

Limerick WWTP Upgrade and Regional Bioresource Centre

ElAR Chapter 21 - Cumulative Impacts and Interactions

June 2026



Formerly JB Barry Partners who became part of Egis in 2023

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Glossary and Defined Terms

Acronym	Description
AA	Appropriate Assessment
AASR	Appropriate Assessment Screening Report
ACP	An Coimisiún Pleanála
AD	Anaerobic Digestion
AGS	Aerobic Granular Sludge
AER	Annual Environmental Report
BOD	Biochemical Oxygen Demand
BC	Bioresource Centre
C	Carbon
CAFÉ	Clean Air for Europe Directive
CHP	Combined Heat and Power
DIN	Dissolved Inorganic Nitrogen
ECJ	European Court of Justice
EIAR	Environmental Impact Assessment Report
ELV	Emission Limit Value
EPA	Environmental Protection Agency
ESB	Electrical Supply Board
EU	European Union
FOG	Fats Oils and Grease
FST	Final Settling Tank
GHG	Greenhouse Gas
HGV	Heavy Goods Vehicle
MLPS	Main Lift Pumping Station
MCA	Multi-Criteria Analysis
MRP	Molybdate Reactive Phosphate
IDA	Industrial Development Agency
IFAS	Integrated Fixed-Film Activated Sludge
N	Nitrogen
NDP	National Development Plan
NHA	National Heritage Area
NIS	Natura Impact Statement
NPF	National Planning Framework
NSO	National Strategic Outcomes
NSS	National Spatial Strategy
NWSMP	National Wastewater Sludge Management Plan
P	Phosphorous
PE	Population Equivalent - The amount of wastewater received at a treatment plant (and its design capacity) is measured in units known as population equivalent (or PE). The wastewater received from all sources, e.g. industrial, tourism, commercial, residential, etc., is converted into these units, with one unit of PE representing the wastewater treatment load typically generated by a single person.
PFF	Pass Forward Flow
PFT	Picket Fence Thickener
pNHA	Proposed National Heritage Area

Acronym	Description
SEA	Strategic Environmental Assessment
SBR	Sequencing Batch Reactor
SHC	Sludge Hub Centre
SIA	Stable Isotope Analysis
SID	Strategic Infrastructure Development
Sludge	Solid by-products of wastewater
SPA	Special Protection Area
SS	Suspended Solids
UWWTD	Urban Wastewater Treatment Directive
WFD	Water Framework Directive
WWDA	Wastewater Discharge Authorisation
WWTP	Wastewater Treatment Plant
WSPS	Water Services Policy Statement
ZTV	Zone of Theoretical Visibility
PS	Pumping Station
QI	Qualifying Interest
RAS	Return Activated Sludge
RBC	Regional Bioresource Centre
RSES	Regional Spatial and Economic Strategy
SAC	Special Area of Conservation
TDS	Total Dry Solids
THP	Thermal Hydrolysis Process

Departments and Stakeholders

Acronym (where applicable)	Departments & Stakeholders
ACP	An Coimisiún Pleanála
DCHG	Department of Culture, Heritage and the Gaeltacht – Changed in 2020
DHPLG	Department of Housing, Planning and Local Government – Changed in 2020
DHLGaH	Department of Housing, Local Government and Heritage
EPA	Environmental Protection Agency
GSI	Geological Survey Ireland
GWS	Group Water Schemes
IFI	Inland Fisheries Ireland
UÉ	Uisce Éireann
LCCC	Limerick City & County Council
LA	Local Authority
NMS	National Monuments Service
NPWS	National Parks & Wildlife Service

21 CUMULATIVE IMPACTS AND INTERACTIONS

21.1 Introduction

This Chapter presents an assessment of the cumulative impacts and interactions between the various environmental factors as a result of the Proposed Development.

In addition, this chapter outlines the applicable legislation and guidance used, presents the methodology adopted to identify and assess plans and projects that have the potential for cumulative effects, and addresses the potential for interactions between impacts on different environmental factors of the Proposed Development itself on the receiving environment.

21.1.1 Purpose of this Report

Cumulative effects are changes to the environment that are caused by an action in combination with other actions. They can arise from:

- The interaction between the various effects within the Proposed Development (i.e. the interaction between the various environmental aspects, for example the interaction between water and ecology); and
- The interaction between the other existing and/or permitted projects with this Proposed Development.

In accordance with the requirements of Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private developments on the environment (i.e., the EIA Directive), this Chapter reports on the likely significant cumulative effects arising from the Proposed Development in combination with other existing and/or approved projects during the Construction and Operational Phases. Cumulative effects are assessed in accordance with the EIA Directive 2014/52/EU¹, of which Annex IV.5(e) states:

"The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project."

Annex IV.5 of the EIA Directive requires that:

'The description of the likely significant effects of the project on the environment resulting from...the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.'

The Environmental Protection Agency's (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022) (hereafter referred to as the EPA EIAR Guidelines) define cumulative effects as:

'The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.'

It also reports on interactions of impacts that can occur when two or more types of environmental impacts associated with the Proposed Development arise at a particular location or act upon an environmental resource. For each environmental topic there will be certain interactions or interdependencies with other environmental topics, whereby impacts may interact to create a greater effect or different type of effect. The assessment is

¹ Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

prepared in accordance with Article 3(1) of the EIA Directive to identify, describe and assess the interactions amongst environmental factors.

21.1.2 Environmental Interactions

Environmental interactions are the reactions between impacts, whether between the impacts of just one project (i.e., the Proposed Development), or between the impacts of multiple projects. For each environmental topic there will be certain interactions or interdependencies with other environmental topics, whereby impacts may interact to create a greater effect or different type of effect. An assessment of these interactions has been undertaken as required by Article 3 of the EIA Directive, which states the following:

'The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

- (a) Population and human health;*
- (b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;*
- (c) Land, soil, water, air and climate;*
- (d) Material assets, cultural heritage and the landscape;*
- (e) The interaction between the factors referred to in points (a) to (d).'*

Some of the topic assessments within this EIAR already address environmental interactions. For example, Chapter 19 (Population and Human Health) provides an assessment of effects on community amenity or human health, which relates to the interaction of impacts on air quality; visual amenity; traffic and transport; and noise and vibration.

Section 21.5 of this chapter sets out the main environmental interactions identified from the Proposed Development, sign-posting chapters which already address environmental interactions and providing a description and assessment of environmental interactions which are not addressed elsewhere in this EIAR.

21.2 Legislation, Policy and Guidelines

The overarching policy and legislation applicable to the Proposed Development is set in Chapter 5 (Planning and Policy) of this EIAR. The following guidelines and publications were considered in undertaking this assessment:

- Draft Advice Notes for Preparing Environmental Impact Statements (EPA, 2015);
- Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report (European Union, 2017c);
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission, 1999);
- Guidelines for Planning Authorities and An Bord Pleanála (hereafter referred to as the Board) on carrying out Environmental Impact Assessment. Department of Housing, Local Government and Heritage (DoHLGH, 2018); and
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022).

21.3 Assessment Methodology

21.3.1 Cumulative impacts

Cumulative effects result from the addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects (EPA, 2022). Additional cumulative effects can be caused due to incremental changes by other past, present or reasonably foreseeable projects together with the Proposed Development.

The assessment of cumulative effects and interactions have been undertaken on a qualitative basis by each of the environmental topic leads based on best scientific knowledge. The approach is aligned with overarching EIA guidelines as well as per the methodology adopted for each environmental factor described in Chapters 6-20.

The cumulative effects of a development refer to the way in which an environmental resource may be subject to a particular type of impact from more than one Proposed Development. The impacts from multiple projects may overlap or act in combination at a particular location or upon a particular resource, thereby leading to more significant environmental impacts than if the impacts were considered in isolation.

21.3.2 Interactions

The EIAR has considered and assessed the interactive effects arising from the construction and operation of the Proposed Development based on best scientific knowledge. Interactive effects (or interactions) specifically refer to any direct or indirect effects caused by the interaction of environmental factors as outlined in Part 1e in Article 3 of the EIA Directive.

21.4 Assessment of Cumulative Impacts

21.4.1 Development plans

The following plans were identified as potential sources of cumulative impacts:

- Limerick Development Plan 2022 – 2028;
- Clare County Development Plan 2023–2029; and
- Strategic Integrated Framework Plan for the Shannon Estuary 2013-2020

The Proposed Development may contravene a number of mitigatory policies and measures set out in the Limerick Development Plan 2022 – 2028. Therefore, there may be cumulative effects from the Proposed Development in combination with the Limerick Development Plan 2022 – 2028. The projects outlined in the Plan that can contribute to cumulative impacts are therefore considered further in the cumulative assessment.

21.4.2 Existing or commenced Planning applications

Table 21-1 below shows the developments considered for cumulative impacts. Any other existing applications not identified do not have the potential to exacerbate impacts.

TABLE 21-1 LIST OF DEVELOPMENT CONSIDERED FOR CUMULATIVE IMPACTS

Planning Body	Reg. No.	Applicant	Brief Description of Proposed Development	Distance from Proposed Development	Decision Date
LCC	22313124	SHD DW Raheen Developments Ltd.	5 year permission sought for the construction of 384 residential units (202 houses, 182 apartments), creche and associated site works.	900m	Granted: 01/08/2022
LCC	21311588 (ABP Reg. Ref. 311588-21)	SHD - Voyage Properties Ltd	Permission sought for the construction of 371 residential units, proposed access road and two storey childcare facility.	765m	Granted: 26/05/2022
ACP	PL91.314754	Voyage Property Limited	Development for a nursing home at a site of c.1.3 ha. in the south eastern part of the former Greenpark Racecourse, Dock Road, Limerick and all site development and excavation works above and below ground. A Natura Impact Statement will be	700m	Grant permission with revised conditions: 16/05/2024

Planning Body	Reg. No.	Applicant	Brief Description of Proposed Development	Distance from Proposed Development	Decision Date
			submitted to the planning authority with this application.		
LCC	2360145	Westbourne Student Limited	Construction of a three-storey student accommodation block comprising 22 en-suite bedrooms		APPLICATION FINALISED
LCC	2360697	Dennehy Commercials Ltd.	Permission for changes to the front facade including material changes, changes to the windows, addition of new signage and all necessary ancillary works to Unit 2, Riverside Retail Park, Ballykeeffe, Dock Road, Co. Limerick. Also, permission for retention of the existing signage to the front facade, external free standing signage including flag poles within the forecourt of the retail park, as well as retention of the use of Unit 2 as a showroom	430m	12/06/2024
LCC	247	Greyhound Racing Ireland	Permission for c.440m ² (c.100kWp) of roof mounted solar PV panels and all ancillary site works.	570m	02/05/2024
LCC	2314	Direct Route Ltd.	Permission for up to 110No. (c.242m ²) equating to c.51kWpm, of ground mounted solar PV panels and all associated works	642m	15/05/2023
ACP	Ref: 301561; MARA Ref: LIC230014	Port of Foynes, in the townlands of Corrig and Durnish, Foynes, Co. Limerick	SFPC Foynes Port Capacity Extension - extension of port infrastructure at Foynes to support increased operational capacity and future industrial use	27.3km	Grant Permissions with Conditions: 12/21/18
ACP	Refs: 319080, 307798; MARA Ref: LIC230008	Moneypoint Generating Station, Moneypoint, Co. Clare.	Moneypoint Hub Project - a strategic transformation of the existing ESB coal-fired power station at Moneypoint, Co. Clare, into a green energy hub designed to support Ireland's decarbonisation goals and the Shannon Estuary Economic Taskforce recommendations	51km	Granted permission w Conditions 9/25/24
	EPA IE Licence Reg. No. P0035-07; MARA Ref: LIC230004		Aughinish Alumina Ltd Expansion and Operations (EPA Industrial Emissions Licence Reg. No. P0035-07; MARA Ref: LIC230004), The operation is regulated under an Industrial Emissions (IE) licence issued by the EPA, with recent permissions also		

Planning Body	Reg. No.	Applicant	Brief Description of Proposed Development	Distance from Proposed Development	Decision Date
			granted for marine survey and dredging activities.		
ACP	ABP Ref: PA08.322568; MARA Ref: MUL240034	Kerry County Council	Gas Networks Ireland Strategic Gas Emergency Reserve Project - involves the construction and operation of a liquefied natural gas (LNG) floating storage and regasification unit (FSRU) at a jetty in the Shannon Estuary, Co. Limerick	52 km	Case is due to be decided by 13/01/2026
LCC	Planning Ref. 20/687	Dock Road, Limerick	Construction of an extension to the north-east side of the existing raw material store building, the recladding of existing asbestos cladding of this building with plastisol coated metal cladding and associated site works(this site is a Seveso Site to which the Major Accident Regulations apply)		APPLICATION FINALISED Conditional Permitted 22/06/2021
LCC	Planning Ref. 2561339	Mr. Binman, Dock Road, Ballykeeffe, Limerick.	Retention and modification of an existing waste transfer facility and associated access road and hardstanding areas. alterations to an existing Waste Transfer Station permitted by Limerick City and County Council - Mr. Binman, Dock Road, Ballykeeffe, Limerick. (Further Information is required)		FURTHER INFORMATION 18/02/2026
LCC	Planning Ref. 16/642	Dock Road Bunlicky	Permitted waste transfer facility including buildings, hardstanding, drainage infrastructure and connection to the wastewater network. A 10 year permission is sought to construct the development of a waste transfer facility in two phases. The facility is intended to handle up to 90,000 tonnes of waste per annum.		APPLICATION FINALISED Conditional Permitted 13/01/2017
LCC	Planning Ref. 16/345		Industrial development at Irish Cement involving alternative fuels and materials handling, with associated drainage and containment infrastructure. Application for 10 year permission for development to allow for the replacement of		APPLICATION FINALISED Conditional Permitted 08/03/2017

Planning Body	Reg. No.	Applicant	Brief Description of Proposed Development	Distance from Proposed Development	Decision Date
			fossil fuels through the introduction of lower carbon alternative fuels and to allow for the use of alternative raw materials in their Limerick Cement Factory.		
	Planning Ref. 22/1280		Commercial and logistics development including warehouse units, drainage infrastructure, attenuation and pumping arrangements.		
LCC	2560620	Kirrary Developments Ltd	Development comprising amendments to an existing permitted warehouse unit granted planning permission under planning file 23/60623, at Alandale Road, Courtbrack, Limerick City.		Granted permission w Conditions 05/11/2025
LCC	20580	Jack Fitzgerald Ltd.	Construction of a single storey Warehouse/Distribution Centre and staff carpark on a derelict site, utilising existing entry access off Dock Road and providing new entry/exit access via Ashbourne Business Park service road and all ancillary site works.		Granted permission w Conditions 27/11/2020

21.4.3 Existing or commenced projects

There are various identified existing or commenced projects in the vicinity that may or may not have a cumulative impact. A list of the projects are as follows:

- Limerick City and Environs Flood Relief Scheme;
- Shannon Town WWTP Upgrade; and
- Castletroy Wastewater Treatment Plant.

This section forward provides a topic-by-topic assessment of likely significant cumulative impacts of the Proposed Development in combination with other developments.

21.4.4 Construction phase

21.4.4.1 Population and Human Health

The potential environmental effects of the Proposed Development have not been assessed in isolation and a review of other relevant permitted or proposed projects in the vicinity of the site was undertaken. Recent significant planning permissions in the vicinity are listed below which may result in cumulative environmental impacts.

- 21222 - Development for a nursing home at the former Greenpark Racecourse, Dock Road.
- 21311588 - Construction of 371 residential units, proposed access road and two storey childcare facility
- 22313124 - Construction of 384no. residential units, creche and associated site works
- 2360145 - Construction of a three-storey student accommodation block comprising 22 en-suite bedrooms

- 2460452 - a change of use from residential use to a community care dwelling.
- 2460336 - Change of use to 2 Apartments on top floor of the vacant part of commercial unit.
- 2560162 - a Large-Scale Residential Development (LRD) comprising amendments to a previously permitted Strategic Housing Development (SHD) (An Bord Pleanála Reg. Ref. 311588-21 for 371 no residential units and creche)

However, with the implementation of the CEMP and appropriate mitigation it is considered that this project does not have the potential to result in cumulative impacts with regards to Population and Human Health.

21.4.4.2 Biodiversity (Terrestrial and Aquatic)

In accordance with the requirements of the EIA Directive and associated guidance, an assessment of cumulative impacts and interactions has been undertaken. This section considers how the Proposed Development, when combined with other past, present or reasonably foreseeable projects and plans, may result in significant effects on the receiving environment, particularly with regard to marine biodiversity and Natura 2000 sites, including the River Shannon and River Fergus Estuaries SPA and the Lower River Shannon SAC.

Plans that could interact collectively with the project include:

- Limerick Development Plan 2022-2028;
- Clare County Development Plan 2023-2029; and
- Strategic Integrated Framework Plan for the Shannon Estuary 2013-2020.

These plans support sustainable development and promote integrated management of the marine environment. They are not expected to result in any negative in-combination effects on the conservation objectives of the Natura 2000 sites.

Projects

Aquaculture and Fisheries

The closest aquaculture site is located over 25Km downstream from the Proposed Development. Ireland's marine atlas² shows the closest fishing ground is pot fishing for shrimp over 44Km downstream of the Proposed Development.

SFPC Foynes Port Capacity Extension (An Bord Pleanála ref: 301561; MARA Ref: LIC230014);

The approved development involves the extension of port infrastructure at Foynes to support increased operational capacity and future industrial use. Key components of the project include:

- Construction of a new open-piled jetty with a 116.5m suspended concrete deck, linking the existing West Quay to the East Jetty.
- Installation of quayside infrastructure such as fenders, mooring bollards, safety ladders, toe rails, and lighting columns.
- Structural upgrades and remedial works to the ends of the existing West Quay and East Jetty to enable integration with the new jetty.
- Relocation of the existing small craft pontoon and walkway, currently situated between the West Quay and East Jetty, to a new position on the western side of the West Quay wall.
- All necessary supporting site development works (e.g. maintenance dredging - Foreshore licence: FS006975 and Dumping at Sea permit: S0009-03).

In addition, the development includes a phased expansion of the port estate over approximately 33.95 hectares of adjoining land to the east. This area will be prepared to accommodate serviced industrial plots for marine-related industries, port-centric logistics, and supporting infrastructure, delivered in line with a comprehensive development framework for the expanded site.

² <https://atlas.marine.ie/#?c=52.6306;-9.5492;11> [accessed: 25/07/25]

Moneypoint Hub Project (An Bord Pleanála refs 319080, 307798; MARA Ref: MARA Ref: LIC230008)

The proposed Moneypoint Hub Project is a strategic transformation of the existing ESB coal-fired power station at Moneypoint, Co. Clare, into a green energy hub designed to support Ireland's decarbonisation goals and the Shannon Estuary Economic Taskforce recommendations. Key components of the project include:

- Development of onshore renewable energy generation and battery storage infrastructure, including substations and associated grid connection infrastructure.
- Construction of offshore renewable energy support infrastructure, such as facilities for assembly and maintenance of offshore wind turbine components.
- Provision of hydrogen production and storage facilities, forming part of a long-term vision to establish a hydrogen supply chain and refuelling hub.
- Upgrades and repurposing of existing industrial land and port infrastructure at Moneypoint to facilitate energy transition technologies.
- Surveys and assessments authorised under a Marine Survey Licence granted by MARA (Ref: LIC230008), supporting the offshore elements of the project.

The project is expected to result in increased marine traffic and industrial activity in the Shannon Estuary, particularly during construction phases. While located downstream of the Limerick WWTP, shared estuarine receptors such as migratory fish species, marine mammals, and water quality could be subject to cumulative environmental pressures when considered in combination with other development in the estuary.

Aughinish Alumina Ltd Expansion and Operations (EPA Industrial Emissions Licence Reg. No. P0035-07; MARA Ref: LIC230004)

Aughinish Alumina Ltd operates a major alumina refinery on Aughinish Island, Co. Limerick. The operation is regulated under an Industrial Emissions (IE) licence issued by the EPA, with recent permissions also granted for marine survey and dredging activities. Key components relevant to cumulative impacts include:

- Ongoing import and export of materials (e.g. bauxite and alumina) via the deepwater berth at Aughinish, contributing to vessel traffic and estuarine activity.
- Operation of the bauxite residue disposal area (BRDA), including engineered containment, leachate management, and long-term environmental monitoring.
- Abstraction and discharge of seawater for processing and cooling purposes, with potential influences on thermal and chemical characteristics of the receiving waters.
- Periodic maintenance dredging activities, permitted under MARA Licence LIC230004, to ensure navigational depth at the facility's berthing areas.
- Recent environmental infrastructure upgrades and modifications submitted to the EPA and local planning authorities, aimed at improving environmental performance and operational efficiency.

Cumulatively, activities at Aughinish Alumina contribute to the industrial and hydrodynamic pressures on the estuarine environment. When considered alongside other regional projects, including the proposed WWTP upgrade, there is potential for interaction in relation to water quality, sediment transport, noise disturbance, and aquatic species movement within the Shannon Estuary.

Gas Networks Ireland Strategic Gas Emergency Reserve Project (An Bord Pleanála Ref: PA08.322568; MARA Ref: MUL240034)

This strategic development, proposed by Gas Networks Ireland, involves the construction and operation of a liquefied natural gas (LNG) floating storage and regasification unit (FSRU) at a jetty in the Shannon Estuary, Co. Limerick. The project forms part of the national energy security strategy to ensure resilience of gas supply in emergency scenarios. The development is designated as strategic infrastructure under the Planning and Development Acts. Key components include:

- Installation of an FSRU vessel, moored permanently at the existing jetty in the estuary, capable of storing and regasifying LNG for injection into the national gas network.
- Development of onshore pipeline infrastructure and connection facilities to link the FSRU with the existing transmission system.

- Ancillary marine works including temporary moorings, marine survey activities, and navigational safety measures.
- Permission for marine survey activities under MARA Licence MUL240034.
- Supporting infrastructure such as control buildings, utility connections, and access roads within the Shannon Integrated Framework Plan (SIFP) industrial area.

The proposed project introduces a new industrial activity with the potential for significant in-combination effects with other estuarine developments. Key cumulative considerations include increased vessel movements, underwater noise, habitat disturbance, and potential water quality impacts.

Limerick City and Environs Flood Relief Scheme (ABP Ref: 312559)

The proposed development involves the implementation of a comprehensive flood relief scheme designed to mitigate flooding in Limerick City and its surrounding environs. The key elements of the scheme include:

- Construction of new flood embankments and walls along key stretches of the River Shannon and other watercourses within Limerick City.
- Enhancement of existing flood defences to increase resilience to extreme flood events.
- Installation of flood gates, sluices, and other water control infrastructure at critical locations.
- Implementation of flood mitigation works at strategic areas, including properties, roadways, and infrastructure vulnerable to flooding.
- Construction of improved stormwater drainage systems to manage floodwater runoff.
- Modifications to various bridges and other structures to facilitate floodwater flow management.

The scheme aims to reduce the risk of flooding to over 1,000 properties and significant infrastructure in Limerick City. An Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) have been prepared to evaluate the potential environmental impacts, including effects on local habitats, species, and water quality.

Conclusion

The assessment of cumulative impacts and interactions has considered the Proposed Development in the context of relevant regional plans and a range of existing and proposed developments within the Shannon Estuary. While each project has distinct objectives, construction timelines, and environmental controls, overlapping receptors such as water quality, estuarine habitats, migratory fish species, and marine mammals present potential for in-combination effects, particularly in relation to increased vessel activity, underwater noise, sediment disturbance, and hydrodynamic alteration.

However, with appropriate mitigation measures applied at project level, adherence to regulatory requirements, and ongoing environmental monitoring, the potential for significant adverse cumulative effects is considered low. The scale and location of the proposed WWTP upgrade, in conjunction with the nature of the receiving environment and distance from other large-scale developments, further reduce the likelihood of synergistic or additive impacts. Ongoing coordination between agencies and project proponents remains critical to ensuring that any residual or unforeseen cumulative impacts are identified and managed in a timely and integrated manner.

Overall, no cumulative or in-combination effects on marine biodiversity are predicted, and cumulative impacts are assessed as not significant

21.4.4.3 Water

A review of other permitted and proposed developments in the wider study area has been undertaken to identify the potential for cumulative impacts on the water environment, including surface water quality, hydrology and flood risk. The assessment considers projects within the vicinity of the Limerick WWTP and Corcanree Pumping Station, as well as strategic infrastructure proposals within the Shannon Estuary catchment.

Castletroy WWTP Upgrade

Castletroy WWTP is located approximately 10 km upstream of Limerick WWTP and discharges to the River Shannon. An upgrade of the plant is proposed to increase treatment capacity and provide additional stormwater storage. As the plant is located upstream, its discharge has the potential to influence background water quality conditions within the Shannon Estuary and therefore forms part of the cumulative assessment.

Discharges from Castletroy WWTP were included in the hydrodynamic and water quality modelling undertaken for this EIAR. The modelling assessment considered the cumulative loading scenario and demonstrated that, with the proposed upgrades in place, no significant cumulative adverse effects on receiving water quality are predicted.

Shannon Town WWTP Upgrade

Shannon Town WWTP is located approximately 3.8 km south-east of Shannon Town and discharges treated effluent to the Shannon Estuary. Upgrade works are underway to increase treatment capacity and improve plant performance.

The discharge from Shannon Town WWTP was included in the cumulative modelling scenario for the Limerick WWTP Upgrade. The assessment indicates that, when considered in combination with the proposed development and other planned upgrades, no significant cumulative adverse impacts on water quality or assimilative capacity in the Shannon Estuary are predicted.

Limerick City Flood Relief Scheme

The proposed Limerick City Flood Relief Scheme (FRS) is currently at design and consultation stage. The scheme is expected to include flood defence and riverbank protection measures within the Shannon Estuary and potentially along Ballinacurra Creek. These works will be subject to separate environmental assessment and will incorporate appropriate mitigation measures to protect water quality and hydromorphology.

Given the current stage of design and the implementation of mitigation measures associated with the Proposed Development, no significant cumulative impacts on water quality, hydrology or flood risk are anticipated. The Proposed Development will not conflict with the objectives of the FRS and will provide improved stormwater management through additional storage capacity and controlled discharge.

Other Developments in the Vicinity of Limerick WWTP

Permitted and proposed developments in the vicinity of the WWTP site were reviewed, including the following:

- Planning Ref. 2561339 – Retention and modification of an existing waste transfer facility and associated access road and hardstanding areas.
- Planning Ref. 16/642 – Permitted waste transfer facility including buildings, hardstanding, drainage infrastructure and connection to the wastewater network.
- Planning Ref. 19/672 – Installation of roof-mounted solar panels at an existing materials recovery facility and associated works.
- Planning Ref. 16/345 – Industrial development at Irish Cement involving alternative fuels and materials handling, with associated drainage and containment infrastructure.

These developments incorporate standard surface water management measures such as attenuation systems, interceptors and controlled discharge to the drainage network.

During the construction phase, there is potential for short-term cumulative effects on surface water quality where works occur concurrently. However, any such effects would be temporary and localised and will be managed through the implementation of Construction Environmental Management Plans (CEMPs), pollution prevention measures and adherence to best practice guidance.

During operation, the Proposed Development will improve effluent quality and reduce uncontrolled stormwater discharges through the provision of additional storage capacity and upgraded treatment processes. When considered in combination with surrounding permitted developments and their associated

drainage controls, no significant cumulative adverse impacts on Bunlicky Lake, Ballinacurra Creek or the Shannon Estuary are predicted.

Other Developments in the Vicinity of Corcanree PS

Permitted and proposed developments adjacent to Corcanree Pumping Station include the following:

- Planning Ref. 22/1280 – Commercial and logistics development including warehouse units, drainage infrastructure, attenuation and pumping arrangements.
- Planning Ref. 20/687 – Extension and recladding works to an existing industrial building and associated site works.

These developments include surface water attenuation, drainage infrastructure and water quality control measures designed to protect local drainage channels and receiving waters. These measures will limit runoff and sediment inputs during construction and operation.

The Proposed Development includes a new stormwater storage tank and improved drainage management at Corcanree Pumping Station, which will reduce the frequency and volume of uncontrolled discharges to the Shannon Estuary. When considered in combination with adjacent developments and their associated mitigation measures, no significant cumulative impacts on surface water quality, hydrology or flood risk are predicted.

Other Strategic Developments in the Shannon Estuary

A number of strategic infrastructure and industrial developments within the wider Shannon Estuary have been reviewed for potential cumulative effects on the water environment.

- Shannon Foynes Port Capacity Extension (ABP Ref: 301561; MARA Ref: LIC230014) – Approved port infrastructure expansion at Foynes including a new jetty, quay works and associated dredging. The project has the potential to temporarily influence sediment transport and water quality during construction; however, it is located downstream of Limerick and subject to separate environmental controls and licensing.
- Moneypoint Hub Project (ABP Refs: 319080, 307798; MARA Ref: LIC230008) – Proposed redevelopment of the existing power station site to a renewable energy and port-support hub, including marine and onshore infrastructure. The project is located downstream in the estuary and may increase marine activity during construction but will be subject to environmental assessment and mitigation.
- Aughinish Alumina Operations and Expansion (EPA IE Licence Reg. No. P0035-07; MARA Ref: LIC230004) – Ongoing industrial operations including licensed discharges, abstraction and periodic maintenance dredging. Activities are regulated under the EPA Industrial Emissions licence and marine licensing regimes.
- Strategic Gas Emergency Reserve Project (ABP Ref: PA08.322568; MARA Ref: MUL240034) – Proposed floating storage and regasification unit and associated marine infrastructure within the Shannon Estuary. The development may increase vessel activity and include marine works, subject to separate assessment and licensing.

These projects are located within the wider Shannon Estuary and are subject to their own environmental assessments, licensing and mitigation measures. While they contribute to the overall level of activity within the estuary, they are geographically separated from the Limerick WWTP discharge location and will operate under regulated discharge and construction controls.

Summary of Cumulative Impacts

Other relevant projects in the Shannon Estuary catchment, including upgrades to Castletroy and Shannon Town WWTPs, the proposed Flood Relief Scheme and nearby permitted developments, have been considered as part of this assessment.

Any cumulative effects during construction would be short-term and localised and will be controlled through standard construction management and pollution prevention measures.

During operation, the Proposed Development will improve treatment performance and provide additional stormwater storage, reducing uncontrolled discharges to the Shannon Estuary. Cumulative modelling of relevant wastewater discharges indicates that the assimilative capacity of the receiving waters will not be adversely affected.

Overall, no significant adverse cumulative impacts on water quality, hydrology or flood risk are predicted. The Proposed Development is expected to result in a minor positive cumulative effect on the water environment.

21.4.4.4 Land & Soils

During the construction phase, potential cumulative effects may occur from combination of earthworks excavation, dewatering activities and construction activities associated with the Proposed Development. The cumulative effects are limited to localised soil disturbance, excavation and handling of material and dewatering. The impacts are limited to the Proposed Development footprint and while some are temporary in duration, some such as removal of topsoil and excavation for structures are permanent, they are controlled through the implementation of the construction environmental management plan. The cumulative effects on land & soils during construction are assessed as slight negative/adverse and not significant after effectively implementing mitigating measures.

21.4.4.5 Odour

There is no potential for cumulative odour impacts to arise during the construction phase of the Proposed Development. The only odour emissions potential associated with construction at the WWTP and PS is at the integration stage and this stage will be very carefully managed to ensure that the predicted Imperceptible to Not Significant odour effects are achieved. Consequently, there is no potential for adverse odour impact during the construction phase.

21.4.4.6 Air Quality

According to the IAQM guidance (2024) should the construction phase of the proposed development coincide with the construction phase of any other developments within 500 m then there is the potential for cumulative construction dust related impacts to nearby sensitive receptors. No major future planned developments which would be constructed concurrently with the Proposed Development were identified during scoping

However, if this were to change and there are construction sites within 500 m of the Proposed Development, provided the mitigation measures outlined in Section 8.5 in Chapter 8 are implemented throughout the construction phase significant cumulative dust impacts are not predicted.

As the operational phase impacts are predicted to be imperceptible, there will be no significant cumulative impact.

21.4.4.7 Climate

With respect to the requirement for a cumulative assessment the ISEP (ISEP, 2022) and TII (TII, 2022) guidance on which the assessment is based states that:

"the identified receptor for the GHG Assessment is the global climate and impacts on the receptor from a project are not geographically constrained, the normal approach for cumulative assessment in EIA is not considered applicable. By presenting the GHG impact of a project in the context of its alignment to Ireland's trajectory of net zero and any sectoral carbon budgets, this assessment will demonstrate the potential for the project to affect Ireland's ability to meet its national carbon reduction target. This assessment approach is considered to be inherently cumulative".

As per the above, the cumulative effect of the Proposed Development in relation to GHG emissions is considered **direct, long-term, negative** and **slight**, which is overall **not significant** in EIA terms.

21.4.4.8 Noise and Vibration

In relation to the in-combination construction and/or operational impact of the Proposed Development, with other proposed schemes planned in the area, the list of projects in the vicinity of the Limerick WWTP and

Corcanree site have been reviewed. Projects within approximately 500m from the Proposed Development have been considered in terms of potential cumulative noise and vibration impact.

The assessment of construction noise impacts from the Proposed Development has indicated that construction noise limit criteria will not be exceeded at the nearest residential properties during typical daytime construction activities.

Noise from construction works will fluctuate throughout the course of a typical working day as well as over the course of the construction works being undertaken in any one location. Therefore, the daytime construction noise limit of 65 dB $L_{Aeq,12\text{ Hour}}$ will be achieved at the nearest residential properties. The construction noise impacts will be short-term and will not be significant. Also, while the overall construction activities for the Proposed Development will occur over several months, the nature of the proposed works and its duration at any one location will mean that noise sensitive receivers will not be exposed to continuous construction noise impact during the construction period.

Once the recommended mitigation measures have been implemented, the residual impacts from the development will not be significant. In the unlikely event of all of the projects in the vicinity of the Limerick WWTP and Corcanree site being constructed simultaneously, there may a potential for a short-term slight negative cumulative noise and vibration impact.

The construction phase of the Proposed Development will implement the mitigation measures listed in Section 10.6 Mitigation Measures in Chapter 10 (Noise and Vibration) in Volume 2 of this EIAR, thereby minimising the potential cumulative noise and vibration impact that this project could have.

Any noise and vibration impacts from the Proposed Development will be temporary and transient in nature. Impacts will also differ between receptors, depending on distance to the works areas, and the type of works being carried out in the area. Given the mitigation measures being implemented for this scheme, and depending on the receptor location in question, there is potential for no impact or a short-term imperceptible to slight negative cumulative impact.

The list of schemes in the vicinity of the Limerick WWTP and Corcanree site have been reviewed to determine if there are any other large-scale plans or projects in the area which could realistically result in cumulative noise and vibration impact. Projects within 500m from the Proposed Development have realistically been considered in terms of potential cumulative impact. The nearest large-scale projects are as follows:

TABLE 21-2 ASSESSMENT OF POTENTIAL CUMULATIVE IMPACT FROM OTHER PROPOSED DEVELOPMENTS

Reg. No.	Applicant	Brief Description of Proposed Development	Distance from Proposed Development	Decision Date	Potential cumulative impact - Yes / No
22313124	SHD DW Raheen Developments Ltd.	384 residential units (202 houses, 182 apartments), creche and associated site works.	900m	01/08/2022	No
21311588	SHD - Voyage Properties Ltd	371 residential units, proposed access road and two storey childcare facility.	765m	26/05/2022	No
TA91.312683	The Clonmacken Partnership	165 no. residential units (43 no. houses, 122 no. apartments), creche and associated site works.	1.04km	26/05/2022	No

Based on the assessment of the Proposed Development in combination with all other programmes and projects in the vicinity, no significant in-combination cumulative effects relating to noise and vibration are anticipated.

21.4.4.9 Material Assets

Given the nature and scale of the developments identified, no cumulative effects on material assets are predicted to occur if anyone, or all of these developments occur concurrent to the construction of the Proposed Development. However, there is the potential for physical and temporal overlap between the Proposed Development and the proposed Limerick City and Environs Flood Relief Scheme.

The design and construction of the overlapping elements of each of the schemes will be implemented in an integrated manner in so far as possible. Further, it will be the responsibility of contractors to ensure effective coordination and communication throughout construction in relation to utilities and services diversions. This approach therefore ensures that the cumulative effects on material assets arising from the construction of the Proposed Development and the proposed Limerick City and Environs Flood Relief Scheme is mitigated and avoided in so far as possible.

21.4.4.10 Traffic and Transport

Cumulative impacts are the potential combined impacts from the other committed developments in conjunction with the Proposed Development. At the time of writing, four other developments (including Greenpark Strategic Housing Development, Nursing Home Development, Commercial and Warehouse Development and Ballykeeffe Strategic Housing Development) in the vicinity of Proposed Development were obtained planning permission from the An Coimisiún Pleanála (previously An Bord Pleanála). Those permitted developments shall be considered for this study in both the “without” and “with” development scenarios. This is because whether or not the proposed development is built, the trips generated by those permitted developments will still apply. The overall cumulative impact during the construction phase of the Proposed Development on traffic and transportation can be reference to the Section 6.6.8 in Chapter 6 (Traffic and Transport).

21.4.4.11 Resources and Waste Management

A planning search was undertaken to identify other proposed developments in the vicinity of the Limerick WWTP and Corcanree Pumping Station. No projects were identified that would give rise to significant cumulative effects on waste generation or waste management when considered in combination with the Proposed Development.

The RBC upgrade includes measures that promote resource recovery, including the production of Class A biosolids for beneficial reuse and the generation of biogas for on-site energy recovery. These measures interact positively with national climate and carbon reduction objectives by reducing reliance on fossil fuels, supporting renewable energy generation, and diverting organic material from disposal.

The recovery and reuse of biosolids also reduces the need for manufactured fertilisers, resulting in indirect greenhouse gas emission savings. These interactions are consistent with the objectives outlined in the Climate chapter of the EIAR and the National Waste Management Plan for a Circular Economy 2024–2030

The specific lands that will be utilised for the landspreading of biosolids produced at the Limerick RBC cannot be identified at this stage. Suitable lands are selected on an ongoing basis, taking into account nutrient requirements and site-specific conditions. Uisce Éireann ensures that all landspreading activities comply with the requirements of the National Wastewater Sludge Management Plan (NWSMP) and all relevant legislation.

21.4.4.12 Archaeology, Architectural and Cultural Heritage

Cumulative effects include the combined effects of multiple developments or activities on a range of receptors, in this case, archaeological monuments and architectural/cultural heritage sites.

- There are no significant cumulative effects on the archaeological and architectural/cultural heritage resource of the area as a result of the Proposed Development. There are no predicted effects on the known archaeological and architectural/cultural heritage features of the site and the surrounding landscape.

- In recent years, a number of small and large-scale developments were proposed, approved and refused in the environs of the site by Limerick County Council (Corcanree PS site 221280, 237021, 05770226, 01770078; Limerick WWPS 2561339, 19672). These refer to lands adjacent or in the immediate proximity to the site.
- Of relevance to the Corcanree PS site is Planning Ref. No. 221280 with monitoring conditioned (no record of it as of yet taking place on excavations.ie or in the public domain). Of relevance to the Limerick WWPS site is Planning Ref No. 2561339, currently at further information request with no request of an archaeological item included.

All related due diligence will be undertaken by the client, who will ensure the completion of the required archaeological and architectural/cultural heritage mitigation measures.

Subject to the implementation of the appropriate mitigation measures during the Construction Phase, it is predicted that there will be no residual effects on the archaeological, architectural and cultural heritage and therefore no possibility of cumulative effects in combination with other plans or projects.

21.4.4.13 Landscape and Visual

The Castletroy WWTP is located approx. 5.7km (Corcanree PS) and 6.7km (Bunlicky) northeast of the Proposed Development. Due to the distance between the sites, the height of the tallest elements on site, and the intervening built-up area of Limerick City, there is no intervisibility between the three sites. This is expected to have a *low to negligible* localised impact.

Planning applications in the surrounding area have been considered to evaluate the proposed application with what current and other proposed use classes. The following applications were noted:

1. Mr. Bin Man next to the Limerick WWTP site has a planning application in progress and at the time of writing has been requested for Further information (planning application details ref: 2561339). Application is for alteration to a previous planning application with Limerick City and County Council Planning Reference 16/642. Planning permission is being sought for:
 - a) *The construction of a proposed new access road from the adjacent Bunlicky Waste Water Treatment Plant Road which will result in the closure of the existing temporary vehicular access from the Dock Road and creation of a pedestrian access only.*
 - b) *Construction of an ESB Substation and all ancillary landscaping and site development works.*

Another planning permission has been finalised and granted, located adjacent to the Corcanree PS site (planning application details ref: 221280). This 7-year planning permission is for the following development:

- Demolition of 3 no. commercial buildings and removal/demolition of a number of sheds/outbuildings;
- Refurbishment of existing warehouse building;
- Provision of 3 no. retail warehouse units (total 2,593sqm) fronting onto Dock Road;
- Provision of 2 no. logistics warehouse H (2,790sqm);
- Provision of 34 no. commercial/enterprise units delivered with a total floor area of 9547sqm;
- Optional mezzanine floor area which has the potential to increase the overall floor area by 1,870sqm;
- Primary access to the site will be through the Corcanree Business Park via the Greenpark Roundabout; and
- The existing access serving the site from Dock Road will be restricted to a left in left out junction.

In accordance with the methodology the cumulative magnitude of change for visual receptors would be negligible. In accordance with Table 15-1 and Table 15-2, the cumulative visual effect on visual receptors would therefore be *permanent, imperceptible, negative*.

Due to the similar form, scale and location of the three developments, and the minimal change to any landscape features, the proposals would not have any significant cumulative effects on landscape fabric or character. In accordance with the methodology the cumulative magnitude of change for landscape fabric and character would be *negligible*. In accordance with Table 15-1 and Table 15-2, the cumulative effect on landscape fabric and character would therefore be *permanent, imperceptible, negative*.

Mitigation Measures

The Limerick WWTP and Corcanree PS are lined with mature vegetation around their boundaries. This vegetation largely screens the sites from the surrounding area. Limited vegetation removal is anticipated for the construction of the Proposed Development at both sites to accommodate the proposed works as well as access to the sites. This vegetation removal is minimal and localised to a maximum width of 5m. The remaining retained existing vegetation at both sites is to be protected and enhanced. To mitigate the losses, reinstating planting at the location where existing vegetation was removed is proposed. Additionally, further tree and herbaceous planting aiming to increase the baseline provision of habitat following the recommendations of the project ecologist has been included to the mitigation.

These measures are expected to reduce further any visual impacts to the assessed visual receptors in the long term as vegetation reaches maturity. They are also expected to have a positive impact to the landscape character along the Upper Shannon Estuary by improving the quality of the vegetation and provided amenity.

21.4.5 Operational phase

It is considered that there are no projects or plans identified in proximity that have the potential to result in cumulative impacts with regards to Population and Human Health.

Odour: The cumulative effects of the Proposed Development in conjunction with current and future developments in the vicinity of the subject site are considered in this section. Cumulative odour impacts from the WWTP and the PS were considered specifically in the assessment carried out and no significant adverse impacts were identified.

Permitted and proposed developments in the vicinity of the WWTP site were reviewed, including the following:

- Planning Ref. 16/642 – Permitted waste transfer facility including buildings, hardstanding, drainage infrastructure and connection to the wastewater network.
- Planning Ref. 19/672 – Installation of roof-mounted solar panels at an existing materials recovery facility and associated works.
- Planning Ref. 16/345 – Industrial development at Irish Cement involving alternative fuels and materials handling, with associated drainage and containment infrastructure.
- Planning Ref. 2561339 - alterations to an existing Waste Transfer Station permitted by Limerick City and County Council - Mr. Binman, Dock Road, Ballykeeffe, Limerick. (Further Information is required)

Permitted and proposed developments adjacent to Corcanree Pumping Station include the following:

- Planning Ref. 22/1280 – Commercial and logistics development including warehouse units, drainage infrastructure, attenuation and pumping arrangements.
- Planning Ref. 20/687 – Extension and recladding works to an existing industrial building and associated site works.

The most relevant nearby sites are the Waste sites close to the WWTP and PS facilities as set out in Section 7.4.2. These sites are located adjacent to the WWTP site boundary and at a distance from the PS boundary. These sites may emit odour into the environment; however, these facilities are located predominantly downwind of the WWTP and due to the nature of the licenced activities are unlikely to lead to measurable cumulative impacts.

The largest EPA licenced facility in the area is the Irish Cement Works at Mungret which is located predominantly upwind of the Proposed Development. Due to the nature of activities at this site, the assessment concluded that there is no potential for cumulative odour impacts from this development.

The Review determined that most of the developments have no potential for cumulative odour impacts to arise. Developments at the waste facilities adjacent to the WWTP site boundary do have potential to generate odour emissions and there is potential for cumulative impacts to arise. All facilities, including the Limerick

WWTP and PS, are regulated under Licence from the EPA and as a result the facilities must comply with stringent odour management conditions to ensure that odours are not detected at nuisance levels beyond the site boundary. In meeting these Licence Conditions, it is ensured that cumulative impacts do not result in adverse impact beyond the site boundary.

21.5 Environmental interactions

The assessment of interactive effects has considered likely significant effects arising from impact interactions that may occur during Construction and Operational phases of the Proposed Development.

The approach taken has been to:

- Identify the potential for interactions between different environmental topics over the construction and operation phases, including consideration in terms of cumulative effects. The determination of interactions was facilitated through consultations between environmental specialists and technical specialists. It also considers the potential for mitigation measures prescribed in respect of one environmental factor to give rise to unintended negative impacts in respect of one or more other factors, as appropriate; and
- Prepare a summary of the interactions between different environmental topics which have been identified and addressed in this EIAR

21.5.1 Interactive Effects

The assessment of interactive effects has considered likely significant effects that may arise during construction and operation of the Proposed Development based on best scientific knowledge. A summary of these effects is presented in the matrix in Table 21-3.

TABLE 21-3 ENVIRONMENTAL INTERACTION

Typical Inter-Relationship Matrix – Environmental Elements	Population & Human Health	Biodiversity	Land & Soils	Water	Air Quality	Climate	Odour	Noise & Vibration	Waste	Landscape & Visual	Cultural Heritage	Material Assets	Traffic & Transport	Major Accident & Disasters
Population & Human Health														
Biodiversity	√													
Land & Soils		√												
Water		√	√											
Air Quality	√	√	√	√										
Climate	√		√		√									
Odour	√				√									
Noise & Vibration	√	√	√	√	√									
Waste			√		√	√								
Landscape & Visual	√	√	√											
Cultural Heritage			√					√						
Material Assets	√		√	√					√		√			
Traffic & Transport	√		√		√	√		√	√		√			
Major Accidents & Disasters	√	√	√	√	√	√			√	√				

21.5.2 Interaction between Population and Air Quality, Noise and Vibration and Landscape and Visual

The most significant interactions are between population and human health and air quality. An adverse impact due to air quality in either the construction or operational phase has the potential to cause health and dust soiling issues. The mitigation measures that will be put in place at the Proposed Development will ensure that the impact of the Proposed Development complies with all ambient air quality legislative limits which are set for the protection of human health. Therefore, the predicted impact is short-term, direct, localised, negative and not significant with respect to population and human health during construction and long-term, direct, localised, negative and not significant during operation phase. No significant impacts to human health are predicted in relation to air quality.

Construction phase activities such as land clearing, excavations, stockpiling of materials etc. have the potential for interactions between air quality and land and soils in the form of dust emissions. With the appropriate mitigation measures to prevent fugitive dust emissions, it is predicted that there will be no significant interactions between air quality and land and soils.

Dust generation can occur during extended dry weather periods as a result of construction traffic. Dust suppression measures (e.g. dampening down) will be implemented as necessary during dry periods and vehicle wheel washes will be installed, for example. The works involve stripping of topsoil and excavations, which will remove some vegetation such as trees and scrub. It will also generate dust and potentially impact on the air quality in the locality. However, the generation of dust will be temporary during construction phase and with the proposed mitigation measures in place is not anticipated to have a significant impact on biodiversity.

The impact of the interactions between land, climate, soils and geology, biodiversity and air quality are considered to be short-term, neutral and imperceptible.

No other significant interactions with air quality have been identified.

21.5.3 Interactions between Population and Human Health, Biodiversity, Material Assets and Noise & Vibration

Combined effects are by their nature interactive; the effect of one impact is dependent or influenced by another effect. Earthworks and piling during the construction phase have the potential to give rise to noise impacts, potentially giving rise to impacts on residential properties and fauna. Mitigation of combined effects is best achieved through management and control measures to prevent the individual impacts in the first instance or reduce the impacts themselves and therefore reduce the likelihood of such interactions occurring. The environmental effects on noise and vibration are interlinked with the environmental effects of:

- Chapter 04 – Construction Impacts
- Chapter 19 – Population & Human Health
- Chapter 13 - Biodiversity
- Chapter 18 – Material Assets

The excavation, movement and transport of soils and building materials along with short-term piling during the construction phase has the potential to give rise to noise and vibration impacts.

All mitigation measures outlined in the respective chapters of this EIAR will be implemented in full to ensure the potential impact is minimised in relation to construction and operation impacts.

21.5.4 Interactions between Population, Human Health, Air Quality, Climate, Noise and Vibration and, Traffic and Transport

Construction impacts due to emissions from vehicular traffic and due to earthworks have been assessed in Chapter 8 (Air Quality) and Chapter 9 (Climate) of this EIAR.

Construction impacts due to noise and vibration from vehicular traffic, most notably HGVs (e.g. transporting earthworks material) have been assessed in Chapter 10 (Noise and Vibration) of this EIAR.

The construction phase importation of material to the site during construction phase is detailed in Chapter 19 (Population and Human Health) of this EIAR. All haulage of plant and materials to and from the construction sites will be via Dock Road, N18, N69, R510, Access Road to Corcanree Business Park and local access road to Limerick WWTP Site.

As a result of the negligible increase in traffic volumes on the surrounding road network, it is anticipated that the Proposed Development will have no significant impact on the capacity of the local road network and have no significant interaction with Population and Human Health.

21.5.5 Interactions between Biodiversity, Land and Soils, Water, Air Quality, Noise and Vibration

The potential interactions between marine biodiversity and other environmental factors have been considered as part of this assessment.

Marine biodiversity is closely linked to water quality (as described in Chapter 16: Water Environment), which is a key driver of ecological conditions within the estuary. During construction, there is potential for indirect effects on marine biodiversity through the mobilisation of sediment or accidental release of pollutants to drainage pathways connected to the estuary. However, with the implementation of standard construction management measures to control surface water runoff, sediment, and pollutants, no significant effects on water quality or associated ecological receptors are anticipated. During operation, improvements in effluent treatment and reductions in untreated discharges are expected to reduce existing pressures on the estuary, with any changes in water quality remaining small, localised, and not significant. As such, the interaction between water quality and marine biodiversity is considered to result in no significant adverse effects.

Interactions with land and soils are primarily limited to the construction phase, where soil disturbance has the potential to generate sediment that could enter drainage systems. This represents an indirect pathway to the estuarine environment. However, given the location of the works within the existing developed footprint and the implementation of appropriate soil and surface water management measures, no significant effects on marine biodiversity are predicted.

Marine biodiversity also has an indirect interaction with terrestrial biodiversity, particularly where habitats and species are connected through shared ecological processes such as surface water drainage and nutrient pathways. During construction, any impacts on terrestrial habitats (e.g. vegetation clearance or soil disturbance) could, in the absence of appropriate controls, contribute to sediment or pollutant runoff to aquatic environments. However, with the implementation of mitigation measures across both terrestrial and aquatic receptors, no significant indirect effects on marine biodiversity are anticipated. During operation, no meaningful interaction between terrestrial and marine biodiversity is expected.

With regard to noise and vibration, construction activities will generate short-term increases in noise levels within the site. However, as no in-water works are proposed and all activities will take place within an existing industrial setting, there is no pathway for significant underwater noise or vibration effects on marine fauna. Any potential disturbance to mobile species such as fish or marine mammals would be limited, temporary, and not significant.

There is limited interaction between marine biodiversity and air quality, as the proposed development is not expected to generate emissions that could materially affect the estuarine environment. Dust or airborne pollutants generated during construction are not anticipated to reach or affect the estuary to a degree that would influence aquatic habitats or species.

Overall, the interactions between marine biodiversity and other environmental factors do not give rise to any additional or cumulative significant effects beyond those identified in the individual assessments.

With regard to interactions between terrestrial biodiversity and land and soils, movement of soils could result in sediment run-off to freshwater habitats including drains within the Proposed Development sites and Bunlicky Lake, with potential to impact freshwater habitats and fauna. However, with the construction phase water quality mitigation measures in place, there will be no potential for significant effect on freshwater habitats and species.

With regard to interactions between terrestrial biodiversity and noise, in the absence of mitigation, there is potential for disturbance due to noise associated with construction works on wintering and breeding bird species and otter. However, with the prescribed noise limitation measures in place, there will be no potential for significant impact in this regard. As set out in Chapter 13 Biodiversity (Terrestrial), there is no potential for significant disturbance effects on terrestrial fauna as a result of vibration.

The potential for air quality impacts on terrestrial biodiversity has also been considered in Chapter 13, as a result of construction phase air quality impacts and operation of the Regional Bioresource Centre. However, as described therein, there is no potential for significant effect to terrestrial biodiversity due to air quality impacts.

21.5.6 Interactions between Land & Soils and Water

The Proposed Development is situated near the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA, both designated as High importance. Given the estuarine setting and the shallow, low-permeability overburden, the potential for interactions between land and soils impacts and the surface and groundwater environment is considered.

During the construction phase, the following interaction have been identified:

- Sediment mobilisation: Earthworks in estuarine silts and clays (medium importance) will disturb fine-grained, easily erodible material. Sediment-laden runoff has the potential to enter surface water drainage channels and ultimately the River Shannon, adversely affecting water quality and ecology. The probability of this is considered likely without appropriate controls.
- Dewatering discharge: Dewatering activities during foundation excavation and pile installation will abstract shallow groundwater and perched water within the soft silt stratum. Uncontrolled discharge of abstracted water without adequate treatment could introduce suspended solids, fine particles, and mobilised contaminants into surface water or the tidal estuary.
- Groundwater level alteration: Dewatering activities have the potential to temporarily lower groundwater levels in the soft silty deposits, causing localised settlement in adjacent areas and affecting nearby hydrological regimes.

The magnitude of these interactions is assessed as Negative/Adverse. With the implementation of the mitigation measures set out in Chapter 14 (Land and Soils), these interactions are predicted to be short-term, localised, and not significant (imperceptible to slight).

During the operation phase, the interaction between land & soils and water is principally governed by the integrity of the engineered containment structures and the surface water management system. The design incorporates impermeable bunding, surface water interception, and controlled drainage to prevent uncontrolled infiltration. Given the ongoing proximity to the Lower River Shannon SAC, the potential for accidental chemical spillages to mobilise through the shallow overburden to water remains a residual consideration; however, the probability of occurrence is low, and the magnitude of any operational impact is assessed as Negligible. The significance of this interaction during operation is therefore considered Not significant (imperceptible).

21.5.7 Interactions between Climate, Air Quality, Waste & Resources, Land & Soils and Traffic & Transport

Climate has the potential to interact with a number of other environmental attributes. Interactions with other environmental chapters are described below.

Air quality and climate have interactions due to the emissions from the burning of fossil fuels during the construction and operational phases generating both air quality and climate impacts. There is no impact on climate due to air quality. However, the impacts on air quality and climate are strongly linked as they often come from the same sources and actions to reduce the impact of one often benefit the actions to reduce the impact of the other. Problems associated with climate change, such as hotter, drier summers, can often exasperate the problems associated with poor air quality.

Waste management measures will be put in place to minimise the amount of waste entering landfill, which has higher associated embodied carbon emissions than other waste management such as recycling. The effect of the interactions between waste and climate are considered to be direct, short-term, negative and not significant during the construction phase which is overall not significant in EIA terms and direct, long-term, negative and not significant during the operational phase, which is overall not significant in EIA terms.

The effect of the interactions between climate and land, soils, geology are direct, short-term, negative and imperceptible during the construction phase and direct, long-term, negative and imperceptible during the operational phase, which is overall not significant in EIA terms.

During the construction and operational phase, there is the potential for interactions between climate and traffic. Vehicles accessing the site will result in emissions of CO₂, a greenhouse gas. The effects of the proposed development on climate have been assessed and the effects of the interactions between traffic and climate are considered to be direct, short-term, negative and not significant during the construction phase and direct, long-term, negative and not significant during the operational phase, which is overall not significant in EIA terms.

21.6 Difficulties encountered in Compiling Information

The cumulative impacts of the Proposed Development with each of the 'other developments' were assessed to a level of detail commensurate with the information that was available at the time of assessment. Where information regarding other Proposed Developments was limited, these gaps were acknowledged within the assessment and the associated uncertainty in these cases is documented.

21.7 References

Draft Advice Notes for Preparing Environmental Impact Statements (EPA, 2015)

Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report (European Union, 2017c)

Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission, 1999)

Guidelines for Planning Authorities and An Bord Pleanála (hereafter referred to as the Board) on carrying out Environmental Impact Assessment. Department of Housing, Local Government and Heritage (DoHLGH, 2018)

Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022)

Limerick Development Plan 2022 – 2028

Clare County Development Plan 2023 – 2029

Strategic Integrated Framework Plan for the Shannon Estuary 2013 – 2020

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