffic Related Atmospheric Pollutant Impact

The air quality impact of the LEL ESS Castlelost project is presented in Chapter 8 of this EIAR.

12.4.2.2 Operational Stage Impact

As there will be negligible traffic movements associated with the operation of the GIS Castlelost project, there will be no measurable traffic related environmental impacts during the operational phase of the project.

12.4.3 LEL ESS CASTLELOST ASSESSMENT

This section assesses the impact of the LEL ESS Castlelost project in isolation from the LEL Flexgen Castlelost and LEL GIS Castlelost projects.

12.4.3.1 Construction Phase Impact

Traffic Impact

Construction related personnel vehicle movements associated with the LEL ESS Castlelost project have been assigned 50% to/from the east and 50% to/from the west on the R446 at the project access junction, representative of the overall traffic flow on the R446. A vehicle occupancy of 1.5 persons per vehicle has been assumed for construction related personnel and 75% of arrivals and departures have been assumed to occur within the peak hour. Heavy goods vehicle movements have been assigned on the R446 to and from the west, as per the intended haul route depicted in Figure 12.1, and 15% of such movement have been assumed to occur within the peak hour. As the traffic modelling is based on PCUs, heavy goods vehicles are factored by 2.3 within the data input into the traffic model. The trip generation of the construction and operational phases of the LEL ESS Castlelost project are detailed in Appendix 12.2, and the assigned peak hour turning movements are detailed in Appendix 12.3. The modelling output for LEL ESS Castlelost project site access junction in the 2023 AM and PM peak hours is summarised in Table 12.3 below and provided in detail in Appendix 12.4. The output shows that the proposed junction will have no material impact on the operation of the R446 at this location, the maximum queue being 0.1 PCUs with the proposed site access junction having 95% spare capacity in the AM peak hour and 91% spare capacity in the PM peak hour.

Table 12.3 GIS Castlelost project access junction operation in 2024 with construction traffic

	AM					PM				
	Set ID	Queue (PCU)	Delay (s)	RFC	LOS	Set ID	Queue (PCU)	Delay (s)	RFC	LOS
	2024 ESS Castlelost Construction									
Stream B-ACD	D3	0.0	0.00	0.00	A	D7	0.0	0.00	0.00	A
Stream AB-CD		0.1	5.36	0.05	A		0.0	5.07	0.00	A
Stream D-ABC		0.0	0.00	0.00	A		0.1	6.39	0.09	A
Stream CD-AB		0.0	5.18	0.01	A		0.0	5.06	0.01	A

Road Structure Impact

The R446 was constructed as a national road capable of withstanding higher than current traffic volumes. No significant visual defects within the immediate vicinity of the proposes site access junction were observed during a site visit on 9th September 2021. The level of traffic anticipated to the generated by the LEL ESS Castlelost project would not be anticipated to impact significantly on the structure of the R446.

Road Safety Impact

The road safety impact of the LEL ESS Castlelost project in isolation will be as detailed in Section 12.4.1.1.3 in relation to the LEL Flexgen Castlelost project, no measurable road safety impact is predicted to result from the LEL ESS Castlelost project subject to the recommendations within the Road Safety Audit being implemented.

Traffic Noise Impact

The noise impact of the LEL GIS Castlelost project has been considered further in Chapter 10 of this EIAR.

Traffic Related Atmospheric Pollutant Impact

The air quality impact of the LEL ESS Castlelost project is presented in Chapter 8 of this EIAR.

12.4.3.2 Operational Phase Impact

As there will be minimal traffic movements associated with the five operatives involved in the operation of the LEL ESS Castlelost project, assuming that the access road and access junction are maintained, there will be no measurable traffic related environmental impacts during the operational phase of the project.

12.5 MITIGATION MEASURES

As the proposed project site access and project access junction are common to all potential elements of the Castlelost projects, the mitigation measures proposed are also consistent between the individual projects.

12.5.1 LEL FLEXGEN CASTLELOST MITIGATION

The following mitigation measures are proposed should the LEL Flexgen Castlelost project be granted permission.

- There is the potential for debris from the site to be carried by vehicles onto the adjacent road network. It is recommended that all vehicles exiting the LEL Flexgen

Castlelost site should pass through a wheel wash facility in reasonable proximity to the project access junction.
- The recommendations contained with the Stage 1 Road Safety Audit contained in Appendix 12.5 should be implemented in full.

12.5.2 LEL ESS CASTLELOST MITIGATION

The following mitigation measures are proposed should the LEL ESS Castlelost project be granted permission.

- There is the potential for debris from the site to be carried by vehicles onto the adjacent road network. It is recommended that all vehicles exiting the LEL ESS Castlelost site should pass through a wheel wash facility in reasonable proximity to the project access junction.
- The recommendations contained with the Stage 1 Road Safety Audit contained in Appendix 12.5 should be implemented in full.

12.5.3 LEL GIS CASTLELOST MITIGATION

The following mitigation measures are proposed should the LEL GIS Castlelost project be granted permission.

- There is the potential for debris from the site to be carried by vehicles onto the adjacent road network. It is recommended that all vehicles exiting the LEL GIS Castlelost site should pass through a wheel wash facility in reasonable proximity to the project access junction.
- The recommendations contained with the Stage 1 Road Safety Audit contained in Appendix 12.5 should be implemented in full.

12.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

Assuming that the mitigation measures detailed in Section 12.5 are implemented, no residual impact is anticipated from the development of the LEL Flexgen Castlelost, LEL GIS Castlelost or LEL ESS Castlelost Projects.

12.7 CUMULATIVE EFFECTS INCLUDING GAS PIPELINE CONNECTION

This section assesses the cumulative impact of all elements of the Castlelost projects progressing simultaneously, including the underground natural gas pipeline connection which will serve the LEL Flexgen Project.

12.7.1 CONSTRUCTION STAGE

12.7.1.1 Gas Pipeline Connection

As part of the LEL Flexgen Castlelost project, natural gas will be supplied to the site from the Gas Networks Ireland (GNI) transmission system. GNI will separately manage the process of delivering the underground natural gas pipeline to the proposed site. The traffic and transport impact of the delivery of the pipeline (utility works) is considered to be negligible as any utility works of this type involving for example road crossings, would be undertaken in accordance with the terms of an agreed road opening licence, and appropriate Temporary Traffic Management, which should be designed and operated in accordance with prevailing national guidance [11, 12, 13].

12.7.1.2 Traffic Impact

The traffic modelling output for the cumulative impact on the LEL Castlelost project access junction in the 2023 AM and PM peak hours, of all elements of the LEL Castlelost projects progressing simultaneously is summarised in Table 12.4 below and provided in detail in Appendix 12.4. The output shows that the proposed junction will have no material impact on the operation of the R446 at this location, the maximum queue being 0.3 PCUs with the junction having 86% spare capacity in the AM peak hour and 75% spare capacity in the PM peak hour.

Table 12.4 Cumulative Castlelost project access junction operation in 2023 with construction traffic

	2023 Cumulative Castlelost Construction									
Stream B-ACD	D4	0.0	0.00	0.00	A	D8	0.0	0.00	0.00	A
Stream AB-CD		0.2	6.03	0.14	A		0.0	5.12	0.02	A
Stream D-ABC		0.0	5.12	0.02	A		0.3	7.74	0.25	A
Stream CD-AB		0.0	5.21	0.01	A		0.0	0.00	0.00	A

12.7.1.3 Road Structure Impact

The cumulative impact of the traffic predicted to the generated by the combination of the elements of the Castlelost project would not be anticipated to impact on the road structure of the R446.

12.7.1.4 Road Safety Impact

No measurable road safety impact is predicted to result from the combination of the elements of the Castlelost project subject to the recommendations within the Road Safety Audit being implemented.

12.7.1.5 Traffic Noise Impact

The noise impact of the projects has been considered further in Chapter 10 of this EIAR.

12.7.1.6 Traffic Related Atmospheric Pollutant Impact

The air quality impact of the LEL ESS Castlelost project is presented in Chapter 8 of this EIAR.

12.7.2 OPERATIONAL STAGE

The traffic impact of the combination of the elements of the Castlelost project is considerably reduced during the operational phase of the project when compared to the construction phased of the project. Therefore, no significant traffic and transport related environmental impacts are predicted.

12.8 MONITORING AND FURTHER WORKS

No specific monitoring is recommended beyond mandatory health and safety monitoring required for any workplace. Depending on the axle loading of construction related vehicles and/or abnormal loads, further tests to determine the structural strength of the R446 carriageway, or further visual inspections prior to and post construction, should be undertaken, if necessary, in agreement with Westmeath County Council.

It is recommended that if granted permission, the detailed design of the project site access junction and access road is subjected to a Stage 2 Road Safety Audit prior to construction.

12.9 SUMMARY OF SIGNIFICANT EFFECTS

Based on the predicted trip generation, assessment contained within this chapter, and implementation of the recommended mitigation measures, no significant environmental effects are predicted as a result of the traffic and transport associated with the Castlelost project.

12.10 REFERENCES

- [1] Transport Infrastructure Ireland (2014) PE-PDV-02045 Traffic and Transport Assessment Guidelines
- [2] Environmental Protection Agency (2017) Guidelines on the information to be contained in Environmental Impact Assessment Reports
- [3] Transport Infrastructure Ireland (2020) AM-PAV-06050 Pavement Assessment, Repair and Renewal Principles

- [4] Transport Infrastructure Ireland (2017) GE-STY-01024 Road Safety Audit' (standard)
- [5] Transport Infrastructure Ireland (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes
- [6] WHO (2000) Air quality guidelines for Europe, 2nd edition
- [7] DTTAS (2015) Guidelines for Setting and Managing Speed Limits in Ireland
- [8] Transport Infrastructure Ireland (2019) PE-PAG-02017 Traffic Demand Projections
- [9] Road Safety Authority Collstats [https://rsa.ie/RSA/Road-Safety/RSA-Statistics/Collision-Statistics/Ireland-Road-Collisions/] *accessed on 14th September 2021*
- [10] Transport Infrastructure Ireland Network Safety Analysis Collision Rates by Reference Population [https://www.tii.ie/technical-services/safety/road-safety/network-safety-ranking/Avg_CollisionRates.pdf] *accessed on 14th September 2021*
- [11] DTTAS (2019) Traffic Signs Manual - Chapter 8 Temporary Traffic Measures and Signs for Roadworks
- [12] DTTAS (2019) Temporary Traffic Management Design Guidance
- [13] DTTAS (2019) Temporary Traffic Management Operations Guidance (Part 2)

13 ARCHAEOLOGY & CULTURAL HERITAGE

13.1 INTRODUCTION

This Chapter of the EIAR presents a cultural heritage impact assessment of the development proposals (for clarity the LEL Flexgen Castlelost, LEL ESS Castlelost and LEL GIS Castlelost Projects) on lands at Kiltotan, Collinstown and Oldtown, Co. Westmeath.

The overall Proposed Development Area (PDA) is located roughly 2km from Rochfortbridge, Co. Westmeath. The PDA is in a series of green fields comprising of improved pastureland in the townlands of Kiltotan, Collinstown and Oldtown bordered to the south by the M6. There are no recorded monuments (registered as an RMP or SMR) within the boundaries of the subject site.

The development proposals comprise the following three projects:

<u>LEL Flexgen Castlelost:</u> Proposed gas-fired reserve generator of 275MW electrical capacity. The project will combust natural gas supplied from the Gas Networks Ireland (GNI) transmission system. The proposal includes the installation of five (5no.) dry low emission (DLE) gas turbines, associated stack(s), raw water/fire water tank, fire water retention basin, back-up fuel tank, emergency generator, gas receiving station (AGI), low, medium and high voltage transformers, customer control room, and all ancillary electrical plant and delivery systems. GNI will separately manage the process of delivering the underground natural gas pipeline to the proposed site.

<u>LEL GIS Castlelost Project:</u> Proposed 220kV Gas Insulated Switchgear (GIS) Electrical Substation. The project will involve installation of two (2 no.) 220 kV underground circuits forming a connection to the existing Shannonbridge-Maynooth 220 kV overhead line (located within the development boundary) and two (2no.) 220 kV underground circuits and associated low voltage and communication underground cabling connecting the proposed substation with electricity transformers on the adjacent reserve gas-fired generator (Project 1) and ESS (Project 3) sites, and all associated and ancillary site development works. The GIS substation itself includes a two storey, 17m high building (housing electrical switchgear, a battery room, a workshop room, and WC), transformer bay(s), access roadway and all ancillary site development works.

<u>LEL ESS Castlelost Project:</u> Proposed Energy Storage System (ESS) using vanadium flow battery (VFB) technology and synchronous condenser. The battery energy storage system (BESS) will comprise a cluster of battery modules positioned within a dedicated BESS outdoor compound. Each module will consist of (i) a battery container (6.1m long

container) housing pumps and heat exchangers positioned on top of two (ii) tank (electrolyte) enclosures (12.2m long containers). An associated battery management system (BMS) and medium voltage power station (MVPS) enclosure will also form part of the battery module. The BMS will monitor and control electrolyte circulation and the MVPS is provided to condition the power generated. The synchronous condenser comprises a rotating generator positioned within a building. The generator is connected to the transmission system via a step-up transformer. When the generator has reached an operating speed that is synchronous to the system frequency, it is synchronised with the transmission network and acts as a motor providing reactive and short circuit power to the electricity network. A customer (IPP) building will also be installed within the ESS compound, and it will house electrical switchgear, store, control room, welfare facilities and administration facilities.

13.1.1 SCOPE OF WORK

This study aims to assess the baseline archaeological, architectural, and cultural heritage environment (hereafter referred to as cultural heritage environment or cultural heritage resource), to evaluate the potential or likely impacts that the proposed development will have on this environment and, where appropriate, to suggest mitigation measures to ameliorate potential impacts, in accordance with the policies of:

- Department of Housing, Local Government and Heritage.
- The National Monuments Acts (1930-2005).
- *Westmeath County* Development Plan; and
- Best practice guidelines.

Following on from this, the residual impact that the proposed scheme will have on the baseline environment is identified and evaluated.

For the purposes of this report the definition of "cultural heritage" is taken broadly from the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972, which considers the following to be "cultural heritage":

- Tangible cultural heritage.
- movable cultural heritage (artefacts).
- immovable cultural heritage (monuments, archaeological sites, etc).
- underwater cultural heritage (shipwrecks, underwater ruins, and cities); and
- Intangible cultural heritage (oral traditions, folklore etc).

This impact assessment addresses Cultural Heritage under the two headings of archaeology and architectural/built heritage.

13.2 ASSESSMENT METHODOLOGY

The methodology used in the preparation of this assessment is broadly based on guidance provided in the National Roads Authority's (NRA) Guidelines for the Assessment of Archaeological Heritage Impacts on National Road Schemes (NRA 2005a), and Guidelines for the Assessment of Architectural Heritage Impacts on National Road Schemes (NRA 2005b) (the 'NRA Guidelines'), which were deemed applicable to the task at hand.

13.2.1 DESKTOP ASSESSMENT

All known cultural heritage sites were reviewed on the Archaeological Survey of Ireland (ASI) along with aerial photography and Ordnance Survey Ireland (OSI) mapping. Sites mapped included the following:

- UNESCO World Heritage Sites including the tentative list of candidate sites.
- National Monuments, be they in the ownership or guardianship of the State, in the ownership of a local authority or monuments under preservation orders.
- Record of Monuments & Places (RMP) and Sites and Monuments Record (SMR) from www.archaeology.ie.
- Records of Protected Structures from *Westmeath County Council*.
- National Inventory of Architectural Heritage (NIAH) for Co. Westmeath; and
- Demesnes Landscapes and Historic Gardens indicated on the OSI First Edition Mapping.

All townlands located within 2km of the proposed development site were listed and crossed referenced with:

- National Monuments, a list for Co. Westmeath available from www.archaeology.ie.
- Preservation Orders, a list available from the National Monuments Service; and
- Lists contained in the Report of the Commissioners or Church Temporalities of Ireland (1879) which contain lists of Churches, School Houses and Graveyards that were vested in the Representative Church Body and the Burial Boards under The Irish Church Act, 1869. These sites which have the potential to be in the ownership of the Local Authorities were highlighted as potential National Monuments.

To assess the potential impact of the proposal the following sources were also consulted or reviewed:

- Excavations Bulletin.
- Topographical files of the National Museum of Ireland.
- Cartographic Sources.
- Toponyms.
- Aerial photographs.
- Published archaeological inventories; and
- Documentary Sources: several literary references were consulted.

13.2.2 TERMS AND DEFINITIONS

13.2.2.1 Cultural Heritage

The phrase 'cultural heritage' is a generic term used to identify a multitude of cultural, archaeological, and architectural sites and monuments. The term 'cultural heritage', in Environmental Impact Statement compliance with Section 2(1) of the Heritage Act (1995), is used throughout this report in relation to archaeological objects, features, monuments and landscapes as well as all structures and buildings which are considered to have historical, archaeological, artistic, engineering, scientific, social or technical significance/merit.

13.2.2.2 Record of Monuments and Places

A feature recorded in the 'Record of Monuments and Places' (RMP) refers to a recorded archaeological site that is granted statutory protection under the National Monuments Act 1930-2004. The RMP is the most widely applying provision of the National Monuments Acts. It comprises a list of recorded monuments and places (resulting from the Archaeological Survey of Ireland [ASI]) and accompanying maps on which such monuments and places are shown for each county. The information contained within the RMP is derived from the earlier non-statutory Sites and Monuments Record (SMR). However, some entries were not transferred to the statutory record as they refer to features that on inspection by the Archaeological Survey were found not to merit inclusion in that record or could not be located with sufficient accuracy to be included. Such sites however remain part of the SMR. The record is a dynamic one and is updated to take account of on-going research.

When reference is made to the distance between an RMP and the proposed development site, this relates to the minimal distance separating the site from the known edge of the RMP. Where the edge of the RMP is not precisely known, the distance relates to that which separates the site from the boundary of the RMP zone of archaeological potential as represented on the respective RMP map; where this is applied, it is stated accordingly.

13.2.2.3 Sites and Monuments Record

The Sites and Monuments Record (SMR) is an inventory of the known archaeological monuments in the State. There are more than 150,800 records in the database and over 138,800 of these relate to archaeological monuments.

An *'area of archaeological potential'* refers to an area of ground that is deemed to constitute one where archaeological site, features or objects may be present in consequence of location, association with identified/recorded archaeological sites and/or identifiable characteristics.

13.2.2.4 Register of Historic Monuments

Section 5 of the 1987 National Monuments Act states that the Minister is required to establish and maintain a Register of Historic Monuments. Historic monuments and archaeological areas present on the register are afforded statutory protection under the 1987 Act. Any interference with sites recorded in the Register without the permission of the Minister is illegal, and two months' notice in writing is required prior to any work being undertaken on or in the vicinity of a registered monument. This list was largely replaced by the Record of Monuments and Places following the 1994 Amendment Act.

13.2.3 WESTMEATH COUNTY DEVELOPMENT PLAN 2021-2027

The *Westmeath County Development Plan (2021-2027)* was reviewed to obtain a comprehensive understanding of the cultural heritage of the area. The development plans contain lists of cultural heritage sites including national monuments, recorded monuments, architectural conservation areas, protected structures, and protected views as well as baseline assessments of the landscape character of the county.

The plans also outline the county's heritage policies and objectives that aim to protect and promote the archaeological, architectural, and cultural heritage of the region. This evaluation was carried out with due regard to these policies and other relevant information contained within the plans. The Rochfortbridge Village Plan was also reviewed.

The relevant policies and objectives for Archaeological, Architectural and Cultural Heritage management were reviewed.

These policies and objectives are outlined in Chapter 14 of the County Development Plan.

13.3 DESCRIPTION OF RECEIVING ENVIRONMENT

13.3.1 LOCATION DETAILS

The site is in the townlands of Kiltotan and Collinstown, and Oldtown, Co. Westmeath and for the purposes of the baseline assessment was accessed to the east via a farm lane to the west of local road L51521, and via a farm lane to south of the R446. The site is on a slight sloping south facing pasture.

Table 13.6 Location Details

County and town	Westmeath
Street	NA
Townland	Kiltotan and Collinstown, Oldtown
Archaeological Monuments	None within subject site boundary. The recorded sites and monuments in the vicinity of the site are listed in Section 13.3.3.
Architectural Sites	None as listed by the National Inventory of Architectural Heritage (NIAH) or RPS within the site boundary.
ITM	Centred on 645219 / 738941

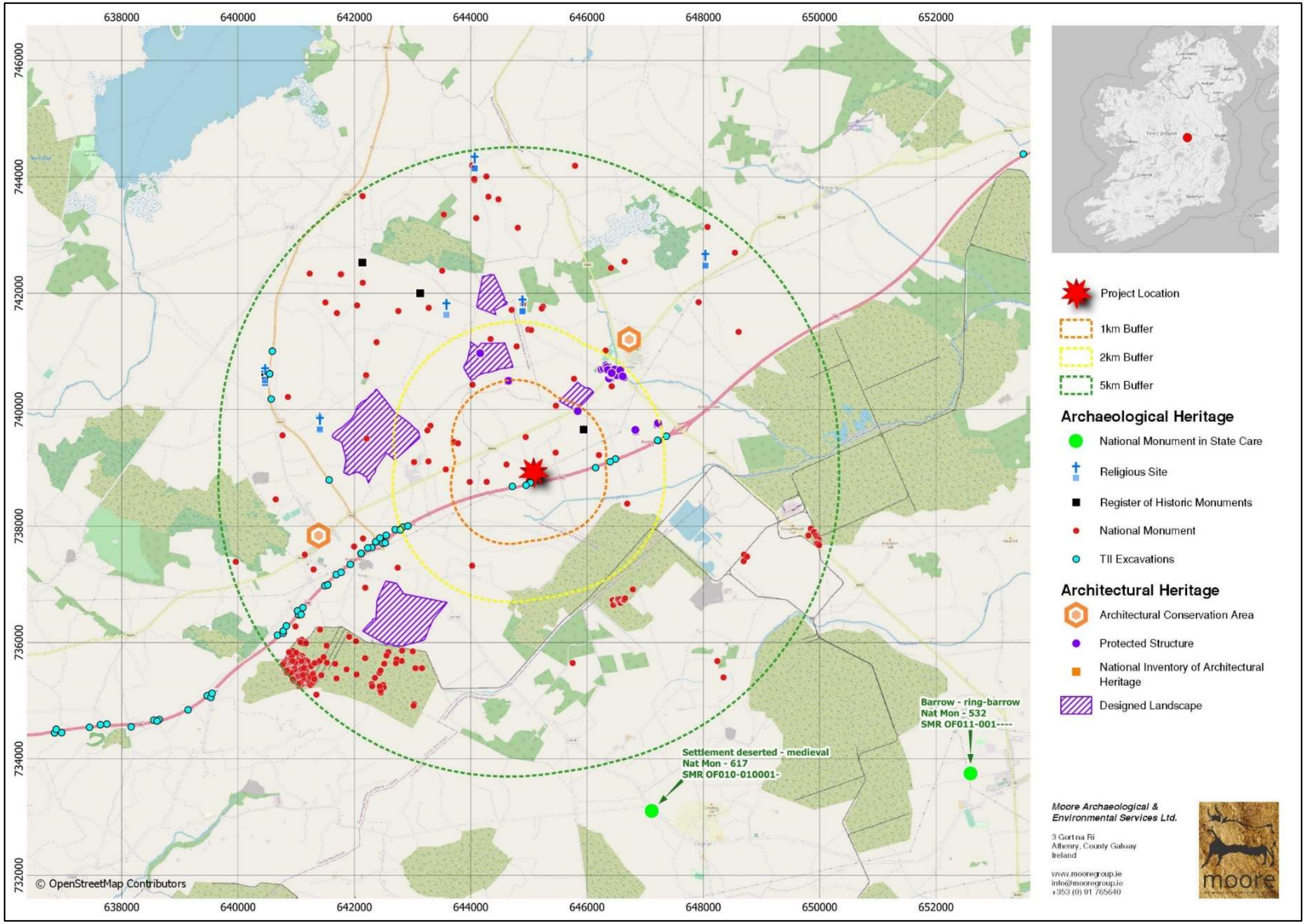
13.3.2 ARCHAEOLOGICAL, ARCHITECTURAL AND HISTORICAL BACKGROUND

13.3.2.1 General Background

Some of the informed presented below derives from the original EIS report related to the recently constructed M6 (Riada Consult 2003) as well as related excavation reports. The subject site is in a rich multi-period archaeological landscape and recent excavations along the route of new M6 road have added significantly to the known cultural heritage resource of the surrounding area. The landscape in the area is typified by regular enclosed fields, bordered by densely overgrown banks with mature hedgerows of ash, elder and hawthorn with areas of raised bogland.

The wider area is associated with ancient routeways of unknown date; a large togher discovered by R.A.S. Macalister in the townland of Baltigeer *ca.* 10km to the east in the 1930s may possibly have linked up with the Slighe Dala or Slí Asail, two ancient routeways which led to Tara and Connacht. One of the five great ancient roads of Ireland, the Slí Mór, is also thought to have passed through the area.

Figure 93.1 Showing location of Proposed Development Area (PDA) and surrounding cultural heritage features



13.3.2.2 Mesolithic Period

The Mesolithic (middle stone age) people were the first inhabitants of Ireland, arriving about 9000 years ago (c.6000BC – 4000 BC). They were a mobile society relying on wild resources for food which was hunted and gathered using stone tools as well as boats, nets, and traps. Settlement was in temporary and semi-permanent groups of huts constructed of wood slung with hide which may have operated as seasonal or hunting camps.

In many cases, the edges of coastal estuarine areas were the preferred location of Mesolithic settlement. The earliest evidence of occupation in the general area comprises a stray Mesolithic Bann flake found in the townland of Rattin roughly 10km east of the subject site.

13.3.2.3 Neolithic Period

Farming was first adopted in the Middle East but spread gradually across Europe in succeeding centuries, arriving in Ireland about 4000 BC. Tending of crops and animals required a more sedentary lifestyle and larger permanent settlements were built. The megalithic (from the Greek mega – large and lith – stone) monuments of the Neolithic people built as communal tombs or for ceremonial purposes, are relatively common in the landscape. New methods were adopted for shaping stone tools and the first long distance trade networks were established.

The sole evidence for human habitation in this area is represented by the discovery of a stone axe, potentially of Neolithic date which was also found in Rattin townland.

13.3.2.4 The Bronze Age/ Iron Age/Early and Later Historic Period

As stone tools were replaced using copper, later combined with tin to make bronze, the structure of society also changed over centuries. While some communal megalithic monuments, particularly wedge tombs continued to be used, the Bronze Age is characterised by a movement towards single burial and the production of prestige items and weapons, suggesting that society was increasingly stratified and warlike. In late Bronze Age Ireland, the use of the metal reached a high point with the production of high-quality decorated weapons, ornament, and instruments, often discovered from hoards or ritual deposits.

The earliest known evidence of settlement in the general area is represented by an Early Bronze Age (c. 2500-1500 BC) togher discovered by the Irish Archaeological Wetland Unit in the townland of Rattin (IAWU 2001). Finds from the area include a socketed bronze axe head from the Late Bronze Age (1936:1873 NMI) which was recovered near Kinnegad townland (exact location unknown). Bronze Age burnt mounds are also reasonably common - A burnt mound was excavated at Kiltotan and Collinstown along with and an anomalous pit which produced a Middle-Late Bronze Age radiocarbon date during works in advance of the M6 to the south of the subject site.

There is a general lack of evidence from the Iron Age (500 BC-500 AD) in the Irish archaeological record. Iron objects are found rarely but there is no evidence for the warrior culture of the rest of Europe although the distinctive La Tené style of art with animal motifs and spirals was adopted. Life in Iron Age in Ireland seems to have been much as it was in the early historic period – mixed farmers living in or around small, defended settlements known as ringforts or stone cashels. A site excavated in advance of construction of the M6 at Monganstown 1 produced two Iron Age radiocarbon dates from metalworking contexts.

The record of Early Historic activity (c. 1100-1650 AD) in the study area and the surrounding area is testified by the numerous early monastic site and churches. These sites include the ancient monastic site founded at Clonfad (WM27: 067, WM27: 066) which survived into the eight century AD. Sites with evidence for craft/industry from this period include charcoal/metalworking pits excavated at a site known as Monganstown 1, which produced two Early Historic radiocarbon dates, and material from a small metalworking pit at Kiltotan Collinstown 14, which also returned an Early Historic date.

The most common settlement monuments of this period are ringforts (also known as rath or lios). These are interpreted as enclosed farmsteads, and they generally consist of a circular ditch outside an earthen bank (constructed with the upcast from the excavation of the ditch). Larger examples may have more than one ditch and a bank forming the enclosure. There are four ringforts located within the immediate vicinity of the overall project area. The nearest, WM033-061, is situated 190mm to the northwest of the subject site and 160m east of the proposed access. East of the site is WM033-068 and to the north is WM033-062, at distances of 260m and 167m respectively. Further west is WM033-066 which is roughly 360m distance. The preponderance of ringforts and enclosures in the general area suggests that it was quite intensely settled during the Early Historic period.

Rochfortbridge, the nearest town to the subject site, is named after the Rochforts, a French family who settled in Ireland in 1243. Before the Rochforts established themselves in the area the Tyrrells, a powerful Anglo-Norman family, held the Barony of Fartullagh. This included the lands around Rochfortbridge and the parish of Castlelost. In the 13th century (c. 1411) the Tyrrells built a castle that consisted of a motte and bailey (a stone castle came later) in Tyrrellspass. It guarded the western entrance to the Barony of Fartullagh and it remained the centre of power for the Tyrrells until the Cromwellian Invasions (1650).

They also built a semi-fortified manorial church on the castle lands which contained an effigy of armoured Knight John Tyrell dating to 1607.

13.3.3 ARCHAEOLOGICAL HERITAGE

13.3.3.1 World Heritage Sites

Although not formally recognised in Irish legislation, impacts on World Heritage Sites will nonetheless be a material consideration for developments in their wider vicinity. There are no World Heritage Sites within the vicinity.

There is one potential World Heritage Site which was on the Tentative List for UNESCO World Heritage Sites in 2010 located roughly 18km to the northwest of the subject site – *'The Hill of Uisneach'* which is part of the Royal Site of Ireland group of monuments which are described in early medieval and medieval texts as the principal ancient sites of royal inauguration in Ireland. The Local Authorities of Kildare, Roscommon, Tipperary, Meath, Westmeath, and Armagh, Banbridge and Craigavon are currently in the process of making an application for the Royal sites of Ireland to be included on the revised list.

13.3.3.2 National Monuments in State Care, Guardianship or under Protection Order

On a national level, the highest degree of protection granted to archaeological monuments are those afforded National Monument status, which are protected under the National Monuments Act of 1930 and its various amendments. These are the pre-eminent archaeological sites in Ireland and fall into several categories including:

- Sites that are in the ownership or guardianship of the state.
- Monuments that are the subject of Preservation Orders.
- Monuments in the ownership of a local authority; and
- Walled towns.

Generally National Monuments in state care are numbered amongst the best preserved and most impressive monuments in the country.

There are no National Monuments in the ownership of a local authority or in the ownership or guardianship of the state within the vicinity of the subject site. There are no Monuments that are the subject of Preservation Orders or walled towns within the vicinity of the subject site.

13.3.3.3 Record of Monuments and Places (RMP)

The legislation that affords protection to the archaeology of Ireland has seen several amendments since the first National Monuments Act of 1930 and there is a legacy of several different registers and associated terminology.

The following sections contain information relative to the Register of Historic Monuments (RHM), the Record of Monuments and Places (RMP) and the Archaeological Survey Database (ASD). Archaeological monuments are general registered by the National Monuments Service using a Sites and Monuments Record (SMR) number.

13.3.3.4 Archaeological Survey Database

The most up-to-date record of archaeological monuments, the Archaeological Survey Database (ASD), is available for viewing and download on the www.archaeology.ie website. This record is continually revised and indicates several additional sites that do not feature in the RMP. The National Monuments Service also makes available SMR Zones of Notification on the website.

Archaeological monuments listed in the ASD that are in the vicinity of the proposed development are presented in Table 13.2. Distances indicated are from the point data, made available in the ASD, to the site boundary.

Table 13.2 Relevant SMR's in the vicinity of the subject area.

SMR No	Class	Townland	ITM Ref.(E)	ITM Ref. (N)	Distance
WM033-061----	Ringfort - rath	KILTOTAN and COLLINSTOWN	644652	739037	c. 160m
WM033-062----	Ringfort - rath	OLDTOWN	644939	739529	c. 167m
WM033-066----	Ringfort - rath	KILTOTAN and COLLINSTOWN	644273	738758	c. 360m
WM033-068----	Ringfort - unclassified	FARTHINGSTOWN	645459	739265	c.260m

- SMR No: WM033-061----
  Classification: Ringfort – rath
  Description: In pasture, on gentle NNE-SSW slope of low rise of ground with good views in all directions. Ringfort (WM033-066----) 370m to the SSW. Only the cropmark of a levelled ringfort is visible on the 2005 OSI aerial photograph. Hachured as a large oval-shaped enclosure on the 1837 ed. OS 6-inch map. Monument described in 1976 as a roughly circular-shaped area (diam. 75m E-W) defined by an earthen bank and external fosse which are best preserved at N and are barely visible elsewhere. There is a small causeway across the fosse at N which may be an original

entrance feature. The ringfort was bisected by a 19th century field boundary running NW-SE. The field to the S of this field boundary was in tillage in 2005, while the field to the N is in pasture.

- SMR No: WM033-062----
  Classification: Ringfort - rath
  Description: In pasture, on slight S facing slope of ground with good views in all directions. Oval-shaped area (diam. 46m N-S; 37m E-W) defined by a poorly preserved bank mainly reduced to a scarp with slight remains of an external fosse that has been mainly filled in with the faintest traces of a possible outer bank. A water reservoir has been built immediately to the N. There are several gaps in the bank due to modern disturbance. A gap in the bank at SSE appears to be the original entrance gap (Wth 2.9m).

- SMR No: WM033-066----
  Classification: Ringfort - rath
  Description: On a slight rise of ground with good views to the E. Ringfort (WM033-065----) 210m to the W, and second ringfort (WM033-061----) 370m to the NNE. Oval-shaped area (diam. 55m N-S; 64m NW-SE) defined by a substantial earthen bank covered in trees and bushes and wide flat-bottomed fosse with low external bank. The inner bank and fosse are best preserved from W-N-NE. The banks have been levelled and fosse filled in from E-S-SSW. No indication of an original entrance feature.

- SMR No: WM033-068----
  Classification: Ringfort - unclassified
  Description: On a low rise of ground in gently undulating pasture. Levelled ringfort which is visible as a roughly circular area (diam. c. 45m) defined by a cropmark which is visible on the 2005 OSI aerial photograph. Marked 'Fort' on the OS fair plan map of the parish of Castlelost (SMR File).

Figure 13.2 Subject site and surrounding cultural heritage sites

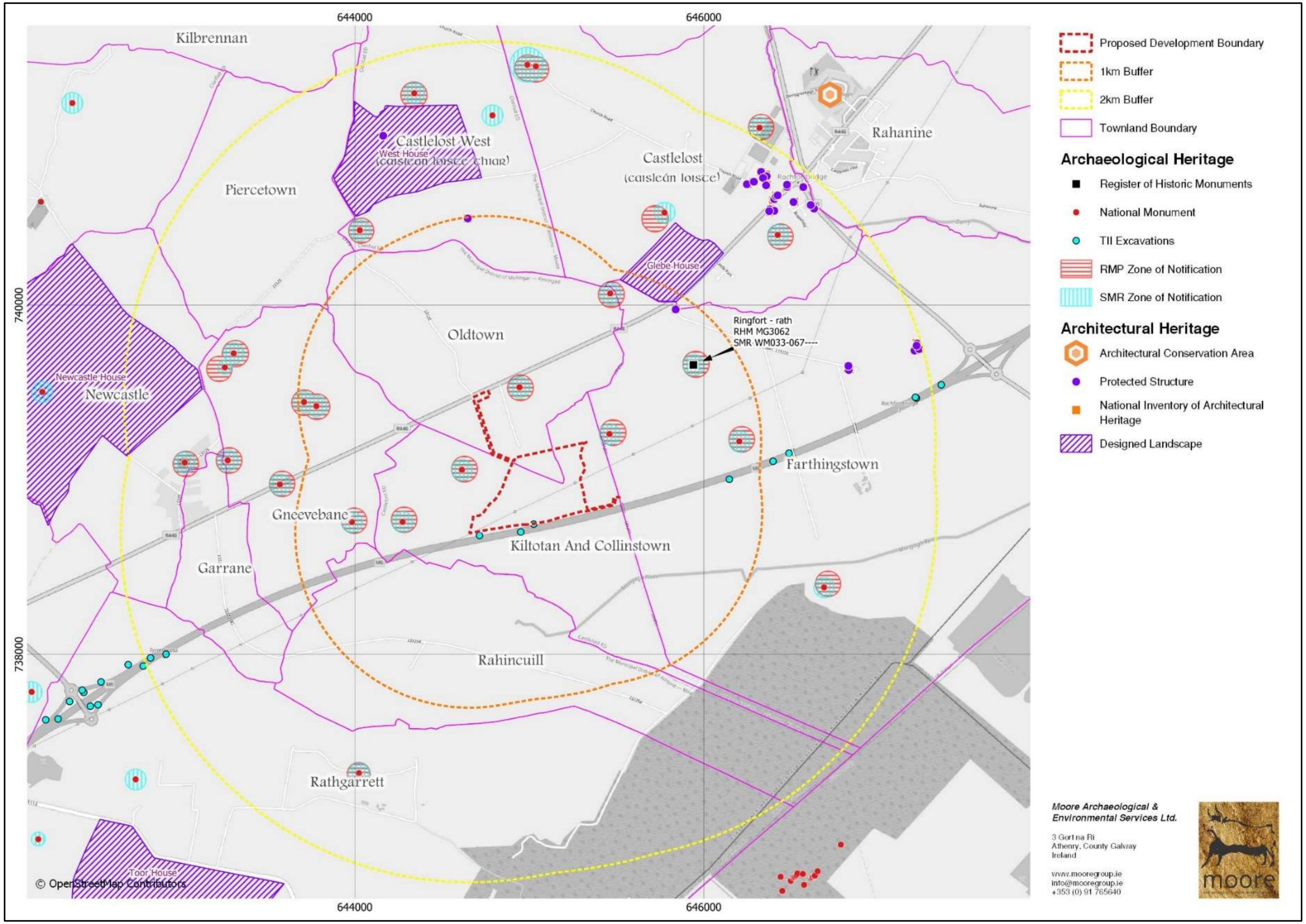


Figure 13.10 Aerial photography showing subject site and surrounding cultural heritage sites

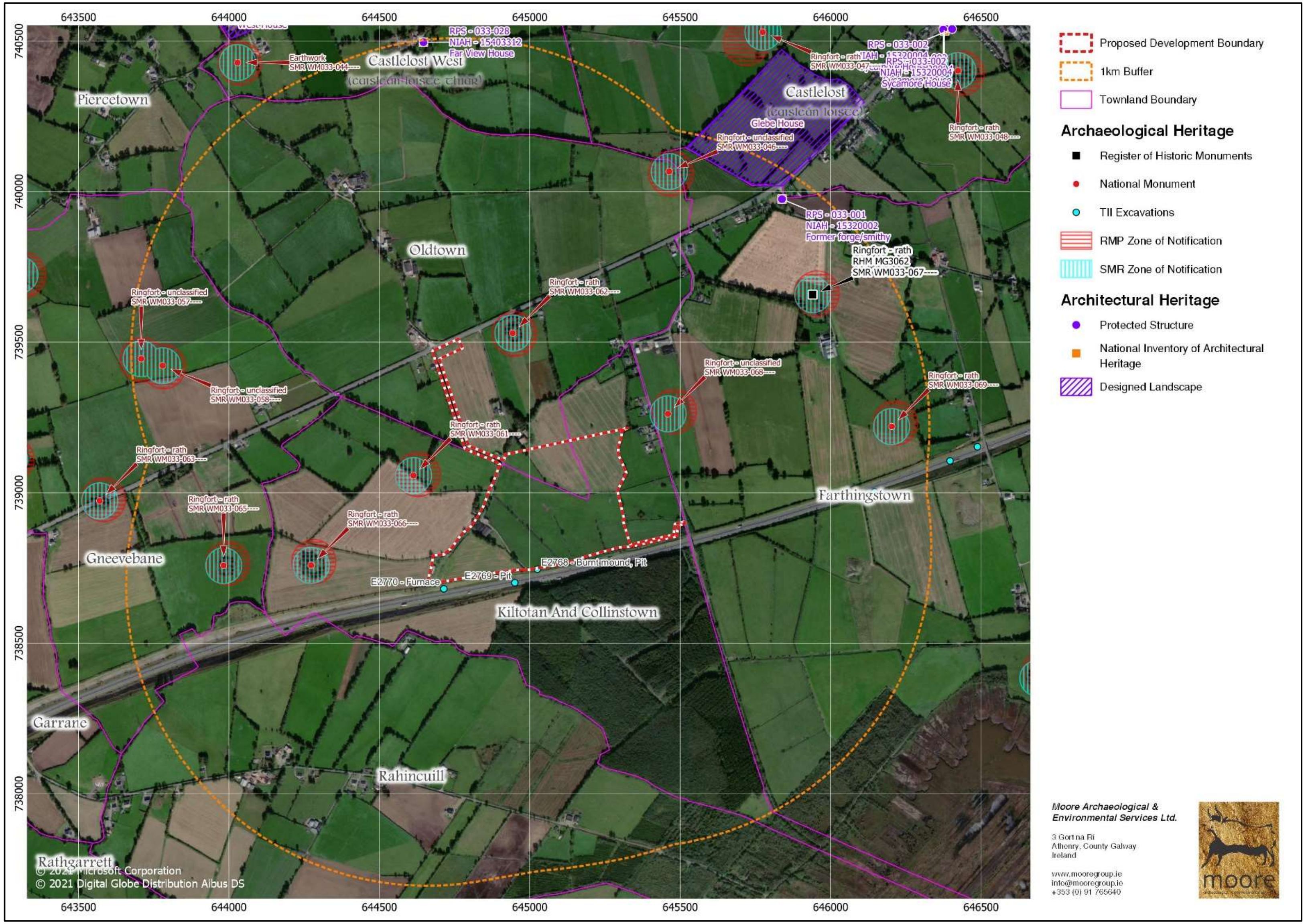


Figure 13.11 Detail showing subject site and surrounding cultural heritage sites

13.3.3.5 Cartographic Research

Analysis of historic mapping shows how the landscape has changed over time. The comparison of editions of historic maps can show how some landscape features have been created, altered, or removed over time. Sometimes features that appear on these early maps are found to be of potential archaeological significance during fieldwork. For this study the following historic maps were consulted:

- First edition Ordnance Survey 6” Maps circa 1830; and
- Third edition Ordnance Survey 25” Maps circa 1900.

The First Edition Ordnance Survey 6” Maps depicts the subject area in pre-famine times (created 1837-1841). The lands within and adjacent to the PDA are depicted as typical scattered farmland and houses of the time. Many of the field boundaries depicted in the 1st edition map remain in situ. A curving townland boundary marking the division between the townland of Kiltotan and Collinstown and the townland of Oldtown has been partially removed in the intervening years to date.

On the Third edition OS 25” map (1897-1913) little change is evident with the townland boundary still extant and the field boundaries much as they were in the 1st edition map.

In both historic maps the archaeological sites in the immediate vicinity noted above are clearly depicted as still extant.

Figure 13.5 Extract from OS 6” first edition map showing subject site.

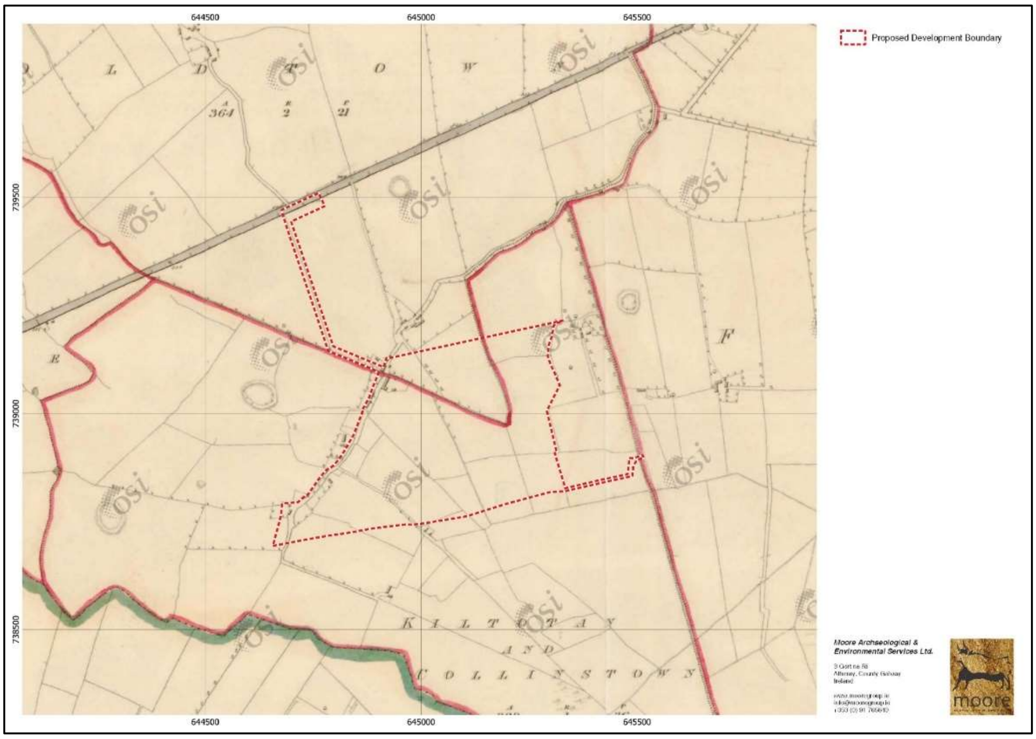
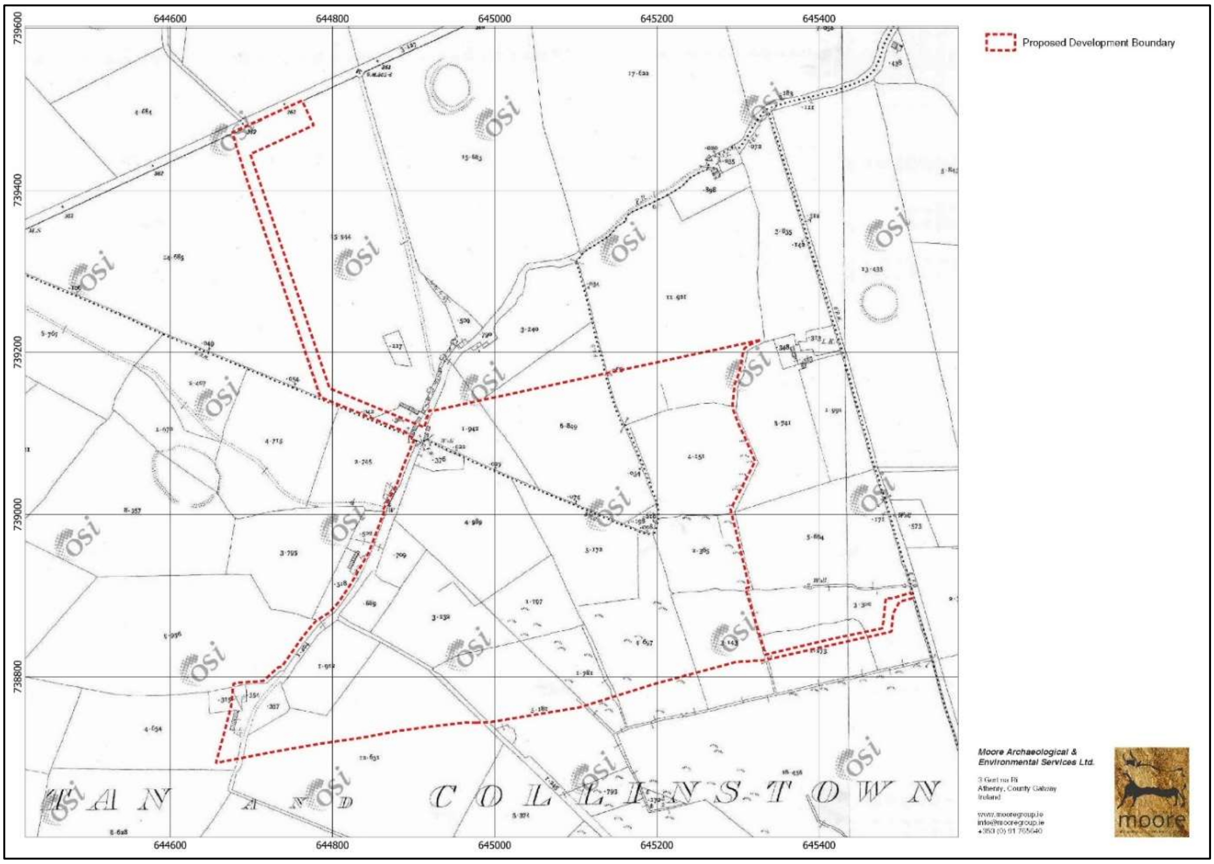


Figure 13.12 Extract from OS 25" third edition map showing subject site.



13.3.3.6 Aerial Photography

The usefulness of aerial photography is that it allows for a different perspective - 'the distant view'. Archaeological sites may show up on the ground surface, depending on their state of preservation, by light and shadow contrasts (shadow marks), tonal differences in the soil (soil marks) or differences in height and colour of the cultivated cereal (crop marks). It is also a useful aid in pinpointing existing features and can assist in ascertaining their extent and degree of preservation. Nothing of cultural heritage significance was noted within the site boundary. Two of the archaeological sites (WM033-061---- and WM033-062----, Ringfort-raths) are visible.

Figure 13.13 Aerial image of the site.

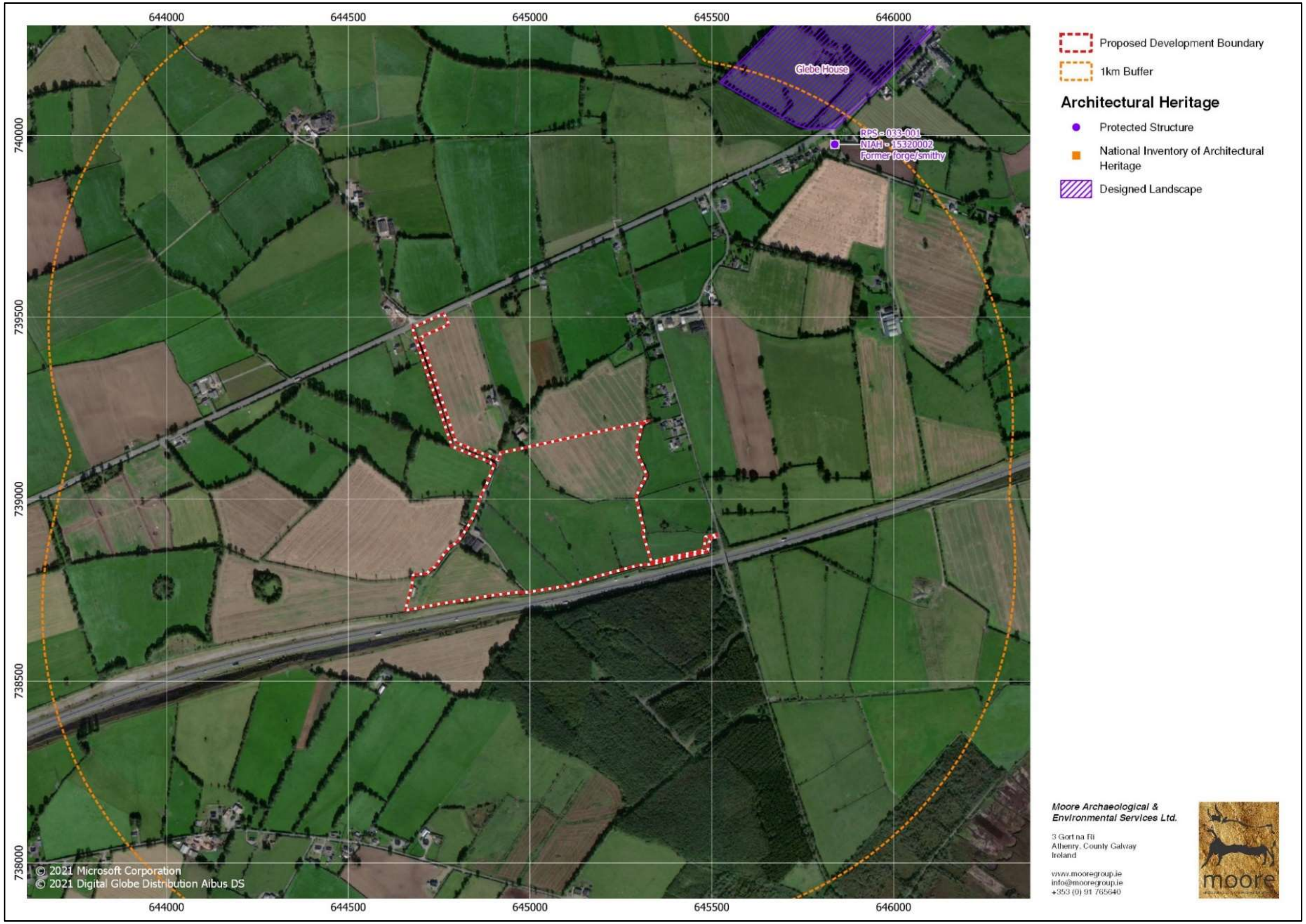


Figure 13.14 Aerial image detail

13.3.3.7 Topographical Files of the National Museum of Ireland

The topographical files of the NMI identify all recorded finds held in the NMI archive that have been donated to the state in accordance with national monuments legislation. The files sometimes include reports on excavations undertaken by NMI archaeologists in the early 20th century. Valuable information that can be gleaned might include the exact location, ground type, depth below ground level and condition when found, of each find. However, the amount and the usefulness of the information available on each find can vary considerably. The topographical files are listed by county and townland and/or street name.

A review of the National Museum of Ireland Finds Database (2010) was carried out (available at https://www.heritagemaps.ie/). No finds have been recorded in the vicinity of the PDA.

13.3.3.8 Previous Archaeological Fieldwork

The Excavation Bulletin is both a published annual directory and an online database that provides summary accounts of all the excavations carried out in Ireland and Northern Ireland from 1970 to 2012.

The database gives access to over 15,000 reports and can be browsed or searched using multiple fields, including Year, County, Site Name, Site Type, Grid Reference, Licence No., Sites and Monuments Record No. and Author.

The National Roads Authority (NRA) archaeological database (http://archaelogy.nra.ie) contains a description of the results of excavations carried out in advance of various road schemes. In general, the database contains information on sites for which final excavation reports have been received.

The following entries are recorded in the vicinity of the subject site:

<table>
<tr><th>Reference No.</th><th>Townland</th><th>Site type</th><th>Licence No.</th><th>Co-ordinates</th></tr>
<tr><td>E2768, A001/07</td><td>Kiltotan Collinstown</td><td>Kiltotan Collinstown 12 - Burnt mound, pits, furrows and ditches</td><td>N/A</td><td>E 644831, N 738766</td></tr>
<tr><td colspan="5">Kiltotan Collinstown 12 was located directly south of the PDA within the footprint of the recently constructed M6 road.

Excavations were undertaken in advance of realignment of the N6, between Kinnegad and Kilbeggan, Co. Westmeath, in 2004 (Excavations 2004, No. 1748, 04E0908).</td></tr>
</table>

Kiltotan/Collinstown 12 was one of four areas of archaeology uncovered in Kiltotan and Collinstown townlands, near the western end of the scheme. Kiltotan/Collinstown 12 was located c. 2.3 km south-west of Rochfortbridge. The site consisted of later agricultural activity, a mound of heat-shattered stones and charcoal, and six pits.

Later activity was evident in the form of hand-dug furrows, drains and a large modern ditch which truncated the archaeological deposits. The burnt mound was composed of four layers. The mound measured c. 5m by 4m and was on average 0.35m deep. Charcoal from one of the layers has been sent for radiocarbon dating. Six pits were excavated. Charcoal samples from two have also been sent for radiocarbon dating (results pending). Two of the layers from the burnt mound also formed the fill of four of the six pits. The remaining two pits were filled with a silty material containing charcoal. Two of the pits possibly acted as troughs: one was 0.8m wide and 0.32m deep but, due to truncation, its full length is unknown and, similarly, the full length of the other was unknown, but its width was 1.15m and it was 0.2m deep.

It is postulated that, given the number of pits and potential troughs on the site, the mound may have been more extensive than that which was uncovered within the road-take. Although truncated by modern agricultural activity, which explains some of the reduction in size of the mound, the excavated area may be just a part of a larger deposit that lies beyond the road-take to the south. The cemetery is very well ordered.

Áine Richardson, Eachtra Archaeological Projects

Reference No.	Townland	Site type	Licence No.	Co-ordinates
E2768, A001/09	Kiltotan Collinstown	Kiltotan Collinstown 14 - Early medieval furnaces and post-medieval ditches	N/A	E 644850, N 738654

Kiltotan Collinstown 14 was located directly south of the PDA within the footprint of the recently constructed M6 road.

In the northwest corner of the site (Area A) a small circular pit (C.18) was excavated measuring 0.47 m in diameter and 0.15 m in depth. A large amount of in situ burning was visible, as the subsoil was scorched red on the base and the sides (except for the southeast side). There were two fills within the pit, C.19 and C.20, both contained inclusions of slag and charcoal indicating that this was a furnace for metalworking. The lower fill of the furnace (C.20) contained cereals (oats) and weed seeds suggesting that domestic refuse such as crop processing by-products were used to fuel the furnace, perhaps as tinder to get the fire going initially. There was no evidence of a superstructure around the furnace in Area A (for example, there were no fragments of baked clay in the fills) and the amount of slag found was quite small, in particular in comparison to the amounts recovered from Monganstown 1. This is probably because this furnace was a smithing rather than a smelting furnace. The slag from C.20 included small pieces of broken plano-convex bottoms (PCBs) which are diagnostic of smithing hearths. Small pieces of fluid slag also suggested that the material had to be heated to very high temperatures, suggesting that the metal used was probably of poor quality.

A northwest-southeast orientated ditch (C.3) ran through the centre of the excavation area in Area B. It was 2 m wide and 0.58 m deep, although its full length is not known as the entire extent of the ditch was not excavated. It had two soft clay fills (C.1 overlay C.2). The ditch appears to have been made in relatively recent times, and the fills appear to have accumulated gradually by natural processes. No artefacts or dateable evidence were retrieved. The ditch is most likely a boundary, or a shallow drainage ditch and it ran along the same alignment as ditches excavated 400 m east in Kiltotan Collinstown 13. This suggests that all these ditches were part of the pattern of field boundaries in the area. The presence of modern artefacts in the fills of the ditch in Area C (C.13) indicates that the field boundary system is relatively recent, although it is possible that the accumulation of sediment in the ditches could significantly post-date the time when they were initially cut. These ditches are not shown on the First Edition Ordnance Survey map.

Two features were excavated in Area C in the southeast corner of the site, a modern ditch (C.13) and an oval pit (C.7) that was interpreted as a furnace. The furnace was partially truncated by the ditch. It measured 0.7 m in length by 0.6 m in width and was 0.24 m deep. The main fill was loose and topsoil-like (C.8) and it was probably a result of soil filling the hollow left after the furnace went out of use. There was a layer of burnt red clay (0.11 m deep) located around the base and sides of the cut (C.10) which is indicative of burning having taken place within the furnace and may have been a clay lining. The burnt clay (C.10) was overlain by a charcoal rich layer (C.9) which included oak and a diffuse-porous wood types. One charred grain of wheat was also found. The smithing residues from this hearth included a tuyere fragment, vitrified clay lining fragments, amorphous slag, and fluid slag. Like the material from Area A, the fluid slag from this hearth suggests that the metal used was being heated to high temperatures because it was of poor quality. Charcoal from the furnace returned a late medieval/post-medieval radiocarbon date of AD 1420-1611. These results are much later than the dates obtained from the furnace in Area A (C.18), although in general the material from both furnaces is similar. Like at Area A there is no evidence for smelting residue in this hearth and the industrial residues suggest smithing. Oak was the main charcoal type used in both furnace and the fuel remains also included cereal grains, suggesting that domestic or crop-processing refuse may have been used as tinder. There was also no evidence for a superstructure around either hearth. The furnace was truncated by a ditch (C.13) that was 2.8 m wide and 0.45 m deep and it extended beyond the limit of the excavation. It was orientated east-west and ran parallel to C.3, the ditch which was excavated in Area B to the north. The ditch (C.13) contained five fills (C.11, C.12, C.13, C.14, C.15 and C.21). The base of the cut contained a stony gully, substantiating the suggestion that this was a drainage ditch. This was overlain by a series of clay fills (C.21, C.15, C.14 and C.13). The upper fills of the ditch (C.12 and C.11) were rich in decaying organics, indicating relatively recent backfilling of the ditch. A number of modern finds were uncovered during the excavations, fragments of modern glass (in C.12; A001/009:12:1-3) and a metal horseshoe (in C.11; not retained). These finds further verify that the ditch was filled in modern times, and it is also likely that it was dug in modern times.

Áine Richardson, Eachtra Archaeological Projects

Reference No.	Townland	Site type	Licence No.	Co-ordinates
E2768, A001/08	Kiltotan Collinstown	Kiltotan Collinstown 13 - Late medieval/early modern	N/A	E 644860, N 738654

Kiltotan Collinstown 13 was located directly south of the PDA within the footprint of the recently constructed M6 road.

Excavations were undertaken in advance of realignment of the N6, between Kinnegad and Kilbeggan, Co. Westmeath, in 2004 (Excavations 2004, No. 1748, 04E0908). Three sites were excavated in Kiltotan and Collinstown townland at the western end of the scheme (Kiltotan and Collinstown 12–14).

Two main areas of archaeological potential, 13m apart, were uncovered in Kiltotan and Collinstown 13; the first, Area A, consisted of a large hollow filled with burnt clay and charcoal and a number of ditches of unknown date, probably late medieval or post-medieval in origin. The second area, Area B, was defined by one irregularly shaped pit with burning.

Area A comprised a series of diagonal ditches, possible pits and large area of burning, which were identified in the course of test excavations in the summer of 2004. These features were subsequently excavated in January/February 2005. A number of the features were identified as being natural in provenance (the possible pits in particular), but a series of field boundaries was confirmed, along with a large enigmatic burnt pit that was visible as a large spread of red burnt clay with charcoal patches. It measured 5.2m by 3.86m by 0.85m in depth and had four fills. Three of the fills contained charcoal flecks. It was thought that this feature could have been a crudely fashioned pit corn-drying kiln, but examination of a sample from one of the deposits within the pit recovered no charred seeds. A second hypothesis was that it was a tree root bole and many of the charcoal fragments in the sample were identified as roots, suggesting that this interpretation was correct. However, the presence of layers of burning within the pit or tree bole suggests human agency in the formation of these deposits.

The late medieval/early modern activity on the site is associated with tillage, land clearance and drainage for agriculture. The physical remains included boundary and drainage ditches. A north-west/south-east-orientated ditch had one brown silty clay fill. It measured 1.5m wide and was 0.5m deep. It was exposed for a length of 19m and it extended outside of the limits of excavation. The base of the ditch contained a large amount of stones. They may represent an episode of field clearance. An adjacent shallow ditch ran north-west/south-east beyond the area of excavation. It measured 0.9m wide and was 0.25m deep. It contained one clay fill that had a concentration of stones at the base, similar to the material observed in the fill of the other ditch. These two ditches were close together and it is possible that they were located on either side of a field boundary bank and that they therefore represent the same phase of field enclosure.

A third shallow ditch also ran parallel to the other two ditches. This was also aligned north-west/south-east, extending beyond the limit of excavation, 0.1m wide and 0.25m deep. There were two fills, but there was very little difference in their composition, with one being only slightly lighter in colour. This fill was only visible in a small area of the ditch and it has been interpreted as slump into the ditch. Unlike the other two ditches, there were no stones found in the base of this ditch. This is the westernmost ditch on the site.

A number of potential archaeological features were identified in Area B in the course of test excavations, including one area of burnt clay and charcoal. On excavation, this was interpreted as a disturbed pit, which contained four deposits. Some of these fills were irregular and ran under the subsoil in places. This indicated a high degree of disturbance and suggested that this may have been a tree root bole where burning took place.

Áine Richardson, Eachtra Archaeological Projects

Reference No.	Townland	Site type	Licence No.	Co-ordinates
2007:1914	Kiltotan Collinstown	Hearth	07E0867	E 644441, N 738951

Quarrying works are planned for this site which comprises two arable fields totalling 16.9ha. Testing took place in September 2007 of geophysical anomalies identified by Earthsound Ltd. Eleven trenches were excavated, totalling 456m. A hearth was identified in the west of the site. This was a rectangular feature with charred fills. A relict field boundary, illustrated on the first-edition 6-inch OS map but not visible on the surface, was identified.

Goorik Dehaene for The Archaeology Company Ltd.

13.3.3.9 Toponym Analysis

Townland names are a rich source of information for the land use, history, archaeology, and folklore of an area. The place name can have a variety of language origins such as, Irish, Viking, Anglo-Norman and English. The names can provide information on families, topographical features, and historical incidents. In terms of the built environment many names reference churches, fords, castles, raths, graveyards, roads and passes etc. In compiling the following data, several resources were consulted including the Placenames Database of Ireland www.logainm.ie and Irish Names of Places by P.W. Joyce (Joyce, 1913).

Table 13.7 Toponyms

Townland Name/ Name	Irish Version	Translation
Kiltotan and Collinstown	Kiltotan is known in Irish as Cill Toiteáin meaning ‘the church of the conflagration’. Collinstown is known as Baile Choileáin translated as ‘the town of Collins’. (OS Namebooks).	The townland of Kiltotan and Collinstown is located within the parish of Castlelost and the Barony of Fartullagh. It lies south and southeast of the old mail coach road from Tyrrellspass to Dublin and borders part of the County of Offaly. In 1837 it consisted of c. 320 acres, which was mainly of arable and pastureland but included a narrow stretch of bog,

Townland Name/ Name	Irish Version	Translation
		which bordered the parish of Newtown.
Oldtown	Irish name to be confirmed	NA

13.3.3.10 Townland Boundaries

The typology of townland boundaries can vary in different parts of the country, with some areas favouring distinctive high, wide earthen banks or just stone walling; sometimes there is a combination of earth and stone, with a stone-revetment or a facing on an earthen bank. Some boundaries are laid out along natural features including rivers, streams and high ground or manmade features such as roads and walls.

The townland boundary between Oldtown and Kiltotan and Collinstown partially intersects the subject site. It comprises of hedgerow and has no visible structural elements.

13.3.4 ARCHITECTURAL HERITAGE

13.3.4.1 Architectural Conservation Areas (ACA)

The Planning and Development Act 2000, as amended, provides that all Development Plans must now include objectives for preserving the character of Architectural Conservation Areas (ACAs). An ACA is a place, area, group of structures or townscape of special architectural, historical, archaeological, artistic, cultural, scientific, social, or technical interest, or which contribute to the appreciation of protected structures.

In these areas, the protection of the architectural heritage is best achieved by controlling and guiding change on a wider scale than the individual structure, to retain the overall architectural or historic character of an area.

There are no ACA's adjacent to the site boundary, or within adjacent townlands. The nearest ACA is Derrygreenagh Park ACA in Rochfortbridge located roughly 2km northeast of the subject site.

13.3.4.2 Record of Protected Structures (RPS) / National Inventory of Architectural Heritage (NIAH)/ Industrial/Vernacular Heritage

The importance of our built heritage is enshrined in the Planning and Development Act, 2000 (Part II, Section 10) which places a statutory obligation on local authorities to include in their Development Plans objectives for the protection of structures, or parts of structures, which are of special interest. The principal mechanism for the protection of these structures is through their inclusion on the Record of Protected Structures (RPS). This list provides recognition of the structure's importance, protection from adverse impacts and potential access to grant aid for conservation works. The record of Protected Structures is an ongoing process and can be reviewed and added to. In considering additions to the Record of Protected Structures local authorities have recourse to the National Inventory of Architectural Heritage (NIAH) which provides a source of guidance on the significance of buildings in their respective areas.

There are no Records of Protected Structures in the immediate vicinity of the subject site. The nearest RPS site is the Forge/smithy at Farthingstown (NIAH No. 15320002, RPS No. 033-001) which is located *ca.* 1.8km northeast of the subject site. The site is described as a detached gable-fronted single-bay single-storey

former forge/smithy, built c.1830, which is now out of use. It has pitched natural slate roof with clay ridge tiles. It is appraised as a modest early-to-mid nineteenth-century forge, which is an interesting addition to the social history and to the built heritage of the Rochfortbridge area. The NIAH rates the building as Regional.

13.3.4.3 Designed Landscapes/Demesnes, Historic Gardens & Country Estates

The Architectural Section of the DHLGH is in the process of a multi-phase study looking at Designed Landscapes and Historic Gardens that appear as shaded areas on the First Edition Ordnance Survey Maps, circa. 1830.

'The objective of this survey is to begin a process of understanding of the extent of Ireland's historic gardens and designed landscape. Sites were identified using the 1st edition Ordnance Survey maps. These were compared with current aerial photography to assess the level of survival and change.'

There are three listed historic gardens/designed landscapes in the general area of the subject site. The closest is Glebe House demesne which is located roughly 1.8km from the subject site boundary. These sites are described below.

- Glebe House, Castlelost
  Garden Survey Ref. No.: 4237
  Present on Ordnance Survey First Edition 6" Series. Buildings indicated. House appears ruinous from review of aerial photography. Boundary is still defined. No description of the house is available.
- Newcastle House
  Reg. No.: 15403313
  Garden Survey Ref. No.: 4220

Rating: Regional

Building Description: Detached five-bay two-storey country house, built or rebuilt c.1851, having an advanced three-storey bay to the centre of the entrance façade (east). Remains of earlier house, c.1740, and a tower house (WM033-053---), built c.1640, to the rear (west). All structures now derelict. Roof now collapsed, originally hidden behind raised battlemented parapets with English-style crenellations. Pitched natural slate roof to earlier house to rear. Coursed rubble limestone construction with cement render over. Raised stone quoins to the corners. Square-headed window openings to main body of building with moulded architraved surrounds, cut stone sills and the remains of timber sliding sash windows. Square-headed openings with curved corners to the projecting breakfront having moulded architraved surrounds, cut stone sills and the remains of paired timber sliding sash windows with margined glazing bars. Earlier three-storey house to the rear (west) having pitched natural slate roof with a large central rendered chimneystack, lime rendered walls and square-headed window openings with single and paired two-over-two pane timber sliding sash windows. Remains of tower house and possible remains of bawn wall and early bawn buildings to the southwest. Extensive complex of single and two-storey outbuildings to the rear (west) and to the southwest. Set well back from road in extensive grounds with main entrance gates and an altered former gate lodge (15403314) to the east. Vernacular gate piers (on circular plan) and wrought-iron bar gates located to the southeast of the complex. Located to the northeast of Tyrrellspass.

Building appraisal: A handsome and imposing complex of buildings dating from the later medieval period to the mid nineteenth-century. This complex retains much of its historical importance and represents an interesting example of changing architectural tastes and styles over a considerable period of time. This site now survives as a complex of some picturesque quality in the landscape to the northeast of Tyrrellspass, adding a romantic and historic element to the local area despite its now sadly derelict condition. The mid nineteenth-century Gothic Revival wing was reputedly built to designs by William Calbeck (1824-1872), a noted architect of his day. This mid nineteenth-century work is rather symmetrical for a Gothic building of its date, suggesting that it represents the extensive alteration of an existing Georgian wing. This tower house to the southwest (WM033-053---) was originally in the ownership of the McLaughlin Family but was confiscated by The Crown, c.1640, and was granted to a James Stopford at this time. It later passed into the ownership of the North Family by the mid-eighteenth century and it is likely that the earlier house to the rear with the pitched roof and large central chimneystack dates to the early-to-mid eighteenth century and was built by the North Family. Newcastle was later the home of C. Coffey, Esq., in 1837. Newcastle House remains an integral element of the architectural heritage of the local area with complex of outbuildings to the rear, the earlier house and vernacular gate to the southwest completing this appealing composition.

Extant Parkland and walled garden with boundary still defined.

- West House, Castlelost West
  Reg. No.: 15403311
  Garden Survey Ref. No.: 4220
  Rating: Regional
  Building description: Detached five-bay two-storey over a basement country house with attic storey, built c.1760, having projecting single-bay wings to either end of the front façade (southeast) and a return to the rear (northwest). Steeply pitched natural slate roof(s) with chimneystacks to either gable end. Roughcast rendered walls over smooth rendered plinth. Square-headed window openings with replacement windows. Central round-headed doorcase with cut stone block-and-start surround having a fluted lintel, a plain overlight and timber double doors. Doorcase reached by a flight of cut limestone steps flanked to either side by rendered walls. Cut stone plaque over the doorcase reads 'This is the house that Jack built'. Coursed rubble limestone walls on quadrant-plan with cut stone coping over run away to either side of house (southwest and northeast) having central square-headed door openings flanked by round-headed niches. Single storey outbuilding to the rear (northwest) and to the northeast. Set well back from road in mature grounds to the west of Rochfortbridge. Main entrance gates to the southeast.

  Building Appraisal: An unusual and distinctive country house, which retains much of its early character and form despite the loss of important early fittings to the openings in recent years. The steeply pitched roof, the narrow plan and a tall window openings suggest that this house dates to the mid-eighteenth century house at the latest. The form of the shallow return to the rear suggests that it may have been originally built to contain the staircase, hinting that this building may be a late-seventeenth/early eighteenth-century 'T-plan' house. The advanced single-bay wings and the quadrant walls running away to either side is a most unusual arrangement that lends this house a vaguely Palladian feel. This suggests, perhaps, that these elements are the result of mid-eighteenth-century alterations to an existing building. The rooflines of these wings continue along the same plane/pitch as that of the main house, which is again a very curious feature. The fine cut stone doorcase, which is of artistic merit, was probably added c.1800. West House is an interesting and distinctive structure that represents an important addition to the architectural heritage of Westmeath, adding to the historic feel of the area to the west of Rochfortbridge.

Extant Parkland and walled garden with boundary still defined.

13.3.5 FIELDWORK

The site of the proposed development was inspected on the 5th of August 2021 by Declan Moore (Archaeologist, Moore Group). The site inspection comprised a walkover of the site to identify the presence of previously unknown archaeological sites and/or features. The site was accessed to the east via a farm lane to the west of local road L51521. The site is on a slight sloping south facing pasture.

The PDA is located on a roughly rectilinear east west aligned series of plots of improved pastureland at the foot a gentle south facing slope. The most westerly plot was under crop at the time of the inspection. To the south it is bordered by timber fencing and a farm access road. South of the access road is the recently constructed M6 road.

Plate 13.1 Looking north at eastern end of overall project area.

Plate 13.2 Looking north at central part of overall project area.

Plate13.3 Looking north at western end of overall project area.

Plate 13.4 Looking west at western end of overall project area.

13.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

The nature of the impacts is assessed with reference to the Glossary of Impacts provided in the Advice notes on Current Practices in the preparation of Environmental Impact Statements, EPA, 2003, the draft Revised Guidelines on the Information to be contained in Environmental Impact Statements, EPA, 2015, Guidelines for the Assessment of Architectural Heritage Impact of National Road Schemes, NRA, 2006 and Guidelines for the Assessment of Archaeological Heritage Impact of National Road Schemes, NRA, 2006.

13.4.1 POTENTIAL DIRECT IMPACTS

Direct negative impacts may occur where sites of archaeological, architectural, and cultural heritage significance are located within the footprint of the proposed development, which would potentially be impacted upon by ground disturbances.

In relation to the proposed development, direct, physical impacts on the archaeological, architectural, and cultural heritage can manifest themselves in the following ways:

- Where an archaeological, architectural, or cultural heritage site, structure, monument, or feature is located within an area where works takes place and the works either intentionally or unintentionally entail the alteration or removal of all or part of the site, structure, monument or feature a direct, physical impact will occur.

- Direct, physical impacts can also occur in gaining access to the site. Where archaeological, architectural, or cultural heritage sites, structures, monuments, or features are intentionally or unintentionally removed or altered when transporting and/or facilitating access for machinery, equipment and/or materials to or from site a direct physical impact will occur; and
- There is the potential for direct, physical impacts on previously unrecorded archaeological and architectural sites, structures, monuments, or features.

If these impacts cannot be remediated, for example if archaeological deposits are destroyed during excavations, then the impacts will be permanent.

13.4.2 POTENTIAL INDIRECT IMPACTS AND IMPACTS ON SETTING

Indirect impacts can take the form of impacts on the settings of architectural or cultural heritage features – impacts on setting are primarily visual and examine the effect of the development upon the setting of a site within the wider landscape. Visual impacts can be reduced with sensitive site development and screening. The impact of the development is usually proportional to the extent to which that development is visible to and from the extant recorded monuments and features.

13.4.3 LEL FLEXGEN CASTLELOST ASSESSMENT

13.4.3.1 Potential direct Impacts on Recorded Archaeological Monuments

There are no known archaeological sites within the PDA, therefore there are no potential impacts on the known cultural heritage resource.

13.4.3.2 Potential direct Impacts on unrecorded Archaeological Monuments

Archaeological testing in the vicinity as part of the M6 road project has identified several archaeological sites in the immediate vicinity of the subject site. The area is archaeologically sensitive due to the proximity to known cultural heritage sites.

There is a moderate to high potential for the presence of previously unknown subsurface archaeological sites or features to be present.

13.4.3.3 Potential direct Impacts Architectural Sites

Internally there are no Protected Structures or NIAH site or previously unrecorded vernacular features within the site boundary or adjacent to the subject site.

13.4.3.4 ‘Do Nothing scenario’

In this instance, there would be no impact on any potential unrecorded sub surface deposits.

13.4.3.5 ‘Worst Case’ scenario’

In this case, construction work could potentially negatively impact previously unknown sites resulting in the loss or damage of archaeological artefacts and features.

13.4.3.6 Potential Impacts on Setting or Indirect Impact

There are no recorded archaeological sites/features listed as being located within the boundary of the subject site. There are several ringforts in the vicinity of the subject site. The impact on the setting of these sites which are in private lands and inaccessible to the public is not considered significant.

13.4.3.7 Architectural Sites

There are no architectural sites that are likely to be affected by the proposed development.

13.4.4 LEL ESS CASTLELOST ASSESSMENT

13.4.4.1 Potential direct Impacts on Recorded Archaeological Monuments

There are no known archaeological sites within the PDA, therefore there are no potential impacts on the known cultural heritage resource.

13.4.4.2 Potential direct Impacts on unrecorded Archaeological Monuments

Archaeological testing in the vicinity as part of the M6 road project has identified several archaeological sites in the immediate vicinity of the subject site. The area is archaeologically sensitive due to the proximity to known cultural heritage sites.

There is a moderate to high potential for the presence of previously unknown subsurface archaeological sites or features to be present.

13.4.4.3 Potential direct Impacts Architectural Sites

Internally there are no Protected Structures or NIAH site or previously unrecorded vernacular features within the site boundary or adjacent to the subject site.

13.4.4.4 ‘Do Nothing scenario’

In this instance, there would be no impact on any potential unrecorded sub surface deposits.

13.4.4.5 'Worst Case' scenario'

In this case, construction work could potentially negatively impact previously unknown sites resulting in the loss or damage of archaeological artefacts and features.

13.4.4.6 Potential Impacts on Setting or Indirect Impact

There are no recorded archaeological sites/features listed as being located within the boundary of the subject site. There are several ringforts in the vicinity of the subject site. The impact on the setting of these sites which are in private lands and inaccessible to the public is not considered significant.

13.4.5 ARCHITECTURAL SITES

There are no architectural sites that are likely to be affected by the proposed development.

13.4.6 LEL GIS CASTLELOST ASSESSMENT

13.4.6.1 Potential direct Impacts on Recorded Archaeological Monuments

There are no known archaeological sites within the PDA, therefore there are no potential impacts on the known cultural heritage resource.

13.4.6.2 Potential direct Impacts on unrecorded Archaeological Monuments

Archaeological testing in the vicinity as part of the M6 road project has identified several archaeological sites in the immediate vicinity of the subject site. The area is archaeologically sensitive due to the proximity to known cultural heritage sites.

There is a moderate to high potential for the presence of previously unknown subsurface archaeological sites or features to be present.

13.4.6.3 Potential direct Impacts Architectural Sites

Internally there are no Protected Structures or NIAH site or previously unrecorded vernacular features within the site boundary or adjacent to the subject site.

13.4.6.4 'Do Nothing scenario'

In this instance, there would be no impact on any potential unrecorded sub surface deposits.

13.4.6.5 'Worst Case' scenario'

In this case, construction work could potentially negatively impact previously unknown sites resulting in the loss or damage of archaeological artefacts and features.

13.4.6.6 Potential Impacts on Setting or Indirect Impact

There are no recorded archaeological sites/features listed as being located within the boundary of the subject site. There are several ringforts in the vicinity of the subject site. The impact on the setting of these sites which are in private lands and inaccessible to the public is not considered significant.

13.4.6.7 Architectural Sites

There are no architectural sites that are likely to be affected by the proposed development.

13.5 MITIGATION MEASURES

13.5.1 LEL FLEXGEN CASTLELOST MITIGATION

Given that the results of archaeological testing in the vicinity as part of the M6 road project identified several archaeological sites in the immediate vicinity of the subject site, and the presence of known archaeological sites in the vicinity, the area is considered archaeologically sensitive There is a moderate to high potential for the presence of previously unknown subsurface archaeological sites or features to be present.

It is recommended that a programme of archaeological testing be carried out at the subject site by a suitably qualified archaeologist under licence to the National Monuments Service of the DHLGH in advance of construction works.

13.5.2 LEL ESS CASTLELOST MITIGATION

Given that the results of archaeological testing in the vicinity as part of the M6 road project identified several archaeological sites in the immediate vicinity of the subject site, and the presence of known archaeological sites in the vicinity, the area is considered archaeologically sensitive There is a moderate to high potential for the presence of previously unknown subsurface archaeological sites or features to be present.

It is recommended that a programme of archaeological testing be carried out at the subject site by a suitably qualified archaeologist under licence to the National Monuments Service of the DHLGH in advance of construction works.

13.5.3 LEL GIS CASTLELOST MITIGATION

Given that the results of archaeological testing in the vicinity as part of the M6 road project identified several archaeological sites in the immediate vicinity of the subject site, and the presence of known archaeological sites in the vicinity, the area is considered archaeologically sensitive. There is a moderate to high potential for the presence of previously unknown subsurface archaeological sites or features to be present.

It is recommended that a programme of archaeological testing be carried out at the subject site by a suitably qualified archaeologist under licence to the National Monuments Service of the DHLGH in advance of construction works.

<u>The above recommendations are subject to the approval of the National Monuments Service (Department of Housing, Local Government and Heritage) and Westmeath Councils Heritage Officer</u>

13.6 RESIDUAL IMPACTS OF THE DEVELOPMENT

There will be an impact on the setting of the nearby ringforts. This impact was not deemed to be significance.

13.7 CUMULATIVE EFFECTS INCLUDING GAS PIPELINE CONNECTION

Three potential routes for gas pipelines connections to the proposed development are being considered by Gas Networks Ireland. These connections will form a sperate planning application. Any gas connection pipeline will be undergrounded. There is potential for pipelines to impact on previously unknown subsurface archaeological remains. This effect would be cumulative to the proposed development.

13.8 MONITORING AND FURTHER WORKS

Further mitigation in the form of archaeological monitoring may be recommended pending the results of the programme of archaeological testing.

13.9 SUMMARY OF SIGNIFICANT EFFECTS

There will be no direct impact on known cultural heritage sites or features. There is a moderate to high potential for direct impacts on previously unknown cultural heritage sites or features.

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14 INTERACTIONS

14.1 INTRODUCTION

This Chapter of the EIAR describes the main interactions between potential impacts identified as part of the Environmental Impact Assessments for each of the proposed developments at Kiltotan & Collinstown and Oldtown, Rochfortbridge, Co. Westmeath.

The interaction of environmental factors was identified and carefully considered from the outset of the project. Interactions during construction, operational and decommissioning stages of the project are considered.

Table 14.1 presents a matrix of interactions likely to occur from the proposed development (highlighted in green). The level of interaction between the various media will vary greatly but the table allows the interactions to be identified and detailed where necessary. If the development does not have the potential to impact or affect the interaction, then that interaction is not highlighted in green.

The interaction matrix is based on the potential interrelationships of the environmental media both during the construction, operation and decommissioning phases of the proposed development.

Table 14.1 Interactions between Environmental Factors

	Population & Human Health	Air, Odour & Climate	Noise & Vibration	Landscape	Biodiversity	Waters	Land and Soils	Material Assets	Traffic & Transport	Archaeology & Cultural Heritage
Population & Human Health		C/D, O	C/D, O	C/D, O			C/D		C/D,	
Air, Odour & Climate	C/D, O				C/D, O		C/D		C/D	
Noise & Vibration	C/D, O				C/D				C/D	
Landscape	C/D, O									
Biodiversity		C/D, O	C/D			C/D, O	C/D			
Waters					C/D, O		C/D, O			
Land and Soils	C/D	C/D			C/D	C/D				
Material Assets										
Traffic & Transport	C/D	C/D	C/D							
Archaeology & Cultural Heritage										

C/D= Construction /Decommissioning
O = Operation

Table 14.2 Summary of Interactions

Interaction of Environmental Factors	Description
Air Quality, Population, Human Health and Biodiversity	There is potential for impact to human beings living in the area of the proposed development during the construction, operation and decommissioning phases of the development. These have been outlined and assessed in Section 8 (Air Quality and Climate) of the EIAR. The impact of construction activities on air quality during the construction phase of all projects is short term in duration and its significance will vary from not significant to slight. The air quality impact at the nearest residential receivers is associated with each of the projects (and in combination) is predicted to be below the relevant air quality standard limit values and is therefore determined to be negligible. Similarly, the impact on identified protected ecological site and biodiversity is not significant.
Noise, Human Beings and Biodiversity	The impact of noise on the human beings living in the area of the proposed development has been addressed during the construction, operational and decommissioning phases of the proposed development. Appropriate mitigation measures have been recommended to ensure the construction phase target noise limits are not exceeded. These will be further prescribed in a construction management plan subject to planning. The predicted noise levels at the nearest neighbouring residential properties due to the operation of the proposed projects during daytime and night-time is negligible. Given the proximity of the development lands and projects to designated ecological sites, noise impacts on the local ecological receivers is not considered significant.
Landscape and Visual, Biodiversity, Population and Human Health	The landscape and visual impacts have potential interactions with impacts resulting from other environmental statement topics. The interactions of these impacts are usually highly complex in practice and this section serves to act as a brief overview to these issues. In addition, the proposed development will create varying impacts during the construction phase and the operation phase. No designated scenic views will be affected by the proposed development. The proposed mitigation planting (including a new berm) will increase the variety of native tree and shrub species on site and this will have a positive impact of providing increasing screening and increased ecological benefit. The management of the site vegetation will also result in a positive impact to the appearance and condition of site vegetation. Based on the landscape and visual impact judgements provided throughout this LVIA, the proposed development is not considered to give rise to any significant residual impacts. Instead, the proposed development is generally well screened or otherwise well assimilated within the prevailing landscape pattern. This is examined in detail in Chapter 11 of the EIAR with the assessment determining that the landscape and visual effects of the projects are not considered significant.
Soils & Geology and Water Environment	There is an interaction between soils & geology and the water environment. The disturbance of soil during construction has the potential to impact on water quality. Construction activities which disturb or expose the soil have the potential to elevate suspended

Interaction of Environmental Factors	Description
	solids in runoff from the site which could impact on local drains. Mitigation measures during the construction process will prevent sediment run-off and construction discharges. A CEMP shall be developed and implemented for the construction phase of all projects. This document will provide a framework under which construction activities which have potential for environmental impact (e.g. generation of dust, ecological impacts, surface water discharge, etc) will be managed. Mitigation measures as outlined in the EIAR shall be included within this plan. There will be no direct discharges to soils or surface water bodies during the operational phase of the developments (in isolation or in combination). Bunds have been designed in accordance with best practice to contain and spillages chemicals stored on the sites. Stormwater generated on the site will be managed in accordance with sustainable best practice proposals as presented in the drainage report for each project. Overall, the impact is not considered significant.
Traffic & Transport, population and human health, noise & vibration, and biodiversity	There will be potential interactions with increased traffic movements as a result of the construction and to a lesser extent the operation of the proposed projects with potential effects on population and human health, air quality, noise and vibration and biodiversity. This is dealt within each Chapter of the EIAR The impact of construction stage traffic on air quality, human health, noise & vibration and biodiversity is short term to not significant (depending on activities) and long term imperceptible during operation.

The proposed development of the individual and collectively development has the potential to impact on various environmental aspects, and there are interactions and inter-relationships between these aspects, as presented in Table 14.1 and described in Table 14.2. This EIAR has considered these interactions and inter-relationships throughout the design process through appropriate siting of development components, functional design in accordance with the relevant standards /codes and guidelines and incorporation of mitigation measures as recommended by the EIA team of specialists.