N6 Galway City Ring Road

Updated Natura Impact Statement (NIS)

March 2025

Volume 2

Main Report

An Roinn Iompair
Department of Transport

Bonneagar Iompair Eireann
Transport Infrastructure Ireland

Comhairle Cathrach na Gaillimhe
Galway City Council

Comhairle Chontae na Gaillimhe
Galway County Council

ARUP

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1. Glossary of Terms

Glossary of Terms	Meaning
AA	Appropriate Assessment An assessment carried out under Article 6(3) of the Habitats Directive of the implications of a plan or project, either individually or in combination with other plans and projects, on a European site in view of the site's conservation objectives
ABP	An Bord Pleanála
Alkalinity	Is a measure of the ability of a solution to neutralise acids
Alluvium	Sediment deposited by flowing water
Annex I habitat	Habitat types listed on Annex I of the EU Habitats Directive whose conservation requires the designation of Special Areas of Conservation
Annex II species	Species listed on Annex II of the EU Habitats Directive whose conservation requires the designation of Special Areas of Conservation
Annex IV species	Species listed on Annex IV of the EU Habitats Directive which are afforded strict protection under EU and national legislation
aOD	Above ordnance datum
Aquifer	A subsurface layer or layers of rock that store and transmit water in significant quantities
Arterial Drainage	Artificial drainage work carried out to support natural drainage networks
Attenuation pond	Water pond used for the collection and slow release of water runoff from the road
At-Grade Junction	Junction where roads converge at the same level
At-grade signalised junctions	Road junction, where roads converge at the same level, which is controlled by traffic signals
AQS	Air Quality Standards
Batholith	A very large igneous intrusion extending to an unknown depth in the earth's crust.
Bathymetric	Bathymetry is the measurement of the depth of water in oceans, rivers, or lakes. Bathymetric maps look a lot like topographic maps, which use lines to show the shape and elevation of land features.
BCI	Bat Conservation Ireland
Benthic	Relating to the bottom of a sea or lake or to the organisms that live there
Biodegradation	Biodegradation is the decomposition of organic material by micro-organisms
Biological Oxygen Demand (BOD)	A parameter used to quantify how fast biological organisms use up oxygen in a body of water. The testing for BOD is not an accurate quantitative test, although it could be considered as an indication of the quality of a water source
Biotite	Biotite is a name used for a large group of black mica minerals that are commonly found in igneous and metamorphic rocks
Bivalves	An aquatic mollusc which has a compressed body enclosed within a hinged shell, such as oysters, mussels, and scallops
Blasting	Breaking apart or blowing up solid rock with explosives

Glossary of Terms	Meaning
Bored tunnel	The excavation of a tunnel using a machine with circular cross section through rock, i.e. the constructed using a boring machine
BoCCI	Birds of Conservation Concern in Ireland
BSBI	Botanical Society of Britain & Ireland
BWI	BirdWatch Ireland
Catchment	The entire surface area feeding water to a given surface or groundwater feature
Carriageway	The particular part of the road used by vehicular traffic
C_6H_6	Benzene
CEMP	Construction Environmental Management Plan
Ch.	Chainage
Cherry picker	A hydraulic crane with a railed platform at the end for raising and lowering people, for instance to work on overhead cables
Chlorophyll	Chlorophyll is a green pigment found in most plants, algae, and cyanobacteria
CIRIA	Construction Industry Research and Information Association
CO	Carbon Monoxide
CO_2	Carbon Dioxide
Conductivity	Conductivity (or specific conductance) of a solution is a measure of its ability to conduct electricity. It is linked directly to the total dissolved solids in the solution
Conservation objectives	The overall target for the species and/or habitat types for which an SAC or SPA site is designated in order for the site to contribute to maintaining or reaching favourable conservation status of those species and/or habitat types. For some SAC/SPA sites this includes a detailed set of targets and attributes against which favourable conservation status can be measured
Construction stage	The stage during which the Project will be constructed. This includes advance contracts such as fencing, archaeological testing and the diversion of utilities/services, site set up and mobilisation
Conveyance	The ability of a river to carry water flow
Cofferdam	A watertight enclosure pumped dry to permit construction work below the waterline, for example foundations for a bridge structure.
Collection System	A system of gathering, sorting or mixing of waste for the purpose of it being transported to a waste recovery or disposal facility
Conduit flow	Groundwater flow though large conduits within the rock mass typical of karstic aquifers.
Culvert	A structure that allows water to flow under an obstruction such as a road or railway
SAC	Special Area of Conservation
Cu	Copper
Cumec	A cubic metre per second, as a unit of rate of flow of water
Cut and cover tunnel	'Cut and cover' is an approach used for constructing shallow tunnels in situations where all the ground above the tunnel can be cleared (cut), the structural element for the tunnel is then constructed before the top of the tunnel is covered over with earth, topsoil and grass

Glossary of Terms	Meaning
DCHG	Department of Culture, Heritage and the Gaeltacht
DAU	Development Applications Unit of the DCHG
dB (decibel)	The unit of sound pressure level, calculated as a logarithm of the intensity of sound.
dB(A)	Unit used to measure the intensity of sound. The "A" denotes that levels were "A" weighted
Designated sites	Sites which have special status as protected areas because of their natural and cultural importance
DHPLG	Department of Housing, Planning and Local Government
DEFRA	UK Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges, UK
Dolerite	A dark, medium-grained igneous rock, typically with ophitic texture, containing plagioclase, pyroxene, and olivine. It typically occurs in dykes and sills
Doline	A shallow usually funnel-shaped depression of the ground surface formed by solution in limestone regions
Drawdown	A withdrawal of water from a reservoir or repository
Dykes	A subvertical sheet-like intrusion of magma or sediment
Effects	The term effects and impacts are used interchangeably in this NIS to mean the result of an action on the ecological receptor/European site under discussion The term "effect" does have a specific meaning under the Habitats Directive when used in the context of discussing "likely significant effects" on a European site. In that context, it refers to an impact/effect that has the potential to affect the conservation objectives of a European site and hence adversely affect the integrity of that European site
Effective rainfall	That part of the total precipitation which remains after evaporation and which is available for vegetation and percolation.
EQS	Environmental Quality Standard
EIA	Environmental Impact Assessment
Enabling works	Preparations to make a site ready for construction. It covers activities from site preparation, creation of access routes, and the installation of facilities like security fencing, ramps, and placing of signs
EPA	Environmental Protection Agency
Epikarst	The thin zone near the karst surface. It includes the solutionally modified (karren) bedrock surface and the overlying and included regolith. The epikarst frequently supports a perched aquifer and serves to retard and store infiltrating rainwater. It also serves as a habitat for a variety of organisms that live in the interstices
Estavelles	Estavelles are orifices with a dual function. They either discharge water as a spring or allow water to sink, depending on groundwater conditions. Typically estavelles are the connection of karst lakes with the karst ground water table
EU	European Union
European site	Collective term used in national legislation when referring to nature conservation sites protected under the Habitats or Birds Directives (i.e. SAC or SPA sites)

Glossary of Terms	Meaning
Favourable Conservation Condition	In the context of assessing effects on the QIs/SCIs of European sites and their conservation objectives, favourable conservation condition is achieved when the QI habitats have sufficient range, area and quality, and QI/SCI species have a sufficient population size range and habitat area, to ensure their survival into the medium to long term, along with favourable future prospects in the face of pressures and threats
Favourable Conservation Status	In the context of assessing the conservation status of Annex I habitats and Annex II/IV species at a national level, favourable conservation status is achieved when the habitats have sufficient range, area and quality, and the species have a sufficient population size range and habitat area, to ensure their survival into the medium to long term, along with favourable future prospects in the face of pressures and threats
Fissure	Natural crack in rock which allows rapid water movement
FPO	Flora (Protection) Order, 2015
Fracture	A discontinuity across which there has been separation
GHG	Greenhouse Gases
GI	Ground Investigation
GIS	Geographic Information System
Grade Separated Junction	Road junction where roads converge and at which at least one road passes over another
Groundwater	That part of the subsurface water that is in the saturated zone, i.e. below the water table
Groundwater vulnerability	Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities
GSI	Geological Survey of Ireland
GTS	Galway Transport Strategy – an overall transport strategy for Galway City and its environs with a clear implementation framework for transportation
GWDTE	Groundwater Dependent Terrestrial Ecosystems
Habitat	The dwelling place of a species or community which provides a particular set of environmental conditions
ha	Hectare (one hectare is equal to 10,000 square meters)
HAWRAT	Highways Agency Water Risk Assessment Tool
HGV	Heavy Goods Vehicle
Horizontal Alignment	Direction and course of the roadway in plan
Hydraulic barrier	A general term referring to modifications of a ground-water flow system to restrict or impede movement of contaminants
Hydrodynamics	The branch of science concerned with forces acting on or exerted by fluids (especially liquids)
Hydrocarbon interceptor	Trap used to filter out hydrocarbon pollutants from rainwater runoff. It is typically used in road construction to prevent fuel contamination of streams carrying away the runoff.
Hydrometric Area	An area defined by the EPA covering a region of river catchments
Hummocky	An elevated tract of land rising above the general level of a marshy region
Hz	Hertz

Glossary of Terms	Meaning
IEEM	Institute of Ecology and Environmental Management
IFI	Inland Fisheries Ireland
IGI	Institute of Geologists of Ireland
Impact	The term effects and impacts are used interchangeably in this NIS to mean the result of an action on the ecological receptor/European site under discussion
In combination impacts/effects	Term for cumulative impacts used when considering impacts on European sites in the context of an NIS/AA – cumulative effects caused by a project currently under consideration together with the effects of any existing or proposed projects or plans
In-situ	In its original place, for construction of a headwall it is built on site
IPPC	Integrated Pollution Prevention and Control
IRP	Incident Response Plan
Karst	Terrain created by limestone solution and characterised by a virtual absence of surface drainage, a series of surface hollows, depressions and fissures, collapse structures and an extensive subterranean drainage network
Karstic	Descriptor for bedrock conditions in limestone that contain solution features such as fissures and caves, and potentially, underground watercourses
Karstification	Formation of the features of karst topography by the chemical, and sometimes mechanical, action of water in a region of limestone, dolomite, or gypsum bedrock
km	Kilometres
kph	Kilometres per hour
kPa	Kilopascal, a unit of pressure measurement
kV	A unit of electromotive force, equal to 1000 volts
LAP	Local Area Plan
L_{den}	The day-evening-night composite noise indicator adopted by the EU for the purposes of assessing overall annoyance. L_{day} is the A-weighted long term average sound level as defined in ISO1996-2: 1987, determined over all the day periods of a year. L_{night} is the A-weighted long term average sound level as defined in ISO1996-2: 1987, determined over all the night periods of a year
Luft	TA Luft Guidance Technical Instructions on Air Quality Control
Macro-invertebrates	Animals without backbones that are big enough to see with the naked eye
Made Ground	Deposits which have accumulated through human activity and may consist of natural materials, e.g. clay and/or man made materials
Meander	A meander in general is a bend in a watercourse
Mesotrophic	A lake or pond that has a moderate amount of plants
mgbl	Metres below ground level
Micro-climatic	The atmospheric conditions affecting an individual or a small group of organisms, especially when they differ from the climate of the rest of the community
Morphology	Morphology is the science of the forms of natural water bodies such as rivers, lakes, estuaries, lagoons, coastal zones and seas, as well as with the processes that create and modify these forms

Glossary of Terms	Meaning
N6 GCRR	N6 Galway City Ring Road
N6 GCOB	A previous application to ABP in 2006 for the then defined 'N6 Galway City Outer By-pass' (GCOB)
NHA	Natural Heritage Area
NIS	Natura Impact Statement
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPF	National Planning Framework
NPWS	National Parks and Wildlife Service
NRA	National Roads Authority
NTA	National Transport Authority
O_2	Oxygen
OD	Ordnance Datum
Oligotrophic	Characterized by a low accumulation of dissolved nutrient salts, supporting but a sparse growth of algae and other organisms, and having a high oxygen content owing to the low organic content
OPW	The Office of Public Works
Operational phase	The period of time in which the proposed road is in use
OS	Ordnance Survey
OSI	Ordnance Survey Ireland
Outcrop	An exposure of bedrock
PAH	Polycyclic Aromatic Hydrocarbons
Paleokarst	The general term for ancient karst features that have been fossilized or preserved. Most commonly these features are filled with lithified sediments
Paleolandscape	A landscape as it was in ancient times
Parent material	The bedrock type from which the rock fragments within a till are derived. For instance, the parent material of a Limestone Till is Limestone
Particulate Matter	Tiny particles of solid or liquid suspended in liquid or gas
Pb	Lead
Permeability	A measure of the ability of a given rock to transmit water
PM_{10}	Particulate matter measuring 10 micrometers (microns) in diameter or less
$PM_{2.5}$	Particulate matter measuring 2.5 micrometers (microns) in diameter or less
pNHA	proposed Natural Heritage Area
Pre-earthworks drains	Where surface water and sub-surface water from adjoining land will flow towards the road, it will generally be necessary to construct intercepting drains at the tops of cuttings and the toes of

Glossary of Terms	Meaning
	embankments. In rural areas these may be ditches rather than filter drains because of their greater capacity and comparative cheapness
Priority Annex I habitat	Annex I habitat types which are in danger of disappearance, and for which the European Community has particular responsibility in view of the proportion of their natural range which falls within the territory
Protected road	A protected road, as defined under Section 45 (1) of the Roads Act, means a public road or proposed public road specified to be a protected road in a protected road scheme approved by An Bord Pleanála. A protected road scheme approved by An Bord Pleanála may provide for the prohibition, closure, stopping up, removal, alteration, diversion or restriction of any specified or all means of direct access to the protected road from specified land or from specified land used for a specified purpose or to such land from the protected road
Qbar	The mean annual maxima flow recorded or calculated at a location
pH	pH is a measure of the acidity or basicity of a solution
Pluvial flooding	This flooding occurs when surface water accumulating from the result of intense rainfall saturates the urban drainage system, and the excess water cannot be absorbed
Podzols	A type of soil formed in cool, seasonally humid climatic regions where leaching (percolation of water) is a dominant process
Assessment Boundary	Refers to lands required for the construction and / or operation of the proposed N6 GCRR plus the extents of the lands included within the planning boundary for the proposed development at Galway Racecourse
QI	Qualifying Interest – Annex I habitat or Annex II species for which a cSAC/SAC is designated under the Habitats Directive
Radio-tracking	Use of radio receivers, directional antennae and radio-transmitters (attached to the target species) to monitor and record species movements and locations.
Receptors	Receptors are people or other organisms that may have sensitivity or exposure to contaminants by virtue of their age and health (e.g. schools, day care centers, hospitals, nursing homes), status (e.g. sensitive or endangered species), proximity to the contamination, dwelling construction (e.g. basement), or the facilities they use (e.g. water supply well)
Recharge	The addition of water to the zone of saturation; also, the amount of water added
Rhizome	Underground stem of plants, laterally growing and capable of producing the root and shoot system of a new plant
Riparian vegetation	Riparian vegetation is the diversity of native vegetation contained on 'land which adjoins or is influenced by a body of water. Riparian habitats have been defined as places 'where terrestrial and aquatic ecosystems meet'
Rockhead	A raised rocky area or prominence; a summit or extremity of rock. The upper surface of bedrock
Rock outcropping	The part of a rock formation that appears above the surface of the surrounding land
Runoff	Water leaving a drainage area or water running across the land surface
SAC	Special Area of Conservation
Saturated zone	The zone below the water table in which all pores and fissures are full of water. Also known as the phreatic zone
SCI	Special Conservation Interest – Annex I bird species for which an SPA is designated under the Birds Directive
Sensitivity	Vulnerability of a sensitive receptor to change

Glossary of Terms	Meaning
Severance	Where a portion of land is separated or isolated from the main land holding or where a portion of habitat is separated/isolated form the main habitat area
SI	Site Investigation
S.I.	Statutory Instrument
Signalised junction	Road junction where roads converge and traffic flow is controlled by traffic signals
SO_2	Sulphur Dioxide
SOx	Sulphur Oxides expressed as Sulphur Dioxide
SPA	Special Protection Area
Sub-catchment	A portion of a river catchment
Subsoils	The material between the topsoil and the bedrock
Subtidal zone	Subtidal zone is that portion of a tidal-flat environment which lies below the level of mean low water for spring tides. Normally it is covered by water at all states of the tide. The word is often used as a general descriptive term for a subaqueous but shallow-marine depositional environment
Substructure	An underlying or supporting structure
SuDS	Sustainable urban drainage systems (SuDS) are a natural approach to managing drainage in and around properties and other developments. They work by slowing and holding back the water that runs off from a site, allowing natural processes to break down pollutants.
Superstructure	A structure built on top of something else.
SPA	Special Protection Area (for birds). Part of the Natura 2000 network of European sites, designated under the EU Birds Directive (79/409/EEC)
TII	Transport Infrastructure Ireland
TOC	Total Organic Carbon
Tufa	A porous rock composed of calcium carbonate and formed by precipitation from water, e.g. around mineral springs
Turbidity	Turbidity is the measure of relative clarity of a liquid. It is an optical characteristic of water and is an expression of the amount of light that is scattered by material in the water when a light is shined through the water sample. The higher the intensity of scattered light, the higher the turbidity
Turlough	Seasonal lakes found in the lowland karsts of western Ireland
Scheme study area	The term “scheme study area”, when used in this EIAR, refers to the wider study area at which constraints were initially identified during the constraints and route selection studies for the proposed N6 GCRR
Seep	A diffuse discharge of groundwater
Seepage	The slow escape of a liquid through porous material or small holes
Soil retention	Soil water retention is a major soil hydraulic property that governs soil functioning in ecosystems and greatly affects soil management. Soil moisture forms a major buffer against flooding, and water capacity in subsoil is a major steering factor for plant growth
Stabilisation	The process of making something physically more secure or stable

Glossary of Terms	Meaning
Study area	The area studied in order to inform the assessment. The study area will vary depending on the environmental factor being considered
Unsaturated zone	The zone between the land surface and the water table, in which pores and fissures are only partially filled with water. Also known as the vadose zone
µg/m3	micrograms per metre cubed
Vertical Alignment	Direction and course of the roadway in profile
Viaduct	A long bridge-like structure, typically a series of arches, carrying a road or railway across a valley or other low ground
VOC	Volatile organic compounds (VOC)
Water table	The uppermost level of saturation in an aquifer at which the pressure is atmospheric
WFD	Water Framework Directive
Windblow	Carried or driven by the wind
Windrose	Map diagram that summarizes information about the wind at a particular location over a specified time period
Zone of Contribution	The groundwater catchment area that contributes water to a well
ZoI	Zone of Influence
%ile	Percentile

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Volume 2 Main Report Contents

1. Introduction

1.1 Introduction

Galway County Council on behalf of itself and on behalf of Galway City Council pursuant to a Section 85 Agreement[1] submitted an application for approval under Section 51 of the Roads Act 1993 (as amended) (the "Section 51 Application") for the proposed N6 Galway City Ring Road around Galway City, hereafter referred to as the proposed N6 GCRR to An Bord Pleanála (ABP) on 23 October 2018. The Section 51 Application included an Environmental Impact Assessment Report (2018 EIAR), an AA Screening Report and a Natura Impact Statement (2018 NIS) among other documentation submitted to An Bord Pleanála at that time. Galway County Council also at that time made the N6 Galway City Ring Road Protected Road Scheme 2018 and the N6 Galway City Ring Road Motorway Scheme 2018 which were also submitted to ABP for approval under Section 49 of the Roads Act 1993, (as amended).

On 4 April 2019, ABP requested further information in relation to the proposed N6 GCRR pertaining to the application for approval including detailed and scaled drawings of the main structures; a copy of the Route Selection Report; details of vegetation samples (relevé data) to support the habitat mapping in the study area; clarity on the extents of some habitats; clarity on some sections of the 2018 NIS, provision of a brief "in-combination" assessment which considers all the plans and projects together, rather than a pairwise with the proposed N6 GCRR, in the 2018 NIS; queries on birds, bats and other ecological issues; justification of the use of 2012 as the base year for the traffic assessment and the growth scenarios used for the traffic; and clarification on references in the EIAR. A detailed Response to this request for further information was submitted to ABP in August 2019[2]. The Response material was also put on public display, adverts included in the Irish Independent, Tribune and the Galway Advertiser, along with letters sent to all parties included in the Protected Road Scheme and Motorway Scheme and statutory consultees inviting them and the public to make submissions.

An oral hearing commenced in February 2020 and was suspended in March 2020 due to Covid-19. It was reconvened again in October 2020 and concluded in November 2020. In response to queries raised during the oral hearing by the inspectors appointed by ABP, statutory consultees and members of the public in attendance at the oral hearing, various supplemental reports were prepared and information provided, all of which were submitted to An Bord Pleanála[3].

ABP granted approval under Section 51 of the Roads Act 1993 (as amended) for the proposed N6 GCRR and approval under Section 49 of the Roads Act 1993 (as amended) for the N6 Galway City Ring Road Protected Road Scheme and N6 Galway City Ring Road Motorway Scheme on 6 December 2021 (with conditions and modifications)[4].

Those approvals were challenged in the High Court by way of Judicial Review and ABP conceded to an order quashing the approvals on limited grounds and the applications for approval of the N6 GCRR was remitted back to ABP by the High Court on 30 January 2023. In this regard the orders of the High Court stated that the applications for approval be remitted to the point of the conclusion of ABP's Inspector's Report.

[1] A Section 85 Agreement has been entered into under the provisions of Section 85 of the Local Government Act 2001 between Galway County Council and Galway City Council and approved by Transport Infrastructure Ireland pursuant to Section 14 of the Roads Act 1993, as amended

[2] http://n6galwaycityringroad.ie/Response/

[3] http://n6galwaycityringroad.ie/

[4] https://www.pleanala.ie/en-ie/case/302848 and https://www.pleanala.ie/en-ie/case/302885

"An Order remitting the said application for approval for a proposed road development under section 51 of the Roads Act 1993 as amended and the said applications for approval under section 49 of the Roads Act 1993 as amended for a motorway scheme and protected road scheme entitled "N6 Galway City Ring Road Motorway Scheme 2018 and Protected Road Scheme 2018" to the First Named Respondent to be considered in accordance with law such remittal to take effect from the point in time immediately after the submission of the Inspector's Report (bearing the reference "ABP-302885-18 & ABP-302848- 18" and dated 22nd June 2021) to the Board"[5]

On 7 December 2023, ABP requested further information (RFI) (Ref: ABP-318220-23[6]) from Galway County Council in relation to the application for approval of the proposed N6 GCRR as follows:

- *Having regard to the passage of time since the applications were lodged and the decisions made by the Board you are invited to update the motorway scheme application and the proposed road development application*
- *Make submissions in relation to the most recent Climate Action Plan and the implications of the new Galway City Development Plan*
- *Update the Environmental Impact Assessment Report*
- *Update the appropriate assessment screening document and the Natura Impact Statement including updated site conversation objectives*

This updated NIS has been prepared in response to item 4 in the above request for further information. The full complement of material submitted to ABP in response to the above request is entitled the **2025 RFI Response**. This is split into seven parts as follows:

- Part I – RFI Response Report
- Part II – Updated N6 Galway City Ring Road Motorway Scheme 2018
- Part III – Updated N6 Galway City Ring Road Protected Road Scheme 2018
- Part IV – Obligations under Section 15 of the Climate Action and Low Carbon Development Act 2015 (as amended) and submissions in relation to the Climate Action Plan 2024
- Part V – Implications of new Galway City Development Plan
- Part VI – Updated Environmental Impact Assessment Report
- Part VII – Updated Provision of Information for Appropriate Assessment Screening Report and this Natura Impact Statement

To aid the understanding of the scale of changes and implications of the changes in this updated NIS, the first part, i.e. Part I, in the suite of documents in this 2025 RFI Response is a report entitled **2025 RFI Response Report**, and it includes, but is not limited to an overview of the changes presented in this updated NIS. Where modifications/changes have been made since the 2018 NIS, these have been set out in this updated NIS. These modifications/changes take account of any potential changes in the ecological baseline of the study area, information presented in the 2019 RFI Response and at the oral hearing in 2020 and findings from the assessment undertaken by the Inspector appointed by An Bord Pleanála (ABP) presented in ABP's report dated 22 June 2021.

The Inspector appointed by ABP, and the appointed ecologist Dr Richard Arnold, agreed with the conclusion of the 2018 NIS, that the proposed N6 GCRR does not pose a risk of adversely affecting (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans or projects, and there is no reasonable scientific doubt in relation to this conclusion. The Inspector did however include additional potential impact pathways, screened in additional European sites for appropriate assessment and

[5] https://www.n6galwaycityringroad.ie/sites/default/files/media/Order%20-%20Friends%20of%20the%20Irish%20Environment%20JR.pdf

[6] It is noted that the reference numbers for the application in 2018, ABP-302848 and ABP-302885 has since been updated by ABP to HA07.318220 and MA07.318217 respectively

included additional mitigation measures identified by Dr Arnold [appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021]. All of these have been taken into account, on a precautionary basis, in the preparation of this updated NIS and are summarised below:

- Construction-related Traffic – screened in the following sites due to their proximity to the wider road network, having the potential to be affected by construction-related traffic associated with the Project: Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SPA, Rahasane Turlough SAC and Cregganna Marsh SPA
- Recreational Pressure – screened in the following sites due to the potential increase in recreational pressure associated with the operation of the proposed N6 GCRR: Maumturk Mountains SAC, The Twelve Bens/Garraun Complex SAC, Connemara Bog Complex SAC, Connemara Bog Complex SPA and Ross Lake and Woods SAC
- Potential deterioration or decline in European site QIs/SCIs – screened in the following sites due to the potential loss of supporting habitats/populations of typical species and positive indicator species: Connemara Bog Complex SAC, Connemara Bog Complex SPA, Ross Lake and Woods SAC, Ardrahan Grassland SAC, Castletaylor Complex SAC, East Burren Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SAC, Moneen Mountain SAC, Black Head-Poulsallagh Complex SAC, Gortnandarragh Limestone Pavement SAC

In addition to the sites screened in by Dr Arnold and considering methodology for evaluating the potential impacts due to recreational pressure from the operation of the proposed N6 GCRR, the following sites have also been screened in for appropriate assessment in this updated NIS on a precautionary basis: Ardrahan Grassland SAC and Castletaylor Complex SAC.

In addition, extensive ecological surveys were undertaken between 2022 and 2024 to verify the results of previous surveys and ensure any changes to the biodiversity baseline were captured to inform this updated NIS. In general, the distribution and extent of habitats, and the distribution and abundance of flora and fauna species, is broadly consistent with that recorded previously to inform the 2018 NIS and although there were certain changes to the baseline, which are detailed in Section 5 and Section 9 of this updated NIS, the changes do not alter the conclusion reached in the 2018 NIS, i.e. that there would be no adverse effect on the integrity of any European site.

The assessment presented in the updated AA Screening Report and this updated NIS is based on the most recent European site boundaries[7], the most recent published Site Specific Conservation Objective (SSCOs), Qualifying Interests (QIs)/Special Conservation Interests (SCIs) for each European site, and the updated baseline habitat and species information of relevance to the Appropriate Assessment, based on the extensive ecological surveys noted above and detailed in Section 4 below, with some of the more critical changes centred around the precautionary change of the classification of the aquatic vegetation in the River Corrib to the Annex I Vegetation of flowing waters [3260].

The impact assessment has also been updated to include the two nearby European sites, for which Harbour porpoise has been added as a QI in March 2024, due to the potential for the Project to affect water quality in Galway Bay: Inishmore Island SAC and Kilkieran Bay and Islands SAC.

All reference material, guideline documents, scientific literature have also been reviewed and updated as necessary to reflect recent source material and information where this is available. None of these updates have resulted in any changes in the findings of this updated NIS and support the initial findings of the 2018 NIS.

1.1.1 Overview of Proposed N6 GCRR and Definition of the Project for EIA and AA Purposes

The proposed N6 GCRR, the subject of the Section 51 Application, comprises the construction of approximately 5.6km of a single carriageway from the western side of Bearna as far as the Ballymoneen Road and approximately 11.9km of dual carriageway from Ballymoneen Road to the eastern tie in with the existing N6 at Coolagh, Briarhill, and associated link roads, side roads, junctions, structures as shown on

[7] The most recent Special Area of Conservation (SAC) boundary dataset is SAC_ITM_2024_05 (released on 15 May 2024) and the most recent Special Protection Area (SPA) boundary dataset is SPA_ITM_2024_01 (released on 11 January 2024)

Figures 1.1 to 1.15 and localised works to the existing electricity transmission and distribution networks (specifically comprising of the diversion of the 110kV and 38kV services). The section of the proposed N6 GCRR from the tie-in with the R336 Coast Road to the N59 Letteragh Junction is a protected road[8] and the section from this junction to the tie-in with the existing N6 at Coolagh, Briarhill is a motorway.

To ensure the functionality of Galway Racecourse during the construction and operation of the proposed N6 GCRR, the construction of both temporary and permanent stables (and associated development) is essential at the racecourse. In this regard, Galway Race Committee Trust applied for planning permission for these temporary and permanent stables and associated development, which was granted permission by Galway City Council in December 2024.

The demolition of the existing stables will occur as part of the construction of the proposed N6 GCRR. As set out in the application for planning permission by Galway Race Committee Trust to Galway City Council (Reference 24/60279) and as set out in the grant of permission, it will only be implemented if the proposed N6 GCRR is granted approval by ABP and is proceeding. Equally, the permanent stables cannot be constructed until post completion of construction and handover of the operational N6 GCRR. This has resulted in the need to provide temporary stables during the demolition of the existing stables and the commissioning of the new permanent replacement stables. The temporary stables will need to be fully operational before the demolition of the existing stables commences. Therefore, whilst the proposed N6 GCRR, the subject of the Section 51 Application is separate to that of the proposed development at Galway Racecourse, it is also interconnected and interlocked with it.

Therefore, it is necessary for Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) purposes to assess the combination of both the proposed N6 GCRR and the proposed development at Galway Racecourse, which, for EIA and AA purposes, is referred to as the "Project" and has been considered and assessed in the updated EIAR and in the updated AA Screening Report and this updated NIS. Therefore, the term Project, when used throughout this updated NIS, refers to combination of the proposed N6 GCRR and the proposed development at Galway Racecourse. A full description of the Project is provided in Section 2 of this updated NIS and shown on Figures 1.1 to 1.15 and a location plan of the Project presented Plate 1.1. The modifications/changes that have been made since the 2018 NIS are set out in Section 2.2.1.

In this updated NIS:

- The term "**Project**" refers to combination of the proposed N6 GCRR and the proposed development at Galway Racecourse
- The "**Assessment Boundary**" refers to lands required for the construction and / or operation of the proposed N6 GCRR plus the extents of the lands included within the planning boundary for the proposed development at Galway Racecourse
- The "**footprint of the proposed N6 GCRR**" refers to the physical development footprint of the road infrastructure
- The "**proposed development at Galway Racecourse**" refers to the physical development of the temporary and permanent stables and their associated works, which are the subject of a separate application for planning permission which was approved by Galway City Council, but are considered to form part of the Project for EIA and AA purposes
- The **"Scheme Study Area**" refers to the wider study area at which ecological constraints were initially identified during the route selection studies for the Project. Information in the ecological baseline description may be supported by data obtained from the Scheme Study Area

[8] A protected road means a public road or proposed public road specified to be a protected road in a protected road scheme approved by the An Bord Pleanála. A protected road scheme approved by An Bord Pleanála may provide for the prohibition, closure, stopping up, removal, alteration, diversion or restriction of any specified or all means of direct access to the protected road from specified land or from specified land used for a specified purpose or to such land from the protected road.

Ecological baseline "**Survey Areas**" vary depending on the species assessed and may be within or outside the Assessment Boundary. These areas are defined under each specific ecological baseline methodology as relevant.

The "**Zone of Influence**" (ZoI) is the area within which the Project could affect the receiving environment such that it could potentially have significant effects on the Qualifying Interest (QI) habitats or species or Species of Conservation Interest (SCIs) of a European site (as defined in CIEEM, 2018) and detailed in Section 7 of this updated NIS.

This updated NIS has been prepared in accordance with the provisions of Part XAB of the Planning and Development Act, 2000 (as amended) and in accordance with the requirements of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (as amended) (the Habitats Directive), the Planning and Development Act 2000 (as amended), and the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) (the Birds and Habitats Regulations).

This updated NIS considers the implications of the Project, on its own and in combination with other plans or projects, for European sites in view of the conservation objectives of those sites. It includes a scientific examination of evidence and data to identify and assess the implications of the Project for any European sites in view of the conservation objectives of those sites. It considers whether the Project, by itself and in combination with other plans or projects, would adversely affect the integrity of European sites. In reaching a conclusion in this regard, consideration is given to any mitigation measures necessary to avoid or reduce any potential negative impacts.

The purpose of this updated NIS is to provide an examination, analysis and evaluation of the potential impacts of the Project on European sites and to present findings and conclusions with respect to the Project in light of the best scientific knowledge in the field. This updated NIS will inform and assist the competent authority, An Bord Pleanála, in carrying out its Appropriate Assessment as to whether or not the Project will adversely affect the integrity of European sites, either alone or in combination with other plans and projects, taking into account their conservation objectives.

It is the considered view of the authors of this updated NIS (Scott Cawley Ltd.) that, following the implementation of the mitigation measures prescribed in Section 10 (the effectiveness of which is also set out in Section 10 and Section 11), the Project will not, by itself or in combination with other plans or projects, have any adverse effect on the integrity of any European sites in view of their conservation objectives and there is no reasonable scientific doubt as to that conclusion.

1.2 Background

The proposed N6 GCRR is a key component of the Galway Transport Strategy (GTS), which has been incorporated into the Galway City Council and County Council Development Plans. The GTS has been subject to Strategic Environmental Assessment (SEA) and Appropriate Assessment, and the mitigation measures identified in the SEA and AA of the GTS which are relevant to the proposed N6 GCRR are being implemented at this stage of the Project and address the potential adverse effects of this Project, including in combination effects.

Scott Cawley Ltd. have prepared an updated Provision of Information for Appropriate Assessment Screening report (Scott Cawley, 2025), for the Project, in order to enable the competent authority, An Bord Pleanála, to comply with Article 6(3) of Council Directive 92/43/EEC (the Habitats Directive), which also forms part of the response to the request by ABP for further information in December 2023 and is included in Part VII of the 2025 RFI Response.

The Project is neither connected with nor necessary to the management of any Natura 2000 site (hereinafter referred to as European sites)[9].

The Provision of Information for Appropriate Assessment Screening Report (Scott Cawley, 2025), hereafter referred to as the updated AA Screening Report, concluded that the possibility of significant effects on the following European sites could not be ruled out and that an Appropriate Assessment is required:

- Lough Corrib SAC
- Galway Bay Complex SAC
- Lough Corrib SPA
- Inner Galway Bay SPA
- Ardrahan Grassland SAC
- Castletaylor Complex SAC
- Kiltiernan Turlough SAC
- Lough Fingall Complex SAC
- Rahasane Turlough SPA
- Rahasane Turlough SAC
- Cregganna Marsh SPA
- Maumturk Mountains SAC
- The Twelve Bens/Garraun Complex SAC
- Connemara Bog Complex SAC
- Connemara Bog Complex SPA
- Ross Lake and Woods SAC
- East Burren Complex SAC
- Moneen Mountain SAC
- Black Head-Poulsallagh Complex SAC
- Gortnandarragh Limestone Pavement SAC
- Inishmore Island SAC
- Kilkieran Bay and Island SAC

[9] The Natura 2000 network of sites are defined under the Habitats Directive (Article 3) as a European ecological network of special areas of conservation, composed of sites hosting the natural habitat types listed in Annex I and species listed in Annex II, and special protection areas classified pursuant to the Birds Directive (2009/147/EC). The aim of the network is to aid the long-term survival of Europe's most valuable and threatened species and habitats. In Ireland, these sites are designed as European sites – as defined under the Planning and Development Acts and/or Birds and Habitats Regulations as (a) a candidate site of Community importance, (b) a site of Community importance, (c) a candidate special area of conservation, (d) a special area of conservation, (e) a candidate special protection area, or (f) a special protection area. They are commonly referred to in Ireland as candidate Special Areas of Conservation (cSACs) and Special Protection Areas (SPAs).

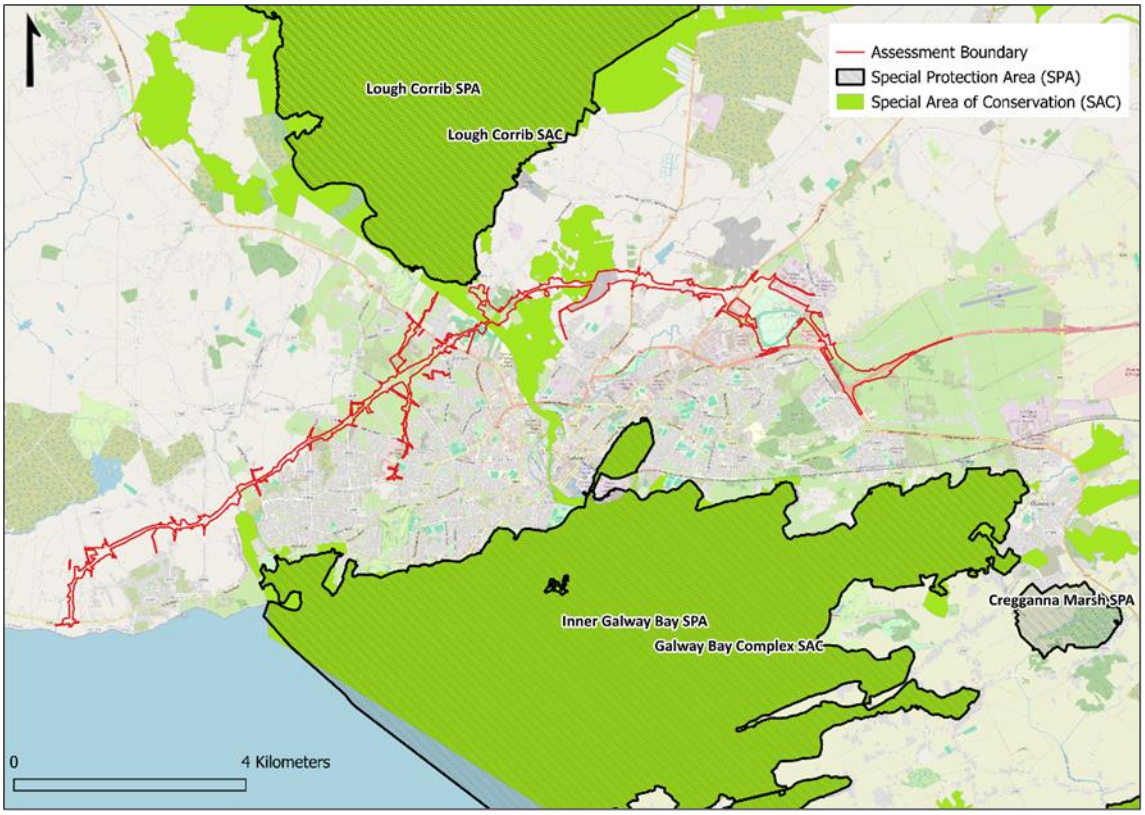


Plate 1.1 Project Assessment Boundary and European sites in the Immediate Vicinity

The Provision of Information for Appropriate Assessment Screening Report (Scott Cawley, 2025) concluded (refer to section 3.2.1 and 3.5 of the updated AA Screening Report) that Ballyvaughan Turlough SAC, Lough Rea SAC and Lough Rea SPA are not identified to be within the Zone of Influence of any potential impact pathways and are not further assessed in terms of this updated NIS.

Screening for Appropriate Assessment was carried out by Galway County Council in 2018 and determined that it cannot be excluded, on the basis of objective scientific information that the proposed N6 GCRR, individually or in combination with other plans or projects, will have a significant effect on European sites in view of the sites' conservation objectives.

1.3 Legislative Context

The Birds and Habitats Regulations transpose into Irish law, Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive) and Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive).

These Directives require Ireland to establish protected sites as part of a European wide network of sites (known in Ireland as European sites) for habitats and species that are of international importance for conservation. In Ireland, European sites include Special Areas of Conservation (SACs, including candidate SACs) and Special Protection Areas (SPAs). SACs are selected for habitats listed on Annex I of the Habitats Directive (including priority types which are in danger of disappearance) and species listed on Annex II. SPAs are selected for bird species (listed on Annex I of the Birds Directive), regularly occurring populations of migratory bird species (such as ducks, geese or waders), and areas of international importance for migratory birds. The specified habitats and species for which each SAC and SPA is selected correspond to the Qualifying Interests (QIs) (in the case of SACs) or Special Conservation Interests (SCIs) (in the case of SPAs) for the sites, for which conservation objectives are developed.

Article 6(3) of the Habitats Directive states that:

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

This provision is transposed into Irish law by Part XAB of the Planning and Development Acts, 2000-2024. Section 177U(4) of the said Acts provides for screening for Appropriate Assessment as follows:

"The competent authority shall determine that an appropriate assessment of [...] a proposed development [...] is required if it cannot be excluded, on the basis of objective information, that the [...] proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site."

Section 177T(1) and (2) provide for an NIS *as "a statement, for the purposes of Article 6 of the Habitats Directive, of the implications of a proposed development, on its own or in combination with other plans or projects, for one or more than one European site, in view of the conservation objectives of the site or sites" and specifies that it "shall include a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications for one or more than one European site in view of the conservation objectives of the site or sites".*

The European Court of Justice has made a relevant ruling in relation to when an Appropriate Assessment is required and its purpose[10]:

"Any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects" and that the plan or project may only be authorised "where no reasonable scientific doubt remains as to the absence of such effects".

The European Court of Justice has also made a relevant ruling on what should be contained within an Appropriate Assessment[11]:

"[The Appropriate Assessment] cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the works proposed on the protected site concerned".

1.4 EU Guidance & Approach to Article 6 Assessment

The European Commission Guidance *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission, 2021)* prescribes a staged process, as set out below, the need for each stage being dependent on the outcomes of the preceding stage. The sequence is designed to test the potential effects of plans and projects on European sites:

1. Screening for Appropriate Assessment
2. Appropriate Assessment
3. Assessment of Alternative Solutions

[10] Case C-127/02 Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v. Staatssecretaris van Landbouw, Naturbeheer en Visserij (Waddenzee) [2004] ECR I-7405

[11] Case C-258/11Sweetman v. An Bord Pleanála [2013] ECR I – 0000 (11 April 2013)

4. Assessment where no alternative solutions exist and adverse impacts remain, *i.e*. the Imperative Reasons of Overriding Public Interest test, and compensatory measures

Stage 1 of the process is referred to as screening for Appropriate Assessment and identifies whether the Project, either on its own or in combination with other plans or projects, would be "*likely to have a significant effect*" upon any European site. A likely effect is one that cannot be ruled out on the basis of objective information. The test is a '*possibility*' of effects rather than a '*certainty*' of effects. The test of significance is whether a plan or project could undermine the site's conservation objectives (See Section 4.3).

If effects are considered likely to be significant, potentially significant or uncertain, the process must proceed to Stage 2: Appropriate Assessment, with the preparation of a Natura Impact Statement to inform the Appropriate Assessment that is to be conducted by the competent authority.

2. Description of the Project

2.1 Project Phases

The Project comprises five phases, which are as follows:

- Phase 1: These works do not form part of the development of which approval is sought as part of the Section 51 Application for the proposed N6 GCRR, however Phase 1 does form part of the Project and has been considered and assessed for EIA and AA purposes. Works undertaken as part of Phase 1 will include the construction of the temporary stableyard, machinery shed, maintenance shed, water supply wells, ESB substation and new pre-parade ring and pavilion on Galway Racecourse lands.
- Phase 2: Works undertaken as part of Phase 2 will include the following:
  - The provision of the proposed N6 GCRR in two stages which will take place concurrently:
    - Stage A - N6 Coolagh Junction to N59 Letteragh Junction
    - Stage B - N59 Letteragh Junction to R336 west of Bearna
  - Existing stableyard at the racecourse to be demolished, including existing well, existing water tank, machinery shed and adjacent car parking.
  - Existing commercial building on the lands the subject matter of the N6 Galway City Ring Road Motorway Scheme 2018 to the north of the Galway Racecourse to be demolished and the site cleared.
  - Existing horse box parking off Racecourse Avenue to be demolished, including removal of existing access arrangement to the Ballybrit graveyard, to accommodate the Galway Racecourse Tunnel as part of the proposed N6 GCRR.
- Phase 3: Again, these works do not form part of the development for which approval is sought as part of the Section 51 Application for the proposed N6 GCRR, however Phase 3 does form part of the Project and has been considered and assessed for EIA and AA purposes. Works undertaken as part of Phase 3 will include construction of the new permanent stableyard upon completion and handover of the proposed N6 GCRR.
- Phase 4: These works do not form part of the development for which approval is sought as part of the Section 51 Application for the proposed N6 GCRR, however Phase 4 does form part of the Project and has been considered and assessed for EIA and AA purposes. Works undertaken as part of Phase 4 will include demolition of the temporary stableyard constructed in Phase 1 and reinstate the site of temporary stableyard as car parking. Retain ESB sub-station, pavilion, machinery shed, maintenance shed and pre-parade ring.
- Phase 5: Relates to the operation of the Project.

2.2 Description of Phase 2: Proposed N6 GCRR

The proposed N6 GCRR, the subject of the Section 51 Application, comprises of the construction of approximately 5.6km of a single carriageway from the western side of Bearna as far as the Ballymoneen Road and approximately 11.9km of a dual carriageway from there to the eastern tie in with the existing N6 at Coolagh, Briarhill, along with associated link roads, side roads, junctions and structures and localised works to the existing electricity transmission and distribution networks (specifically comprising of the diversion of 110kV and 38kV services), as shown in Plate 2.1 below and Figures 1.1 to 1.15.

The total area within the Assessment Boundary is 334ha. The total area within the footprint of the development boundary was 280ha in the 2018 EIAR. This increase of 54ha is due to the additional lands included at Galway Racecourse for the purposes of the application for the Galway Race Committee Trust Planning Permission relating to the proposed development at Galway Racecourse for which planning

permission has been granted. Of this total area, an area of 180ha is required for the footprint of the proposed N6 GCRR.

Plate 2.1 Project Overview

The proposed N6 GCRR follows the alignment as submitted in the Section 51 Application in 2018 for the majority of its length, but also takes account of the modifications outlined in Section 2.2.1. These modifications are described sequentially in this Section as they occur across the length of the proposed N6 GCRR.

The proposed N6 GCRR ties into the existing R336 Coast Road in An Baile Nua with an at-grade roundabout junction approximately 2km to the west of Bearna Village and then proceeds north and east as a single carriageway to the north of Bearna Village and onwards towards Ballymoneen. Local connectivity is maintained via the Troscaigh/Na Foraí Maola Overbridge Link whilst an at-grade roundabout is proposed at the Bearna to Moycullen Road L1321. An at-grade roundabout is proposed at the Bearna to Moycullen Road L1321. At-grade signalised junctions are proposed at Cappagh Road and Ballymoneen Road.
To the east of the Ballymoneen Road Junction the proposed N6 GCRR is a dual carriageway and continues east to a grade separated N59 Letteragh Junction located in Letteragh. The junction connects to the N59 Moycullen Road via the proposed N59 Link Road North, and to the Letteragh Road and Rahoon Road via the proposed N59 Link Road South. The proposed N6 GCRR continues eastwards to cross the existing N59 Moycullen Road at Dangan and travels on a viaduct over the University of Galway Sporting Campus before crossing the River Corrib (and the Lough Corrib SAC) on a bridge structure. The total length of the structure through the University of Galway Sporting Campus and over the River Corrib Bridge is 620m.

The University of Galway (UoG) Sports Pavilion will be modified and will continue to function as a sports facility during and post construction. The modifications to the Sports Pavilion at UoG Sporting Campus will be undertaken as enabling works during the summer period prior to commencement of the construction of the proposed N6 GCRR. Welfare facilities at the Sports Pavilion at UoG Sporting Campus will be maintained throughout the construction works.

The Section 51 Application for the N6 GCRR submitted in 2018 included the provision of an all-weather full size GAA pitch and a training pitch at the location of the existing GAA pitches at University of Galway (UoG) Sporting Campus due to the loss of the two number grass based GAA sized playing pitches adjacent to the River Corrib. However, after the Section 51 Application was made to ABP in 2018 UoG completed their University Sports Masterplan and strategy and identified their requirements and plans for the University Sporting Campus. UoG confirmed at the oral hearing in February 2020 that they do not want the mitigation measures originally proposed in the 2018 EIAR and subsequently obtained planning permission from Galway City Council Ref 19/372 which was appealed to ABP Ref ABP-308412-20 for replacement pitches. ABP upheld the decision of Galway City Council and granted permission for the replacement pitches on 19 February 2021. These pitches are at an alternative location on UoG lands in line with their strategy and for UoG to mitigate the impacts of the proposed N6 GCRR on their sports campus and to ensure its continued operation to its requirements and in accordance with its masterplan and strategy. To ensure interconnection for UoG Sporting Campus post completion of the construction of the proposed N6 GCRR, Galway County Council will provide a right of way for UoG to use the lands under the proposed viaduct for sporting/athletic purposes by way of a long term lease. This commitment has been included in the Schedule of Environmental Commitments.

East of the River Corrib, the proposed N6 GCRR continues east on embankment toward the townland of Menlough. Additional lands to the north of Menlo Castle are included as part of the Project to provide lands for the enhancement of the core foraging habitat for the Lesser horseshoe bat known to roost at Menlo Castle and mitigate against potential impacts to this species. These lands will be planted with additional hedgerows and maintained as agricultural lands by the local authority and will remain in their ownership.

Continuing east, the proposed N6 GCRR crosses over Bóthar Nua in the townland of Menlough and remains on a viaduct section, the Menlough Viaduct (320m length), towards Seanbóthar before entering a section of cut preceding Lackagh Tunnel (length 205m), immediately west of Lackagh Quarry, and exits the tunnel in the quarry. There is a tunnel maintenance building located adjacent to Lackagh Tunnel as shown on Figure 1.8.

The proposed N6 GCRR continues east with a grade separated junction located at the N84 Headford Road Junction at Ballinfoyle and continues east through the townland of Castlegar to the grade separated junction at the N83 Tuam Road. This junction provides access to both the N83 Tuam Road and the proposed Parkmore Link Road between the Ballybrit Business Park and the Parkmore Industrial Estate via the proposed City North Business Park Link Road to provide full connectivity at this location.

The southern portion of the Parkmore Link Road was originally routed along an existing IDA road passing between Boston Scientific and Hewlett Packard and the old APC site in the Section 51 Application for the proposed N6 GCRR submitted in 2018. However, Boston Scientific subsequently acquired the site formerly occupied by APC which allowed them to expand their activities at this location to both sides of the IDA road and brought this vacant industrial building back into a high value use. The route of what was originally proposed for the Parkmore Link Road as set out in the 2018 EIAR created a conflict with necessary daily movements of both people and plant between Boston Scientific activities to the east and west of the proposed link road. In developing its masterplan for the expanded campus Boston Scientific proposed a new route for the section of the Parkmore Link Road within their lands at the oral hearing in 2020 which served the transport functionality of the original proposal and achieved the objectives of the original alignment as follows:

- Provides the necessary link for the public transport network envisaged in the GTS and as detailed in the updated EIAR, our analysis indicates it would also be envisaged in any update to the GTS
- Provides dedicated cycle lanes as required of the primary cycle network in the GTS (and as detailed in the updated EIAR, our analysis indicates it would also be envisaged in any update to the GTS), and pedestrian facilities are also provided
- Provides a connection to the proposed N6 GCRR to enable dispersal of traffic directly to its destination

In achieving the objectives set out, it enables the type of compact employment centre located where it is easily accessed by active and public transport modes from the city's residential area. The alignment of the southern portion of the Parkmore Link Road is retained in accordance with the modification presented at the

oral hearing in 2020 and for which the local authority sought such a modification (and this modification did form part of the Section 51 Approval that was since quashed and remitted back to An Bord Pleanála).

The proposed N6 GCRR then continues southeast entering the Galway Racecourse Tunnel (length 230m) at Ballybrit to the north of the racetrack which results in the demolition of the existing stables. As noted in Section 1 Galway Race Committee Trust has subsequently applied for planning permission for replacement temporary and permanent stables, and associated development, to address/mitigate against the loss of stables and ensure the continued operation of the racecourse. That application (Reference 24/60279) was granted approval by Galway City Council on 2 December 2024. The lands on which the temporary stables are located is in the infield of Galway Racecourse and in the ownership of Galway Race Committee Trust. Galway Race Committee Trust have consent from the landowner and the tenant on that landholding, subject to obtaining planning permission from Galway City Council for application 24/60279, which is subsequently received, to construct the permanent stables in the same location as presented in the 2018 EIAR. As confirmed by Galway Race Committee Trust in its application that separate planning application will only be implemented if the development of the proposed N6 GCRR obtains approval and is proceeding and this is reflected in the conditions attached to the grant of planning permission by Galway City Council. These lands are acquired temporarily for the purposes of the construction of the Galway Racecourse Tunnel in the Motorway Scheme.

There is a tunnel maintenance building located adjacent to the Galway Racecourse Tunnel as shown on Figure 1.10. On emerging from the tunnel, the proposed N6 GCRR continues southeast, crossing over the R339 Monivea Road on embankment and continuing south to enter a cutting as it reaches its junction with the existing N6 at Coolagh Junction. The proposed Coolagh Junction will be a fully grade separated junction with partial free flow on the major movements.

The proposed N6 GCRR will also include extensive landscape planting and the creation of Annex I habitat areas[12] (e.g. Calcareous grassland habitat within Lough Corrib SAC on the east bank of the River Corrib). Noise barriers will also be installed at locations along the Project.

2.2.1 Modifications Since 2018

Further to the submission of the Section 51 Application for the proposed N6 GCRR in 2018 and the subsequent response to the Request for Further Information in 2019, certain modifications and their associated environmental assessments were presented on the proposed N6 GCRR at the commencement of the oral hearing before An Bord Pleanála in February 2020 namely:

- Change to the mitigation proposed for University of Galway (formerly NUIG) Sporting Campus
- Alternative alignment for the southern portion of the Parkmore Link Road through Boston Scientific campus

Further modifications to the proposed N6 GCRR were proposed during the oral hearing in 2020 and were presented on a series of drawings which were included in the Schedule of Commitments on 4 November 2020[13]. This suite of drawings was originally included in Appendix A.9.1 of the 2019 RFI and they were updated during the oral hearing. The final version of these drawings is shown as Figures 5.6.01 to 5.6.30 in Volume 3 of the updated EIAR. The changes proposed during the oral hearing are as follows:

- Additional access to severed lands for property 106 proposed from Access Road AR 0/02 as shown on Figure 5.6.01 in Volume 3 of the updated EIAR
- Access Road AR 1/01 was amended to facilitate access to properties 131 and 7891 as agreed with these property owners and shown on Figure 5.6.02 in Volume 3 of the updated EIAR
- Access Road AR 7/04 was extended further west to provide access to lands severed by a stream which is shown on Figure 5.6.02 in Volume 3 of the updated EIAR

[12] The Annex I habitat creation relates to addressing residual impacts to Annex I habitats outside of any European sites in the EIA Report. It is not in response to any impacts on Annex I habitats that relate in any way to effects on QIs or the conservation objectives of any European sites and that habitat creation does not constitute "compensatory measures" in the meaning of that term in Article 6(4) of the Habitats Directive.

[13] https://www.n6galwaycityringroad.ie/sites/default/files/media/GCRR-4.04-019_002%20Chapter%2021%20SoC_I2_Final%2004112020.pdf

- Connection between Access Road 13/06 and the N83 Tuam Road for pedestrians which is shown on Figure 5.6.18 in Volume 3 of the updated EIAR
- Changes to land ownership boundary details and/or property extents which are reflected in proposed modifications to the Motorway Scheme (Part II of the 2025 RFI Response) and Protected Road Scheme (Part III of the 2025 RFI Response) and Figures 5.6.01 to 5.6.30 in Volume 3 of the updated EIAR
- Some permanent land acquisition was changed to temporary acquisition which is reflected in proposed modifications to the Motorway Scheme (Part II of the 2025 RFI Response) and Protected Road Scheme (Part III of the 2025 RFI Response) and Figures 5.6.01 to 5.6.30 in Volume 3 of the updated EIAR
- Some land proposed to be acquired was removed which is reflected in proposed modifications to the Motorway Scheme (Part II) and Protected Road Scheme (Part III) of the 2025 RFI Response
- Additional cycle paths and footpaths were added at Gort na Bró as set out in Drawing GCRR-SK-OH-054 in the Schedule of Commitments on 4 November 2020[14]. This is reflected in the updated series of drawings showing the Pedestrian and Cycle Facilities in Figures 5.7.12 to 5.7.13 of Volume 3 of the updated EIAR. These were originally included in Appendix A.1.13 of the 2019 RFI

A further modification was made post oral hearing based on the decision of ABP Board Order ABP-302885-18:

- Access Road AR 13/02 amended to minimise impacts on landowner while providing access to adjoining landowner as shown in Figure 5.6.17 in Volume 3 of the updated EIAR

Another further modification was made as a result of the grant of approval by ABP for a development, Glenveagh Large-scale residential development (LRD), at Gort na Bró, Knocknacarra, noting that the approval has subsequently been challenged in judicial review proceedings. This modification includes a bus bay on the southern side of the access road AR 06/04 into Galway Retail Park to align with the proposed bus bay in the LRD development, and all is possible within the proposed land acquisition within the N6 Galway City Ring Road Protected Road Scheme 2018:

- Access Road AR 06/04 amended to add a bus bay to reflect the design of the Knocknacarra District Centre Large-scale Residential Development (LRD) which obtained approval from ABP reference ABP-318687-23. This is shown on Figure 5.7.13 in Volume 3 of the EIAR

Further, the decision of An Bord Pleanála on the Section 51 Application for the proposed N6 GCRR on 6 December 2021, reference ABP-302848-18, conditioned the omission of the permanent stables at Galway Racecourse. Arising from this decision, Galway Race Committee Trust has, in order to mitigate the significant impacts of the proposed N6 GCRR on the operation of the racecourse and to ensure the continued operation of the racecourse, separately sought planning permission for replacement temporary and permanent stables, and associated development, and that application (Reference 24/60279) was granted approval by Galway City Council on 2 December 2024.

Galway Race Committee Trust in its application confirmed that that separate planning application will only be implemented if the development of the proposed N6 GCRR obtains approval and is proceeding and this is reflected in the conditions attached to the grant of planning permission by Galway City Council.

All these modifications are reflected in the updated documents submitted to An Bord Pleanála in the response to the request for further information and have been taken into account in the assessment of the Project in the updated EIAR and in this updated NIS.

2.2.2 Overlap with European sites

There are many European sites present in the local and surrounding areas. Lough Corrib SAC is the only European site traversed by the Project. Galway Bay Complex SAC and Inner Galway Bay SPA are downstream of the Project. Galway Bay Complex SAC lies c.145m to the south of the Project at Bearna. Inner Galway Bay SPA also lies to the south of the Project (c.1.1km). Lough Corrib SPA is c.190m to the

[14] https://www.n6galwaycityringroad.ie/sites/default/files/media/GCRR-4.04-019_002%20Chapter%2021%20SoC_I2_Final%2004112020.pdf

north of the Project at Kentfield and ***c***.70m from the Project at Menlough. While Lough Corrib SPA is generally upstream of the Project, a single outfall (the proposed drainage outfall for the N59 Link Road North) eventually discharges to a part of the River Corrib which falls within the SPA designation. All other European sites are at a greater distance from the Project.

The Project and its Assessment Boundary overlaps with, i.e. traverses through or adjacent to, the Lough Corrib SAC at four locations: at the termination of the proposed drainage outfall from the N59 Link Road North at Kentfield; at the site of the proposed River Corrib Bridge between Dangan and Menlough; to the west of the Coolagh Lakes (Ch. 9+850 to Ch. 10+100 of the proposed N6 GCRR); and, to the west and north of Lackagh Quarry where the Project will consist of a tunnel (Lackagh Tunnel) and approach road infrastructure (Ch. 10+620 to Ch. 11+800 of the proposed N6 GCRR). Refer to Plate 2.2 below. The total area within the Assessment Boundary is 334ha and approximately 3.8ha of the Project (all associated with the proposed N6 GCRR) lies within this European site (c.0.6ha above Lackagh Tunnel and c.0.5ha beneath River Corrib Bridge). The Project also traverses a number of groundwater bodies that support groundwater dependant wetland habitats within European sites which are discussed further in Section 1.1 below and traverses a number of watercourses that lie within or drain to a European site.

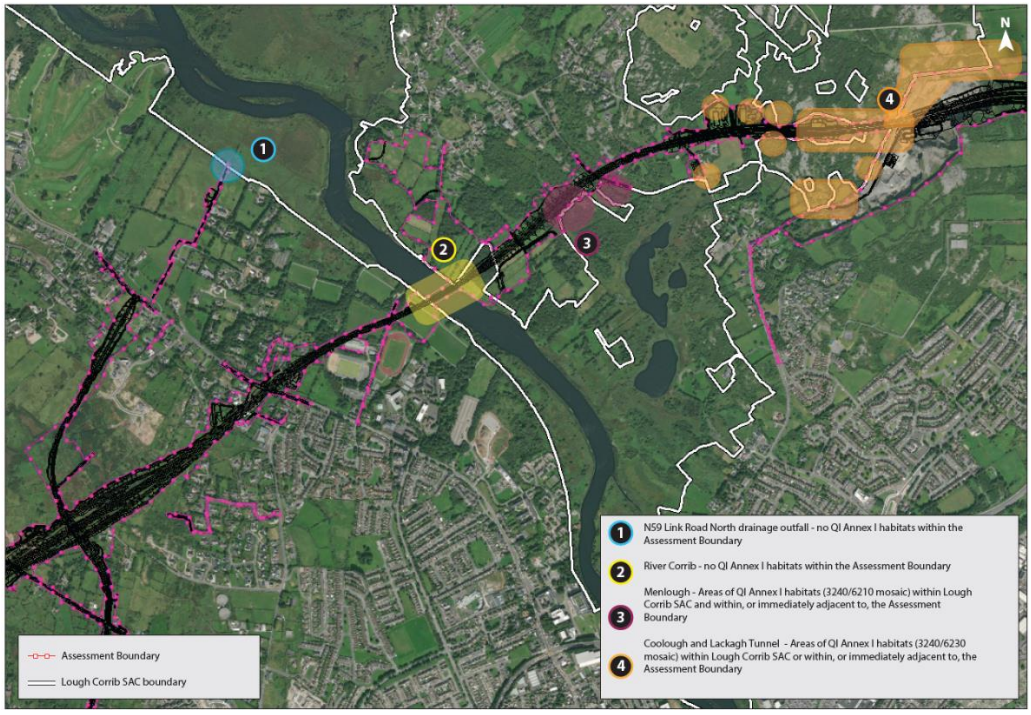


Plate 2.2 Project overlap with European sites

Through the evolution of the Project however, elements were included in the design which allowed the Project to avoid some direct and indirect effects on European sites. These avoidance measures include the following:

- Lackagh Tunnel: A tunnel beneath a narrow section of the Lough Corrib SAC in Menlough at Lackagh Quarry
- Retaining walls: A retaining wall on the southern side of the proposed N6 GCRR at approximately Ch. 9+880 to Ch. 10+050 and on both sides of the proposed N6 GCRR at approximately Ch. 10+850 to Ch. 11+150 to avoid the encroachment on QI Annex I habitat within the Lough Corrib SAC
- River Corrib Bridge: A bridge over the River Corrib (which forms part of the Lough Corrib SAC) with no instream piers. Whilst the supporting piers do lie within the terrestrial habitat areas of Lough Corrib SAC, they are not located in areas of QI habitat

The following presents the sections of the Project which traverses immediately adjacent to or through the Lough Corrib SAC.

2.2.2.1 Termination of the proposed drainage outfall from the N59 Link Road North at Kentfield

The proposed drainage outfall from the N59 Link Road North will discharge to an existing drainage ditch which will ultimately outfall to the River Corrib within the Lough Corrib SAC and Lough Corrib SPA. This is discussed further below in Section 2.2.4 and Section 2.4. The Assessment Boundary also overlaps with the Lough Corrib SAC at this location, as shown in Plate 2.3 below, to the same drainage ditch in Lough Corrib SAC at Kentfield.

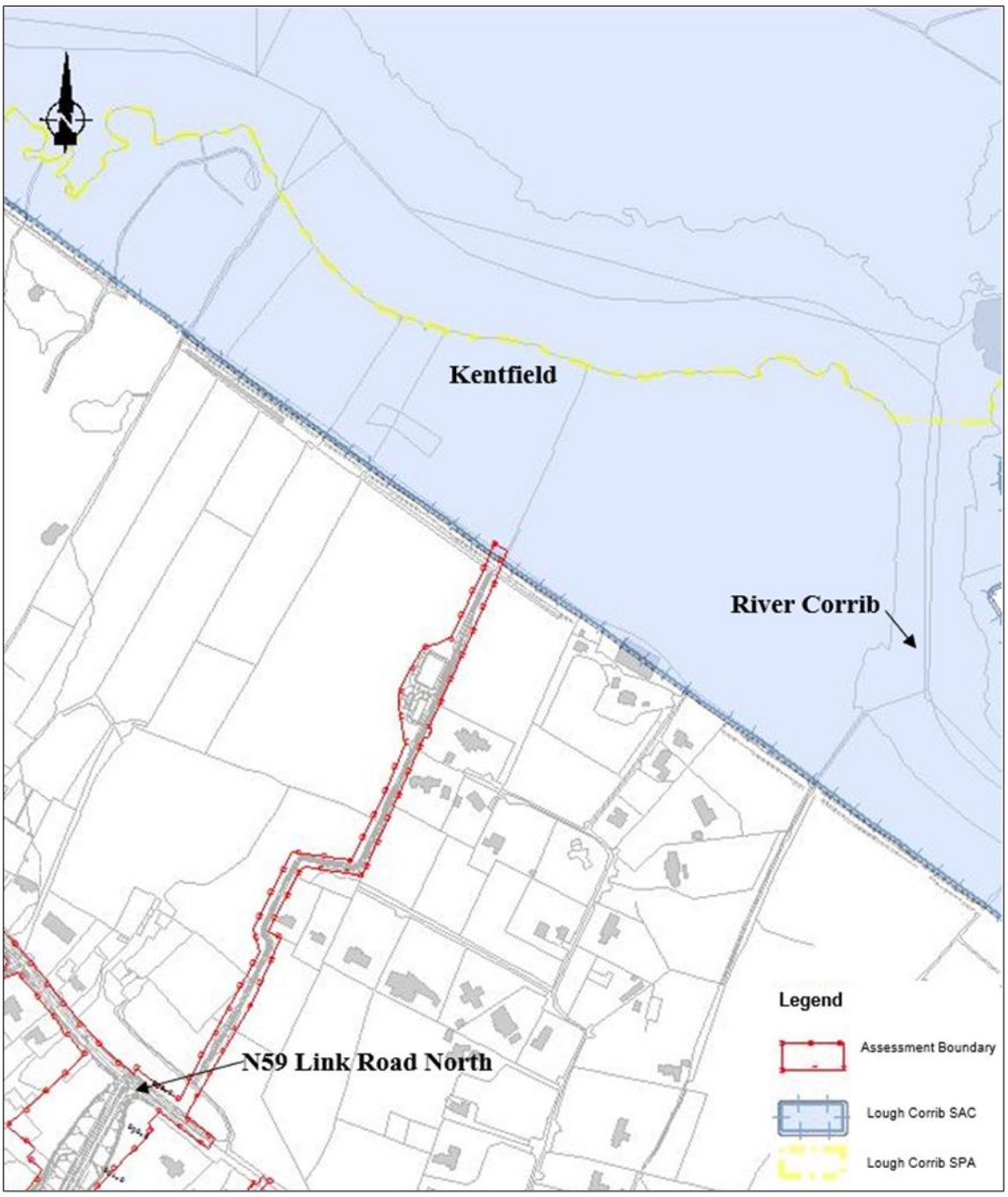


Plate 2.3 Project at Kentfield

2.2.2.2 River Corrib - Ch. 9+250 to Ch. 9+550 of the proposed N6 GCRR

The width of the River Corrib Bridge is 21m. The footprint of the proposed N6 GCRR (including associated earthworks and interceptor ditches) widens to 27.5m on the eastern bank of the River Corrib and within the Lough Corrib SAC between Ch. 9+250 to Ch. 9+550 widening to a maximum width of approximately 90m to allow for the road embankment and drainage design. Plate 2.4 below shows the Project as it traverses the Lough Corrib SAC and the area of overlap with this European site.

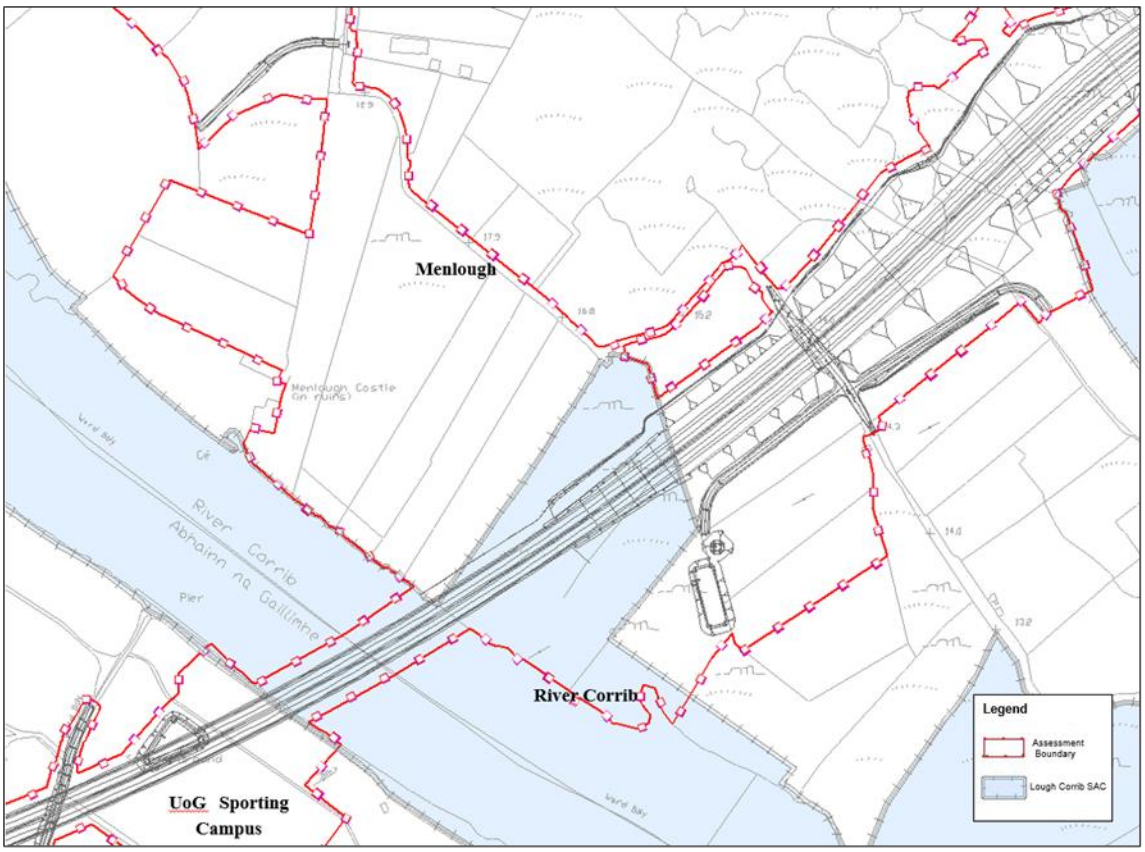


Plate 2.4 Project Ch. 9+250 to Ch. 9+550

2.2.2.3 Menlough - Ch. 9+850 to Ch. 10+150 of the proposed N6 GCRR

Between Ch. 9+850 and Ch. 10+150 sections of the Project lies within, or immediately adjacent to the Lough Corrib SAC. Plate 2.5 below shows the Project adjacent to the Lough Corrib SAC and the area of overlap with this European site.

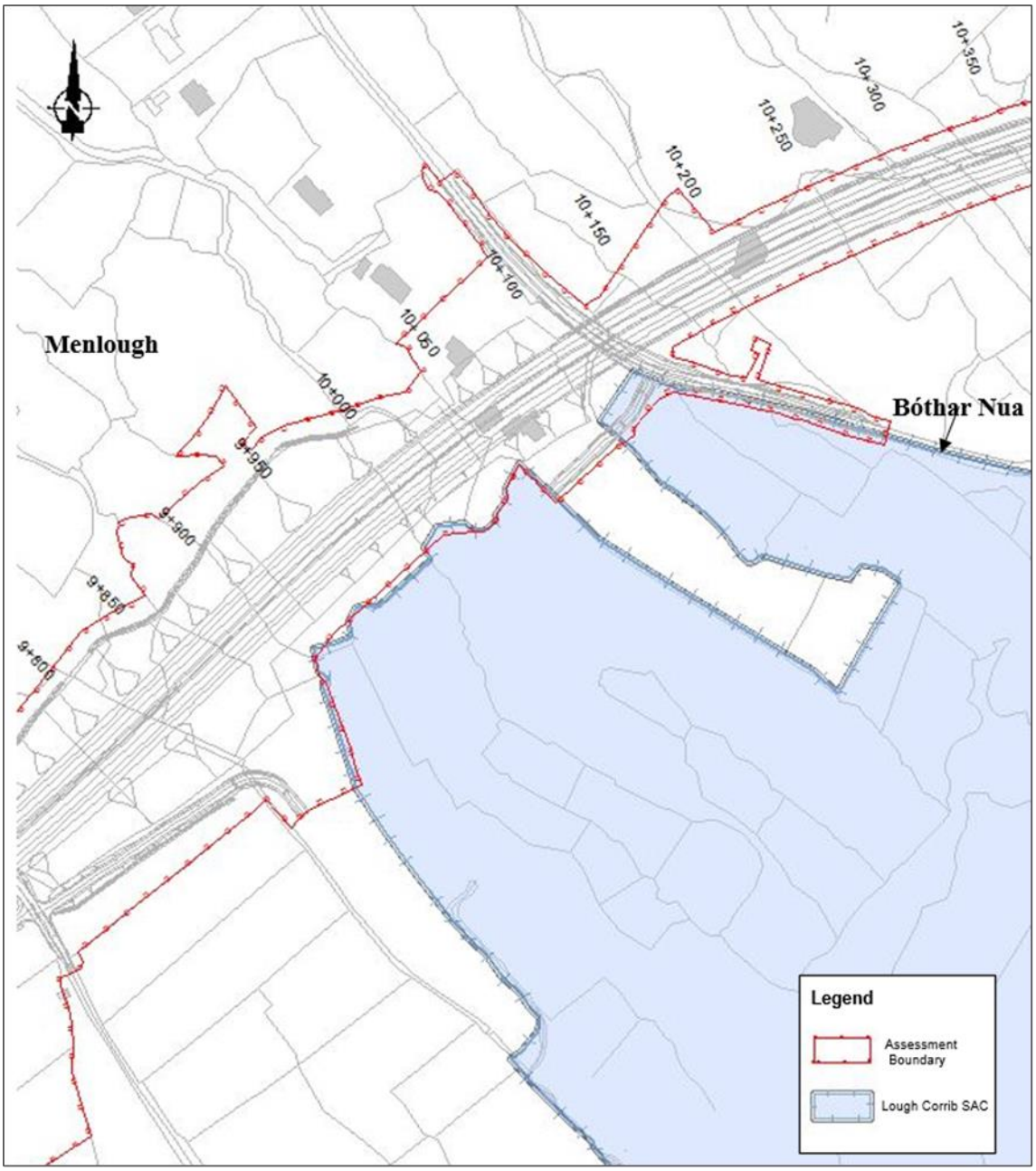


Plate 2.5 Project Ch. 9+850 to Ch. 10+150

2.2.2.4 Coolough and Lackagh Tunnel - Ch. 10+620 to Ch. 11+420 of the proposed N6 GCRR

The Assessment Boundary overlaps with the boundary of the Lough Corrib SAC at the following locations between Ch. 10+620 and Ch. 11+420, including the western approach to Lackagh Tunnel and its associated drainage lies partly within Lough Corrib SAC (Ch. 10+750 to Ch. 11+000), with the tunnel itself passing beneath the SAC (Ch. 11+140 to Ch. 11+420). Plate 2.6 below shows the Project as it traverses adjacent to, within and beneath the Lough Corrib SAC and the area of overlap with this European site.

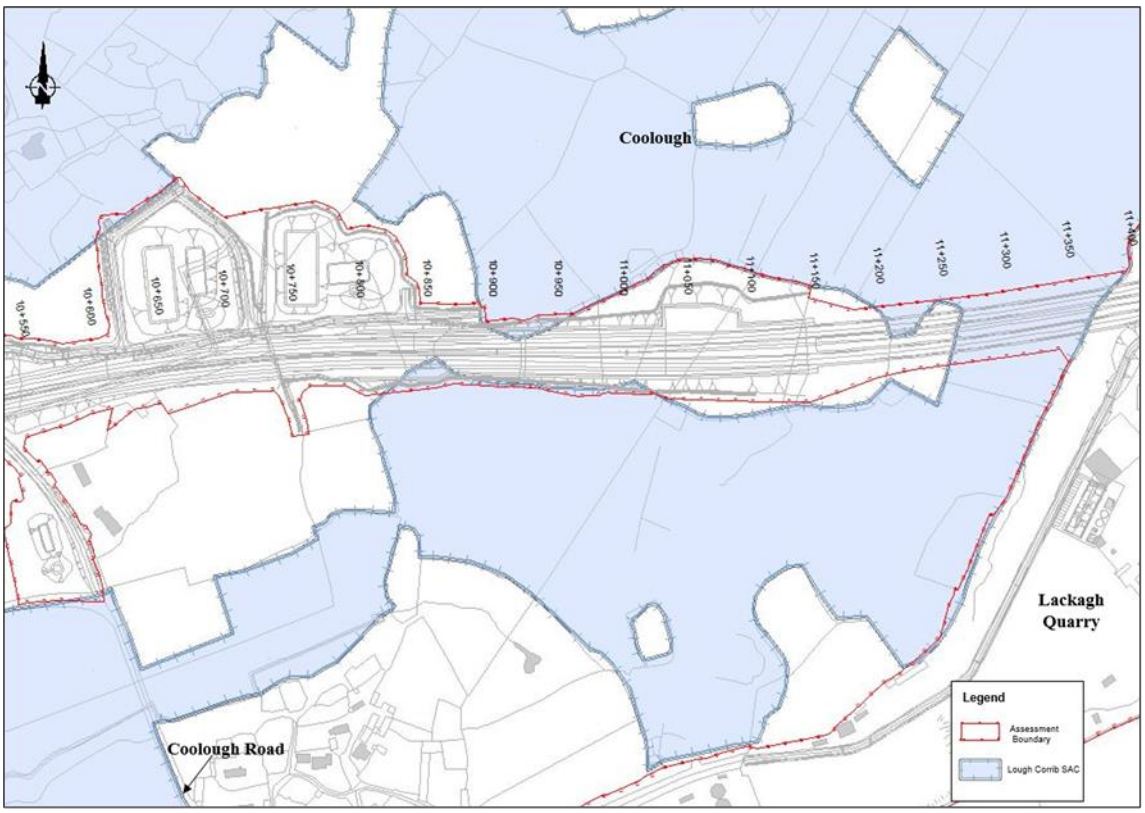


Plate 2.6 Project Ch. 10+620 to Ch. 11+420

2.2.3 Structures

There are numerous structures proposed across the length of Phase 2 of the Project, i.e. the proposed N6 GCRR. Bridges, culverts, accommodation underpasses and mammal underpasses are required to provide mitigation for existing watercourses, local access routes and mammals by maintaining access under the mainline of the proposed N6 GCRR.

There are four significant structures included in the design of the proposed N6 GCRR, namely the River Corrib Bridge, Menlough Viaduct, Lackagh Tunnel and Galway Racecourse Tunnel. The following is a summary of these structures.

2.2.3.1 River Corrib Bridge

The proposed N6 GCRR crosses the River Corrib on a bridge structure (S08/04) from Ch. 8+850 to Ch. 9+500 (650m in length). The proposed structure comprises of an eight span bridge carrying the proposed N6 GCRR over the River Corrib adjacent to a retained embankment with five culvert openings on the eastern approach. The proposed structure is a variable depth (between 3m and 7m) single concrete box without supports in the river with the main span over the river being 153m. The adjacent spans consist a variable depth single concrete box increasing in depth from 3m to 7m on approach to the main span. The remaining western approach spans consists of 3m constant depth single concrete box while the remaining eastern approach links into a retaining embankment with five culvert openings to facilitate the passage of wildlife. The superstructure will be supported on reinforced concrete piers. For aesthetic reasons, inclined webs instead of vertical webs are proposed.

There is no encroachment by the bridge structure into the Lough Corrib SAC on the west side of the River Corrib. On the east side, retaining structures are provided on the approach embankment to limit encroachment of the embankment into the Lough Corrib SAC.

2.2.3.2 Menlough Viaduct

A viaduct structure, Menlough Viaduct (S10/01) is proposed from Ch. 10+100 to Ch. 10+420 is located outside but adjacent to the Lough Corrib SAC. This structure spans over an area of priority Annex I habitat, namely Limestone pavement and a Turlough (all of which fall outside of the Lough Corrib SAC boundary) and it will reduce the potential impact on these habitats. The viaduct has a total length of approximately 320m, and the proposed N6 GCRR is on embankment on both approaches to it. The viaduct contains eight spans of a similar 40m span length. The span lengths have been adjusted to reduce the impact of the substructure and foundations on the Limestone pavement and Turlough.

The minimum distance between the soffit of the superstructure and the ground level is approximately 1.5m at one pinch point at the location of the high point in the rock outcropping on the western side. The bridge deck superstructure will consist of prefabricated precast post-tensioned beams supporting a cast in-situ concrete bridge deck. The substructure will consist of conventional reinforced concrete piers at intermediate supports while the reinforced concrete bankseats at the abutments will be supported on a reinforced earthworks system. No substructure supports are proposed within the extents of the Turlough.

2.2.3.3 Lackagh Tunnel

Lackagh Tunnel (S11/01) is 270m long and is located at Ch. 11+150 to Ch. 11+420. The eastern portal of Lackagh Tunnel is located within the inactive Lackagh Quarry, a limestone quarry. The central section of the tunnel will pass under the Lough Corrib SAC (as detailed previously in Section 2.2.3.1), while the western portal is proposed to be located in agricultural fields, outside of Lough Corrib SAC.

The primary function of the Lackagh Tunnel and its Western Approach is to transverse the Lough Corrib Special Area of Conservation (SAC) between Lackagh Quarry and Menlough without directly impacting on the Limestone pavement and Calcareous grass within the Lough Corrib SAC. This requires a safe method of excavation and construction of the tunnel such that there will be no impact on the Lough Corrib SAC during the construction or operation of the tunnel, as discussed in Section Appendix F.

2.2.3.4 Galway Racecourse Tunnel

The proposed Galway Racecourse Tunnel (S14/02) consists of a 240m twin tube reinforced concrete cut and cover tunnel with central wall. The purpose of the Galway Racecourse Tunnel is to avoid by design adverse impacts, namely disruption to operations and functioning, on the Galway Racecourse. The proposed mainline passes through the northwestern corner of Galway Racecourse property and necessitates a cut and cover tunnel from Ch. 14+950 to Ch. 15+190, resulting in a tunnel length of approximately 240m. This tunnel does not traverse through and is not immediately adjacent to any European site.

2.2.4 Drainage

2.2.4.1 Overview

The Project involves the construction of a new drainage system which includes the provision of a surface water collection system, earthworks drainage, sub-surface drainage, attenuation and pollution control, and the culverting of existing streams (Figures 2.1 to 2.15). The Project has been designed such that surface water drainage and sub-surface drainage will be provided for the proposed N6 GCRR mainline carriageway, junctions, link roads and all new sections of local roads.

Due to the contrasting geological features across the Project extent, the type of natural drainage can be split into two different broad categories west and east of the N59 Moycullen Road.

The natural discharge of rainfall and surface water drainage west of the N59 Moycullen Road is overland to low points in the topography where shallow ditches and streams are present. The underlying bedrock is granite. This is a low importance, poor aquifer where the bedrock is generally unproductive except for local zones (refer to Appendix A). In general, the water table is quite close to the surface.

The natural discharge of rainfall and surface water drainage east of the N59 Moycullen Road is directly to ground with extreme events accumulating at low points and seasonal lakes within the topography. The underlying bedrock is limestone. The aquifer is a regionally important karstified aquifer which is dominated by conduit flow. Except for the River Corrib, Terryland River, Ballindooley Lough and Coolagh Lakes there are no other significant watercourses in the area east of the N59 Moycullen Road.

The two different categories of natural drainage inform the approach to drainage design for Phase 2 of the Project, i.e. the proposed N6 GCRR. As well as the efficient removal of water from the road surface and pavement, the drainage design aims to minimise the impact of runoff from the Project on the receiving environment by replicating, as much as possible, the natural water flows across the Project. This is achieved using a variety of sustainable drainage measures.

All surface water collected by the proposed N6 GCRR carriageway drainage system will be discharged to watercourses or existing storm sewers crossed by or adjacent to the proposed N6 GCRR if present, or will be discharged to ground via infiltration. Flow control measures will be provided at outfalls and discharge points along the length of the mainline of the proposed N6 GCRR to ensure discharge does not cause any adverse effects upstream or downstream of the receiving watercourse or sewer, in terms of flow rate. Infiltration basins have been sized to allow sufficient time for infiltration to discharge to the ground. Pollution control measures will be provided on all mainline road drainage networks prior to outfalling/discharging to ensure that receiving water bodies are not contaminated by runoff from the proposed N6 GCRR.

In summary, the design basis for the drainage strategy is as follows:

- West of the N59 Moycullen Road the surface water collected by the carriageway drainage system will be discharged into watercourses crossed by, or adjacent to, the Project that eventually outfall to Galway Bay or the River Corrib. A number of these watercourses outfall to either the area of Galway Bay that is within the Galway Bay Complex SAC and Inner Galway Bay SPA, or to the River Corrib, either directly or to a tributary, which is within the Lough Corrib SAC.
- East of the N59 Moycullen Road the surface water collected by the carriageway drainage system will be discharged to ground via infiltration, with the exception of two drainage networks (S18A and S18B refer Figure 2.7) which will discharge directly to the River Corrib and three networks (S14A, S14B refer to Figure 2.6 and S15 refer to Figure 2.6 and Figure 2.12) which discharge to tributaries which eventually outfall to the River Corrib. One infiltration basin for the drainage design (outfall S19B – Figure 2.8) is within the Lough Corrib SAC and the groundwater to which this and other infiltration basins discharge interacts with the groundwater and water bodies within the Lough Corrib SAC.
- The drainage design will include combined filter drains, carrier drains, surface water channels, narrow filter drains, cut-off and toe drains, attenuation ponds, grassed surface water channels, petrol and oil interceptors, wetlands and infiltration basins.

The procedures below have been adopted for the drainage design of the Project in accordance with current TII Publications, guidance documents and best practice methods.

2.2.4.2 Culverts

Hydraulic culverts have been designed to minimise impact on both upstream and downstream flood risk. In addition to the hydraulic requirements for the crossings of the proposed N6 GCRR, consideration has also been given to the passage of mammals at some ecologically sensitive areas. Some of the hydraulic culverts have been increased in size to allow passage for a range of mammal species; for example, otters, badgers and bats.

2.2.4.3 Interceptor ditches

Interceptor ditches are included where required to intercept the overland flow from the natural catchment adjacent to the proposed N6 GCRR (during both construction and the operational phases) and to prevent ponding of water adjacent to embankments. The use of interceptor ditches is to prevent drainage from the road curtilage running onto adjacent lands and vice-versa. Therefore, the interceptor ditches serve a function to maintain the existing natural catchments.

The interceptor ditches are provided at the top of the cutting or the base of the embankment where land falls towards the proposed N6 GCRR to collect overland flow. The ditches have been sized to cater for a 1 in 75 year return period. All land drains that are intercepted by the proposed works will be discharged into an interceptor ditch. Scour protection shall be provided where velocities exceed 2.5m/s in the interceptor ditches.

To the west of the N59 Moycullen Road, interceptor ditches will discharge to existing streams, rivers and storm sewers. Due to the undulating nature of the natural topography of the land along the route of the proposed N6 GCRR, there are some considerable areas of cutting required for earthworks drainage. To the east of the River Corrib, interceptor ditches will discharge to stone filled infiltration trenches located adjacent to the proposed N6 GCRR. Cross-drains will be provided to convey flow from the interceptor ditches beneath the proposed N6 GCRR to the outfall/discharge locations where required.

2.2.4.4 Carriageway Drainage

A surface water collection system will be provided so as to comply with the design requirements of DN-DNG-03022 – Drainage Systems for National Roads (HD33/15) (February 2024). Whilst this standard was updated from the earlier March 2015 edition, this does not change the drainage design. This includes providing suitably sized longitudinal carrier drains to accommodate a 1 year return period storm in-bore without surcharging, with no flooding of the proposed carriageway for a 1 in 5 year return period for filter drains. Where combined surface and ground water drains are proposed, a 1 in 5 year return period storm will not rise above the formation level, or sub-formation level where a capping layer is present. The drainage networks are designed to include an increase of 20% in rainfall depth to cater for the impact of climate change.

In the western section of the proposed N6 GCRR from the R336 Coast Road to the N59 Moycullen Road, the drainage network is in accordance with Figure 3.1 of DN-DNG-03022 (HD 33/15) and will comprise of a combination of surface water channels, filter drains, carrier drains or similar. However, in the eastern section of the proposed N6 GCRR from the N59 Moycullen Road to the connection point with the existing N6 at Coolagh, Briarhill, due to the karstic nature of the underlying bedrock and the vulnerability of the underlying aquifers, there is a requirement for a fully sealed system to accept the proposed carriageway runoff. Therefore, the network collecting the drainage from the proposed carriageway will remain separate to the groundwater and sub-surface drainage network. This will be achieved by using either a kerb, gully and carrier pipe system or a surface water channel and carrier pipe system. This allows for controlled treatment of surface waters prior to discharge to the ground thereby reducing the risk to the underlying aquifer. For cuttings and low embankments, a separate filter drain will be provided for sub surface flows.

2.2.4.5 Sub-Surface Drainage

A sub-surface drainage system of the road pavement will be provided in order to control groundwater levels in the vicinity of the proposed N6 GCRR and to drain the road foundation. This is required in areas of cuttings and low embankments (<1.5m). In general, this is achieved using a network of filter drains or narrow filter drains.

Due to the karstic nature of the catchments to the east of the N59 Moycullen Road a hydrogeological risk assessment for each surface water drainage network catchment has been carried out at the location of each infiltration basin (Appendix A).

2.2.4.6 Structure Drainage

A separate isolated sealed drainage system will be utilised for the Lackagh Tunnel and the Galway Racecourse Tunnel structures. The drainage system will be designed in accordance DN-STR-03015 – Design of Road Tunnel (BD78) (December 2000). The sealed system of slot drains and carrier pipes will be used in both tunnels to pick up groundwater ingress, surface water from wheels, fire flows and tunnel wash down, all of which will be drained to sumps and pumped to the closest foul sewer. The foul effluent flow discharges via gravity to the Mutton Island Waste Water Treatment Plant where it is treated. This sealed system controls the drainage of these tunnel structures; it also mitigates against the potential for pollution of groundwater and minimises the risk to the Lough Corrib SAC and any surface water bodies.

A watertight seal will be installed on the underside of the road base and cuttings on the western approach to the Lackagh Tunnel and on the eastern approach to the Galway Racecourse Tunnel up to the known high winter groundwater level. This is to protect against groundwater inflow and prevent contamination of groundwater and no dewatering is permitted in the operational phase of the proposed N6 GCRR at these locations (Appendix A).

Drainage of the proposed bridge structures will be managed so as to achieve the requirements set out in DN-DNG-03022 – Drainage Systems for National Roads (HD33/15). For the long lengths of the Menlough Viaduct and the River Corrib Bridge a specialised sealed drainage system will capture the runoff on the bridge deck, transport it beneath the structure in a network of sealed carrier drains, before descending into the ground at suitable pier locations and discharging to a wetland and attenuation treatment area. This is required due to the sensitivity of the areas over which the bridges are crossing and of wetland habitats supported by the receiving environment i.e. Limestone pavement and Turlough (Priority Annex 1 habitats, which fall outside of the Lough Corrib SAC boundary and do not form part of its Qualifying Interests) at Menlough and wetland habitats associated with the Coolagh Lakes and the River Corrib (QI Annex I habitats, and supporting QI species of Lough Corrib SAC).

2.2.4.7 Link Road and Side Road Drainage

The side roads require kerbs at locations such as at bridge or junction locations or where footways are required and will therefore be drained using gullies with carrier drains or combined filter/carrier drains. Piped drains will discharge to an outfall, a sealed drain or to the mainline drainage system. Side roads that do not require kerbs will be drained using either over-the edge drainage or combined filter drains where appropriate in accordance with the principles described above. The drains will discharge to an outfall, a sealed drain or to the mainline drainage system.

2.2.4.8 Outfalls, Attenuation Ponds and Infiltration Basins

West of the N59 Moycullen Road the surface water collected by the proposed N6 GCRR carriageway drainage system will be discharged to watercourses crossed by, or adjacent to, the proposed N6 GCRR. In order to prevent discharge from the road increasing the peak flow rate of water within many of the watercourses, which may compound any flooding downstream of the proposed N6 GCRR, flow restriction and attenuation storage is proposed. Attenuation is provided prior to discharge in order to prevent discharge from the road increasing the peak flow rate of water within the watercourses, which may compound any flooding downstream of the proposed N6 GCRR. Attenuation ponds have been selected as the main attenuation facility provided along the proposed N6 GCRR. Attenuation ponds will not be lined to the west of the N59 Moycullen Road and can become a feature of the landscape in time and is in line with current best practice guidelines. The proposed outfalls, with proposed attenuation ponds, have been chosen at appropriate locations along the route of the proposed N6 GCRR typically as close as possible to an existing watercourse.

Where the drainage system outfalls to a watercourse the final outfall level (after the attenuation and treatment measures) shall be set above the 1 in 5 year flood level of the watercourse where possible. Furthermore, an assessment of the impact of the pond on the hydraulic regime of the watercourse has been undertaken (Appendix B).

A flow control device (Hydrobrake or similar) will be installed at the outfall location of all attenuation ponds to control the flow rate from the pond to the receiving watercourse. The discharge rate for each drainage catchment is set to the Q_{bar} greenfield runoff rate to replicate the existing environment or to a minimum of 5 l/s on smaller catchments to minimise the risk of blockage from debris within the network.

There are a number of outfalls to existing sewers along the proposed N6 GCRR. The surface water sewers are generally located in the more urbanised areas adjacent to the proposed N6 GCRR, where existing streams and ditches have already been previously culverted to facilitate development.

East of the N59 Moycullen Road the surface water collected by the carriageway drainage system will be discharged to ground via an infiltration basin where a positive outfall to a watercourse is not available. Ground investigations have been undertaken at the proposed locations of the infiltration basins to determine the permeability of the existing soil and bedrock and inform the design of the infiltration basins. Where the infiltration rate is outside the range of the permissible flow rates (e.g. discharge directly to karst limestone bedrock) then the base layer of the infiltration basin will be created synthetically to reduce the infiltration

rate artificially. The design infiltration rate for the proposed N6 GCRR is 0.036m/hr. The infiltration basins have been sized so as to drain down to half volume in a 24-hour period. The infiltration basins will not be lined so as to allow for infiltration to ground.

To the East of the N59 Moycullen Road, where attenuation ponds and discharge to watercourses or public sewers are proposed in the karst limestone area, the base of the attenuation ponds will be lined to prevent infiltration to groundwater using a synthetic or suitable clay liner.

The attenuation ponds and infiltration basins will cater for a return period up to 1 in 100 year storm event minimising any increase in flood risk to adjacent properties up to this return period. A minimum freeboard of 300mm is provided between the maximum water level in the attenuation pond or infiltration basin and the top level of the pond/basin or the pond/basin protection bund. Peak discharge rates from the development will not exceed the peak discharge rates in the greenfield scenario for the critical storm return period. The pond/basin will be bunded to a level 500mm above any adjacent 1 in 100 year flood levels. To reduce the risk of receiving water and groundwater being contaminated by runoff from the proposed N6 GCRR, pollution control measures will be provided as detailed in the following section.

2.2.4.9 Pollution Control

Pollution control measures are proposed prior to each outfall/discharge point from the proposed N6 GCRR carriageway to reduce the risk of watercourses or groundwater being contaminated by runoff from the proposed N6 GCRR. A range of pollution control measures have been adopted along the length of the proposed N6 GCRR which includes combined and narrow filter drains, attenuation ponds, grassed surface water channels, petrol and oil interceptors, spill containment areas, wetlands and infiltration basins.

Sustainable drainage systems (SuDS) systems will be implemented in the first instance. Only where there is insufficient space or the road geometry precludes their inclusion (e.g. on embankments higher than 1.5m or in cuttings with groundwater drainage problems) were other conventional methods used. In general, where the risk to groundwater is low combined filter drains or grassed surface water channels will form the first treatment against pollutants making their way into surrounding water bodies. The filter material will trap suspended solids and other contaminants thus reducing downstream pollution risk. Where the road carriageway runoff drains into grassed surface water channels, the slow moving surface flow through shallow swales will allow for the processes of sedimentation and absorption to take place while carrying the runoff to the outfall.

Where the groundwater is highly vulnerable a sealed drainage system (e.g. carrier pipe with gullies, concrete surface water channels, slot drains etc.) will collect and distribute surface water runoff to a suitable outfall location/discharge point. Sub surface flow will be collected in a series of narrow filter drains.

At each mainline and link road drainage network across the proposed N6 GCRR, a SuDS surface flow (SF) treatment wetland will also be provided upstream of each attenuation pond or infiltration basin to further treat runoff. The surface flow wetlands have been sized to store the ‘First Flush’ runoff from their associated road pavement catchments in the permanent pool. This comprises a volume equal to a 15mm depth of rainfall on the road catchment. This ‘First Flush’ runoff carries the highest load of pollutants, compared to runoff discharged later in the rainfall event. The minimum depth of the permanent pool is 600mm which will further encourage settlement of suspended solids and will be lined to reduce the risk of watercourses or groundwater being contaminated by runoff from the proposed N6 GCRR. Suitable planting and additional measures will be employed to encourage the settlement of silt and absorption of any remaining pollutants i.e. silt traps, reed beds. The increased retention time provided by the wetland will provide additional time for further adsorption and sedimentation to take place and will also allow for a range of natural biological processes (including biodegradation, microbial action and plant uptake) to further remove waterborne pollutants.

Oil and petrol interceptors will be provided upstream of the wetland and attenuation pond/infiltration basin to prevent any contamination from hydrocarbons, such as oil or petrol spillages, from entering the receiving water or groundwater. The interceptors will be sized for each drainage catchment according to the inflow. Along the mainline of the proposed N6 GCRR a minimum emergency spill containment volume area equal to $25m^3$ will be provided at all outfall locations.

2.3 Description of Phases 1, 3, 4 and 5: Proposed Development at Galway Racecourse

Whilst Phase 1, Phase 3 and Phase 4 of this Project are subject to a separate development consent process for which planning permission has been granted as mentioned above, those phases form part of the Project that has been considered and assessed for AA purposes in the updated AA Screening Report and this updated NIS (and for EIA purposes in the updated EIAR). These phases relate to the provision of temporary and permanent stables for Galway Racecourse arising from the demolition of the stables to facilitate the construction and operation of the proposed N6 GCRR and so that the racecourse can mitigate against the impacts of the proposed N6 GCRR on the operation of the racecourse and ensure its continued operation.

All works required for the diversion or protection of any of the services in conflict with all phases of the Project have been confirmed with each of the service providers.

2.3.1 Phase 1

Phase 1 includes the construction of a temporary stableyard including horsebox parking, machinery shed, maintenance shed, ESB substation, two wells, new pre-parade ring and pavilion on Galway Racecourse lands.

The proposed temporary stables are to be located on an existing grassed area in the centre of the racetrack i.e. the infield. The temporary stableyard will consist of 159 No. stables; vet, security, storage facilities and groom's pavilion and 61 number horsebox parking spaces.

The machinery storage shed is located to the east of the temporary stables on an area currently used to store sand and grit for use around the Racecourse. A pre-parade ring will be provided to the east of the existing pre-parade ring. A maintenance shed will be provided to the east of the proposed pre-parade ring to replace the existing maintenance shed that will be demolished as part of Phase 2.

Two proposed wells for water supply for track watering will be provided in the existing horsebox parking area to replace the existing water tank within the existing stableyard that will be demolished as part of Phase 2.

An ESB substation will be provided to the rear of the proposed maintenance shed, as well as associated internal roads, drainage, site, utilities connection and landscape works will be undertaken. The external corridors of the temporary stable courtyards will be lit by dimmable LED surface mounted luminaires.

The layout of the proposed temporary stableyard and associated works is shown in Appendix A.5.3 of the updated EIAR contains the full details of the proposed development at Galway Racecourse.

Similar to the carriageway drainage, a surface water collection system will be provided in both locations. The temporary stables discharges to a natural 'swallow hole' feature in the infield area of racecourse and caters for storm events up to the 1 in 100 year return period storm event, with a limited discharge of 5l/s The proposed system incorporates critical elements of a sustainable drainage (SuDS) treatment train comprising source control (green roof system), water quality improvements (green roof system), runoff volume reduction (green roof system), runoff rate control (hydrobrake flow control) and attenuation storage (attenuation pond).

2.3.2 Phase 3

Phase 3 comprises the construction of the new permanent stableyard including horsebox parking post handover of the proposed N6 GCRR.

The permanent stableyard will consist of 152 No. stables; vet, security, storage facilities and Groom's Pavilion, and horsebox parking.

The permanent stables will be constructed on a brownfield site and has two outfall locations. The parking area will incorporate a Grasscrete GC1 system to facilitate a reduction in the hardstanding area and make a provision for attenuation, prior to discharging into the existing track drainage network, which discharges to the 'swallow hole' noted above. The main stable yard and buildings will discharge to the proposed diverted combined sewer via a flow control to reduce the existing flow rates to the existing network.

The drainage networks are designed to include an increase of 20% in rainfall depth to cater for the impact of climate change.

The external corridors of the temporary stable courtyards will be lit by dimmable LED surface mounted luminaires.

2.3.3 Phase 4

Phase 4 comprises the demolition of the temporary stables constructed in Phase 1.

The above ground structures of the stables will be demolished and removed. However, the bases beneath the temporary stables will be retained and reinstated as car parking. The rubberised surface in the temporary stableyard will be removed and this area will be repurposed as the circulatory area for carparking.

The drainage features installed as part of Phase 1 will be retained for attenuation of this repurposed parking area plus attenuation of a portion of the permanent stables installed during Phase 3.

The horsebox parking spaces will be redesignated for car parking post demolition of the temporary stables.

The ESB sub-station, pavilion, machinery shed, maintenance shed, well and pre-parade ring constructed as part of Phase 1 are retained.

2.3.4 Phase 5

Phase 5 is the fully operational N6 GCRR and the fully operational permeant stables.

2.4 Construction Activities

2.4.1 Overview

This section outlines the construction activities of relevance to considering potential impacts on European sites. These activities include construction phasing, enabling works (including archaeological test trenching and ground investigations), site preparation and clearance works, main construction activities (including mitigation measures such as landscaping measures and ecological habitat planting), proposed construction methodologies, material sources and transportation including, earthworks quantities, proposed haul routes and construction compounds, service and utility diversions, commissioning and decommissioning of the Project.

An overall construction period of 60 months is anticipated for the construction of the Project, albeit that it will not be a continuous period of construction. The temporary stables and permanent stables, for which a separate planning application has been made to Galway City Council by Galway Race Committee Trust (Ref. 24/60279), are required so as to mitigate the impacts of the proposed N6 GCRR on the operation of the racecourse and to ensure that the racecourse can continue to operate both during and after the construction of the N6 proposed GCRR. The construction period for the stables will span either side of the N6 Galway City Ring Road construction, which itself has a duration of up to 36 months. The Project will be constructed in phases during this time, one year for Phase 1, three years for Phase 2 and one year to complete Phases 3 and 4. A variety of construction activities will occur simultaneously at a number of locations along the route of the proposed N6 GCRR during Phase 2 of the Project, but will be in a phased manner. Construction will be undertaken using internationally accepted methods. Construction of the Project will include activities such as excavation, embankment and structural construction, tunnelling, piling, rock breaking and movement of materials within the fenced off working area. This will generate noise, dust and movement of machinery which will potentially impact on the surrounding environment. The duration of these works will vary. A series of best practice mitigation measures will be incorporated during the construction phase to ensure that strict limit values set to avoid significant impacts will not be exceeded at sensitive locations.

A strategy for construction has been developed with the aim of minimising potential environmental impacts at each subsequent phase of the Project. Major construction activity such as excavation work, requires the use of powerful and often large and heavy equipment. These works take a significant time period to complete and progressive phases of construction entail different activities and require the use of various types of equipment. Overall, however, construction is a temporary activity. Modern machinery and techniques are sophisticated and are designed to be operated to minimise the impact on their surroundings. Any residual

impact, which may arise as a result, is for a limited period of time. The works required to construct the Project are essentially similar to other major construction projects in Ireland and across the world.

The general activities associated with the construction of the Project include:

- Site clearance including demolitions and vegetation clearance
- Fencing
- Site access
- Construction compounds
- Site investigations and archaeological testing
- Quarrying and processing of aggregates
- Material requirement and source of material
- Temporary road closures and diversions
- Water management/treatment
- Temporary storage of materials, surplus materials or wastes arising
- Processing and transportation of excavated materials, where suitable, for reuse within proposed N6 GCRR

The above activities of relevance to considering potential impacts on European sites are discussed below. In addition to the above list the following are also discussed:

- Construction form and duration of works
- Construction constraints
- General construction methods
- Construction programme, staging and working hours
- Construction-related traffic and access

2.4.2 Construction Phasing

There are additional phases, five in total, in the overall construction sequence from that presented in the 2018 NIS to accommodate the separate application for permission for the temporary and permanent stables. The construction of the Project occurs over four of the five project phases as follows:

- Phase 1: These works do not form part of the approval sought as part of the Section 51 Application for the proposed N6 GCRR, however Phase 1 does form part of the Project that has been considered and assessed for EIA and AA purposes. Works undertaken as part of Phase 1 will include the construction of the temporary stableyard, machinery shed, maintenance shed, water supply wells, ESB substation and new pre-parade ring and pavilion on Galway Racecourse lands. The works are the subject of an application for planning permission as mentioned above by the owners of Galway racecourse.
- Phase 2: Works undertaken as part of Phase 2 will include the following:
  - The provision of the proposed N6 GCRR in two stages which will take place concurrently:
    - Stage A - N6 Coolagh Junction to N59 Letteragh Junction - 9.9km (Including the N59 Link Road North and South)
    - Stage B - N59 Letteragh Junction to R336 west of Bearna - 7.5km

    Completion of Stage A would provide the benefit of a new river crossing and also provide a new connection to the N59 Moycullen Road and greater Knocknacarra area. The N59 Link Road North

and South and Parkmore Link Road could also potentially be constructed as part of an advance works contract however these will be assessed as part of the main contract for the purpose of this updated EIAR as the associated environmental impacts would be the same. Completion of Stage B would enable a full connection from the west of Bearna Village and to the east in Coolagh, Briarhill with various at-grade and grade separated connections

  - Existing stableyard to be demolished, including existing well, existing water tank, machinery shed and adjacent car parking
  - Existing commercial building on the lands the subject matter of the N6 Galway City Ring Road Motorway Scheme 2018 to the north of the Galway Racecourse to be demolished and the site cleared
  - Existing horse box parking off Racecourse Avenue to be demolished, including removal of existing access arrangement to the Ballybrit graveyard, to accommodate the Galway Racecourse Tunnel as part of the proposed N6 GCRR

- Phase 3: These works do not form part of the approval sought as part of the Section 51 Application for the proposed N6 GCRR, however Phase 3 does form part of the Project and has been considered and assessed for EIA and AA purposes. Works undertaken as part of Phase 3 will include construction of the new permanent stableyard upon completion and handover of the proposed N6 GCRR. Again, these works are the subject of an application for planning permission as mentioned above by the owners of Galway racecourse.
- Phase 4: These works do not form part of the approval sought as part of the Section 51 Application for the proposed N6 GCRR, however Phase 4 does form part of the Project and has been considered and assessed for EIA and AA purposes. Works undertaken as part of Phase 4will include demolition of the temporary stableyard constructed in Phase 1 and reinstate the site of temporary stableyard as car parking. Retain ESB sub-station, pavilion, machinery shed, maintenance shed and pre-parade ring. Again, these works are the subject of an application for planning permission by the owners of Galway racecourse.

2.4.3 Enabling Works

Enabling works are those generally undertaken to existing facilities in order to provide space or access for the permanent works and or construction. By their nature, these works must be complete before the main works can start. The timing of enabling works depends on the programmed start of the phase of main works that they are designed to enable. Some may start well in advance of the main construction activities. The potential environmental impacts associated with the enabling works have been considered in this updated NIS.

Before the start of the main construction works, there will be elements of enabling and preparatory works, such as ground investigation, treatment of non-native invasive plant species and archaeological investigations within or immediately adjacent to the Lough Corrib SAC, which are designed essentially to clear the ground for the main activities. These activities have been considered at this stage to ensure all necessary land and access is included within the Assessment Boundary and all potential direct and indirect impacts considered.

2.4.4 Site Clearance and Preparation Works

Site clearance, including vegetation clearance, will be undertaken within the Assessment Boundary. The clearance of vegetation including the treatment of non-native invasive plant species will be done in accordance with the Construction Environmental Management Plan (CEMP) in Appendix C.

Areas of QI Annex I habitat within Lough Corrib SAC and the Assessment Boundary will be retained and protected from construction works (Figure 17.1 to Figure 17.5, Figure 18.1 to 18.5, Figure 19.1 to Figure 19.5 & Figure 20.1 to 20.5). Within the Lough Corrib SAC, all areas of the site required for the construction of the Project will be cleared down to ground level. Trees will be protected where practicable when construction accesses are formed. The presence and nature of items of heritage significance will be recorded and preserved where possible. Archaeological monitoring and investigations will also be undertaken in order to record and preserve any buried findings using the appropriate methods.

Access for ground investigation work and archaeological testing have been considered and are included within the Assessment Boundary.

The diversion of utilities is not required within the Lough Corrib SAC. There is no demolition of a structure within the Lough Corrib SAC.

Surplus materials will be reused within the Project where feasible and subject to appropriate testing to ensure it is suitable for its end use. Unavoidable wastes generated will be managed as outlined in the CEMP in Appendix C.

2.4.5 Fencing

Prior to the commencement of Phase 1, the area around the temporary stables will be temporarily fenced off until Phase 1 is complete. For Phase 2 the land to be acquired for the proposed N6 GCRR will be fenced and access across it restricted. Temporary construction fencing or hoarding may be required during construction prior to the installation of permanent fencing to secure the site and prevent unauthorised access. Fencing will be erected from the proposed road side of the fence. In areas where the Assessment Boundary includes Annex I habitat within Lough Corrib SAC the permanent fencing will be located between the proposed road and the Annex I habitat and will not be located within the habitat areas. Fencing in accordance with TII Publications will be used. In Phase 3, the area around the permanent stables will be fenced off until Phase 3 is complete and then the temporary stables will be fenced off during Phase 4 whilst they are being demolished. Drawings of the proposed fence types are included in Figures 5.5.01 to 5.5.30 in Volume 3 of the updated EIAR. These figures were originally submitted as A.1.9 of the 2019 RFI.

Fence types will vary across the Project depending on the different requirements and may be temporary in nature. Temporary fencing required to secure the construction site for the construction of the River Corrib Bridge will be outside the Lough Corrib SAC on the western river bank and set back 10m from the bank edge. On the eastern bank and the other sections within or adjacent to the Lough Corrib SAC the permanent fencing will be erected within the Lough Corrib SAC prior to construction. Mammal proof fencing, related to the protection of Otter, will be provided as shown on Figure 6.

2.4.6 Site Offices and Compounds

Site preparation works will also include the provision of facilities for the contractors and the construction management team. The proposed locations of site compounds have been identified within the Assessment Boundary as shown on Figures 3.1 to 3.2. There will be no site office or compound located within the Lough Corrib SAC. There are two site compounds (SC 09/01 and SC 11/01) proposed to be located immediately adjacent to the boundary of the Lough Corrib SAC.

Lackagh Quarry (Site Compound SC 11/01) will be one of the principal site compounds across the Project, given its size and location in relation to the overall Project. It is proposed to include a concrete batching and rock crushing plant at Lackagh Quarry. A rock crushing and grading plant may be included at any of the proposed site compounds with the exception of site compound SC 09/01. This has been considered in the potential impacts assessment. The appropriate authorisation for crushing plants such as waste facility permits will be obtained by the operator prior to commencement of the activity.

2.4.7 Main Construction Works

The below text provides a summary of the proposed construction and its estimated duration for each phase of the Project, noting again that there are additional phases since 2018. A likely sequence of construction is presented as part of this updated NIS, this is based on a worst-case scenario so that all potential impacts are considered for each phase of the Project. All construction will be employed using best practice methods and in accordance with the relevant standards.

An overview of each Phase and its associated construction activities are discussed in the following sections which should be read in conjunction with Figures 3.1 and 3.2 which show the locations of the proposed site compounds, blasting locations and haul routes.

2.4.7.1 Phase 1

The Phase 1 construction works involve constructing temporary stableyard including horsebox parking, machinery shed, maintenance shed, ESB substation, two wells, new pre-parade ring and pavilion on Galway Racecourse lands. The temporary stables construction will comprise:

- Cut and fill earthworks to level land at the site
- Laying of base material and flooring
- Construction of pre-cast concrete stable and washroom units, loading bays, retaining walls, pavilion, machinery shed, maintenance shed, pre-parade ring and ESB sub-station
- Additional access roads

For Phase 1, topsoil and subsoil will be excavated and the ground levelled to provide the needed surface for construction of the temporary stables within the infield of Galway Racecourse. The excavated soil will be transported directly offsite. Construction of the temporary stables in Phase 1 includes the excavation of an attenuation pond to the south of the proposed temporary stables.

Two lane tarmac roads are proposed as part of Phases 1 of the Project to provide access for horse boxes and other vehicles to the stables. These roads will be constructed using tarmacadam surfacing. Phases 1, 3 and 4 will also contain horsebox parking facilities which will also be paved with tarmacadam surfaces. The circulatory areas in the temporary stableyard will be surfaced with a rubberised flooring.

2.4.7.2 Phase 2

The main construction works associated with Phase 2 will involve the excavation and placement of material for the construction of cuttings and embankments as well as the hauling of materials and importation/exportation of materials to complete the road formation for the Project. Materials for the road construction will include materials that need to be brought to site including gravels and bituminous pavement and surfacing materials. In addition to the earthworks construction the main activities will involve the following:

- Road Works – sub-base and base construction, bituminous pavement, surfacing
- Drainage – the installation of pipe culverts, filter drains, linear grassed channels and wetlands
- Structures – the construction of retaining walls, piling works, construction of bridges and viaducts including their foundations, piers, abutments and the installation of large beams and other reinforced concrete works
- Tunnels – the construction of a mined (drill and blast) tunnel and a cut and cover tunnel
- Blasting – excavation of rock for cuttings and tunnels
- Ancillary roadworks including the installation of safety barriers, signage and road marking
- Accommodation works for landowners such as access roads, entrances, fences, gates, walls, ducting and reconnection of severed services
- Temporary traffic management

Phase 2 also comprises the demolition of the existing stableyard, including the demolition of the existing well, existing water tank, existing machinery shed, adjacent car parking (60 spaces).

The main construction activities within or immediately adjacent to the Lough Corrib SAC, all incorporated in Phase 2, include the construction of:

- Drainage measures including the N59 Link Road North Outfall (S15) and outfalls S18A and S18B
- The River Corrib Bridge
- Retaining walls

- Earthworks and pavement works
- The Menlough Viaduct
- The Lackagh Tunnel and its western approach

Each of these are discussed in more detail below.

Drainage Outfalls
There are three drainage networks which discharge directly to the Lough Corrib SAC, namely S15, which drains the proposed N59 Link Road North and outfalls to an existing drainage ditch which ultimately outfalls to the River Corrib (part of both the Lough Corrib SAC and Lough Corrib SPA at this location), S18A and S18B which both directly discharge to the River Corrib.

Additionally, there are two road drainage networks (S14A and S14B) which outfall indirectly to the Lough Corrib SAC via an existing stream[15] which flows to the west of Aughnacurra residential estate.

A working width of 15m is available for the construction of the above drainage networks to allow room for the necessary machinery and equipment to operate. The extent of the Assessment Boundary does not include any Annex I habitat within the Lough Corrib SAC in these areas.

The headwall at the outfalls in to the Lough Corrib SAC will be constructed flush with the existing drainage bank. The headwall can be constructed using either a precast headwall or by casting the headwall in-situ. For either method, the construction process will be undertaken using standard best practices. Where the headwall will be constructed using a precast headwall, a temporary cofferdam structure can be constructed if necessary to allow the precast concrete headwall to be lowered into position. Where the headwall is to be cast in-situ, a temporary cofferdam will be constructed to allow the necessary ground works to be completed and to cast the headwall. This cofferdam is used to prevent any potential impact to the water quality of the river/stream/drainage ditch. Where any pumping of water is required, this water will go through environmental treatment to remove all pollutants before being reintroduced to the local surface water drainage network. Once the headwall has been constructed the temporary cofferdam is removed.

River Corrib Bridge
The River Corrib Bridge clear spans the river (i.e. with no piers in the river) and as such a balanced cantilever construction is proposed over the river section and the spans over the river banks. Due to the larger span, the superstructure structural depth is significantly larger at the pier locations and varies in depth along the span. This increases the construction complexity of the deck. Post-tensioned in-situ concrete deck can be built using travelling formwork over the river and side spans; and using falsework or travelling formwork on approach spans. There will be no in-stream works with the River Corrib. For full details of the proposed construction of the River Corrib Bridge see Appendix D.

Retaining walls adjacent to Lough Corrib SAC
A retaining structure, reinforced soil embankment, between Ch. 9+850 to Ch. 10+050 will retain the proposed N6 GCRR from encroachment on the Annex I habitat of the Lough Corrib SAC. The construction of both the retaining structure and reinforced soil embankment will be undertaken in tandem within the Assessment Boundary and outside the areas of Annex I habitat (Figure 1.7 together with Figure 17.1 and Figure 18.1). The reinforced soil embankment will be constructed using heavy plant machinery with the height of the retaining structure increasing at the same rate as the embankment height increases.

A combination of retaining systems will be implemented along the Western Approach and above the western tunnel portal at Lackagh Tunnel (Ch. 10+850 to Ch. 11+150) where the use of unsupported slopes is not used as they would encroach on areas of Annex I habitats. The retaining system type is governed by the ground conditions encountered at that particular location, for example whether it is rock only, or overburden only or a combination of overburden and rock. Within this area the rock head level changes significantly, requiring retaining system solutions for shallow and deep rock ground conditions which can be constructed outside the Lough Corrib SAC Annex I habitat.

[15] It should be noted that a section of this stream is partially culverted through Ard na Locha and is referenced as a sewer on Figure 2.6

The retaining systems constructed in this area include the following construction methodologies:

- In areas of shallow rock:

The overburden will be removed followed by rock excavation which will be progressed in levels in a cyclic manner including drilling, blasting, rock mapping by a geotechnical expert and mucking out. A composite rock stability support system in the form of rock bolts, rock dowels, steel mesh and sprayed concrete will be implemented where required for stability on the rock face prior to excavation to the next excavation level based on the rock mapping results. A watertight reinforced concrete retaining structure will be constructed within the rock excavation cutting, generally at the base of the excavation (where the excavation is below +17.7mOD).

Prior to undertaking this excavation, a detailed ground investigation, including down the hole geophysical survey to determine the rock mass geometry will be completed to inform the detailed design and ensure that this method is feasible. In the event that this method is not feasible a piled solution from surface level will be implemented, which is described below.

A trial blast, as per the Schedule of Commitments and will be carried out as part of a blast assessment. The monitored trial blast will be undertaken in the same bedrock formation by the blasting contractor in a controlled location, not exceeding the vibration limitations of the local sensitive receptors, posing no risk to sensitive receptors including Annex I habitat in Lough Corrib SAC. The trial blast will calibrate the blast design to a site specific design.

- In areas of deep rock (overburden only) or a combination of overburden and rock:

Piled retaining walls, with ground anchors will be implemented in these areas. The piled wall will be either a contiguous or secant piled wall. Both of these wall types are installed using the same rig and construction methods. A contiguous piled wall is not watertight as it is a linear series of individual piles whilst a secant piled wall can be designed to be watertight as it is a linear series of interconnected/overlapping piles. A watertight system is only required below +17.7mOD, therefore contiguous piled walls will be implemented with a watertight structure constructed within the excavation.

The piles will be installed from the existing ground level prior to excavation works or from a reduced excavation level where potential impacts to the Annex I habitat in Lough Corrib SAC can be avoided. The piling rig will be set up outside of the footprint of the Annex I habitat. Once the piles have been installed, the excavation of the overburden and bedrock will be completed. The bedrock will be broken using a hydraulic hammer or by blasting with the piled wall acting as an additional buffer to the rock blast.

A watertight reinforced concrete retaining structure will be constructed within the excavation footprint where required.

Prior to undertaking the piling works, a detailed ground investigation, will be completed to inform the detailed design and ensure it is site specific.

The methodologies are bespoke to this location and, when implemented, will ensure that they will be constructed without encroaching on Annex I habitat within Lough Corrib SAC. Each of these options has been considered and assessed throughout the assessment in Sections 6 through 9 of this updated NIS.

Earthworks and pavement works

For Phase 2, topsoil and subsoil will be excavated and replaced with road construction. Stripped topsoil and subsoil will be stored within the site boundary and reused within the construction of the Project where feasible subject to testing to ensure it is suitable for its proposed end use. Where off-site storage is required for any period the contractor will ensure that these storage facilities have the appropriate waste licences or waste facility permits in place. All earthworks shall be managed having regard to the TII Guidelines for the Management of Waste from National Road Construction Projects.

Materials will be transported to and from the site using the existing road network. Excavation and filling will be carried out using mechanical plant.

Road embankments will be constructed using excavated material or, where necessary, imported fill material and will generally be compacted using static and vibrating rollers or similar equipment.

The majority of the embankments will be constructed from self-supporting fill material. In some instances, steepened earthworks which shall have a vegetated finish or reinforced soil or reinforced concrete retaining walls have been used in areas where the need for soil retention in a tighter space is required.

Bituminous paving will be undertaken throughout the extent of the proposed N6 GCRR. The thickness of the road pavement will be determined at detailed design stage but on this type of road, a new blacktop thickness of 350mm could be anticipated.

All new blacktop material will be transported to site in trucks designed for the transportation of materials at high temperatures. The material shall be transferred directly to paving machines, which spreads the blacktop onto the road in layers. The spread material is then compacted using rollers.

Menlough Viaduct

There are three alternative construction methods possible for constructing Menlough Viaduct to reduce the potential direct and indirect impacts to the Annex I habitat. The Menlough Viaduct is located outside but adjacent to the Lough Corrib SAC and this area of Annex I habitat does not provide a supporting role to, nor form part of the QI for, this SAC.

Construction Method 1 includes the construction of a protection system over the Limestone pavement and uses this as a construction platform and Construction Method 2 utilises the balanced cantilever system in conjunction with a protection system over the Limestone pavement. Construction Method 3 is a prestressed precast beam superstructure construction method. This method is similar to Method 1 and also includes a protection system over the Limestone pavement which will be provided. No construction works will take place directly within the extents of the Turlough for any of the three methods.

The stages of the construction under the proposed methodologies are as follows:

- Stage 1 - Site access and enabling works
- Stage 2 - Construction of the Limestone pavement protection system
- Stage 3 - Viaduct construction

All three construction methodologies are described in full in Appendix E and there is some scope to integrate the Method 1 and 2 to incorporate aspects of the cantilever method and to add false work if required.

Each of these three options has been considered and assessed throughout the assessment in Sections 6 through 9 of this updated NIS.

A specialised sealed drainage system will capture the runoff on the bridge deck, transport it beneath the structure in a network of sealed carrier drains, before discharging to a wetland and infiltration basin at a suitable location located east of the viaduct.

Lackagh Tunnel

Excess excavated material can be hauled back to Lackagh Quarry site compound (SC 11/01) for temporary stockpiling after crushing and re-grading and used elsewhere on the Project.

The construction activities for Lackagh Tunnel are split into three sections:

Section 1:	Stabilisation of the Lackagh Quarry face
Section 2:	Construction of the eastern entry portal
	Construction of tunnel (from east to west) – Mined (drill and blast)
	Stabilisation of the connection to Section 3 (Western Approach)
Section 3:	Installation of retaining wall structures where required
	Excavation of overburden
	Installation of retaining wall temporary/permanent support
	Construction of western approach road

The following construction sequence is envisaged. It is possible for Section 3 to be constructed in parallel with the construction of Sections 1 and 2.

Stage 1:
- Site enabling and preparation works

Stage 2:
- Stabilisation of the Lackagh Quarry western face (Section 1)
- Construction of the tunnel entry portal (Sections 1 and 2)
- Installation of a retaining wall from existing ground level in Section 3

Stage 3:
- Construction of the proposed tunnel (Section 2)
- Ongoing installation of retaining wall from existing ground level in Section 3 and commencement of the excavation works (Section 3)

Stage 4:
- Excavation ongoing for Section 3
- Stabilisation of the rock along the Section 2/Section 3 boundary (if/where required)
- Completion of the proposed tunnel (Section 2)
- Construction of the proposed road (Section 3)

A detailed report of the constructability of Lackagh Tunnel and the Western Approach and its potential direct and indirect impacts is included in Appendix F. This report has been updated to capture the detailed discussed at the oral hearing in 2020.

The pre-earthworks drainage (PED) at the western tunnel portal at Lackagh Tunnel can be constructed outside Annex I habitat in Lough Corrib SAC. The PED can be constructed from within the proposed N6 GCRR corridor prior to the earthworks construction. To minimise the footprint of the proposed N6 GCRR within the Lough Corrib SAC the PED side slopes, a short length (c.20m at Ch. 10+920 to Ch. 10+940) of PED ditch will be piped to carry flows from the adjacent catchments. This construction will be undertaken using an excavator.

2.4.7.3 Phase 3

The permanent stableyard including horsebox parking will be constructed in Phase 3, to the north of the temporary stables. This will be completed after completion of Phase 2. The works involved in constructing the permanent stables will be similar to those involved in constructing the temporary stables in Phase 1.

As the permanent stables will be constructed on the levelled site presented at the completion of Phase 2 to the north of the covered tunnel, there will be minimal earthworks to be excavated before construction. Again, any excavated material will be transported directly off-site using predetermined haul routes.

Two lane tarmac roads are proposed as part of Phase 3 of the Project to provide access for horse boxes and other vehicles to the stables. These roads will be constructed using tarmacadam surfacing. Phases 1, 3 and 4 will also contain horsebox parking facilities which will also be paved with tarmacadam surfaces. The circulatory areas in the permanent stableyard will be surfaced with a rubberised flooring.

2.4.7.4 Phase 4

Phase 4 involves the demolition of the temporary stables, and retention of the pavilion, machinery and maintenance sheds, pre-parade ring, and ESB sub-station. The area previously used for the temporary stables will then be reutilised as car parking. The main activities will involve the following:

- Demolition of concrete structures and other buildings
- Clearing demolished materials from site

- Providing suitable surface for car parking

There is potential for some earthworks to be excavated during Phase 4 when the site previously holding the temporary stables will be reformatted to facilitate parking. Any earthworks quantities generated from this phase will be minimal and will be transported directly off-site.

2.4.7.5 Phase 5

Phase 5 is the operational phase of the Project, it does not involve any construction activities.

2.4.8 Material Sources and Transportation

2.4.8.1 Overview

The earthworks operations will be a major activity on site and will include excavation, stockpiling, processing, deposition, blasting, material reuse, import and transportation from site for recovery/disposal. The construction of the Project will require considerable movements of materials to, from and around the site. Most of the materials leaving the site will consist of spoil from the excavation works. Stockpiling of surplus materials will not be permitted on lands within any European site to avoid any potential impacts as a result of stockpiling.

The current design of Phase 2 of the Project, i.e. the proposed N6 GCRR including the modifications detailed in Section 2.2.1 of this updated NIS, has an overall surplus of excavation material west of the River Corrib and an overall deficit of fill material east of the River Corrib. All excavated material deemed to meet the required standards will be reused as part of the fill sections subject to testing to ensure it is suitable for its proposed end use.

If the proposed N6 GCRR is to be constructed in stages as per Section 2.4.2 above, then there will an overall surplus of 597,000m^3 in Stage A and overall deficit of 258,000 m^3 in Stage B. Therefore, there will be a requirement to store excavated acceptable material from Stage A to balance the deficit in Stage B. This material will be stored within the Assessment Boundary and outside of any European site.

All wastes which are not suitable for reuse within the Project will be delivered to authorised waste facilities in accordance with the Waste Management Acts 1996-2022. By only using facilities with the appropriate waste permits/licence/certificates, Galway County Council/TII will ensure that the Contractor will comply with the objectives of the Waste Management Act and that any environmental emissions (noise, dust, water) are managed at the destination site and therefore are legally the responsibility of the owner/operator of the destination site. Galway County Council can thereby be satisfied that the off-site spoil management aspect of the development is legally compliant with environmental and waste management legislation.

All traffic movements associated with the transportation of materials have been included in the assessment and take account of the design modifications detailed in Chapter 5 of this updated EIAR.

Materials required for the construction works will be sourced locally where possible.

A Construction and Demolition Waste Management Plan is included in the CEMP in Appendix C. This plan has been prepared as part of the CEMP to ensure that waste arising during the construction and demolition works for the Project on site will be managed and disposed of in a way that ensures compliance with the provisions of the Waste Management (Amendment) Act, 1996-2024 and associated Regulations (1996-2024) to ensure that optimum levels of reduction, re-use and recycling are achieved and to ensure that waste management does not impact on any European sites. The contractor will be obliged to implement the Construction and Demolition Waste Management Plan.

The western section of the Project is in a granite area as far as the N59 Moycullen Road and a limestone area east of here. The overburden across the study area consists of glacial till derived from the underlying bedrock which have different chemical compositions. If limestone derived material is placed over granite bedrock, surface water run-off or groundwater movements through the material have the potential to impact local areas of peatland habitats by changing the pH of the groundwater. Therefore, the following fill limitations will be incorporated, to prevent impact due to the placement of non-native construction materials:

- The use of fill material is limited where sites have a pathway to a European site

- Only pavement and capping layers protected from surface water runoff and groundwater movements are permitted to be derived from non-native material at sensitive locations

All other acceptable fill material will be derived from native material or other pH compatible material.

Rock crushing may be undertaken on site in order to make the excavated rock suitable for reuse as general fill. Otherwise it will be necessary to import crushed stone to site. Materials required from quarries will only be sourced from quarries which are listed on the register maintained by the local authority. There are operational quarries located in close proximity to the Project. There is potential to import bituminous material for paving from one of these quarries. Haul routes have been identified to these quarries and any potential impacts associated with these haul routes have been assessed in this updated NIS.

2.4.8.2 Potential Haul Routes

Potential haul routes have been identified across the Project with aim of minimising interaction with the general public and creating as little disruption to the receiving environment as possible. Where possible haul routes will remain within the Assessment Boundary with local road crossing points. However, there will be unavoidable periods where haul routes will require the use of public roads.

A number of the potential haul routes will cross a European site both on existing roads and within construction footprint of the proposed N6 GCRR for the Project. The Galway Bay Complex SAC will be crossed by two proposed haul routes along the existing R336 between Bearna and Knocknacarra. The Lough Corrib SAC will crossed by two proposed haul routes on the existing N6 Quincentenary Bridge and on the existing Coolough Road. The Lough Corrib SAC will also be crossed by haul routes within the Assessment Boundary on the proposed River Corrib Bridge and at the proposed Lackagh Tunnel. Refer Figures 3.1 to 3.2 for haul route locations.

2.4.9 Construction Site Decommissioning

On completion of construction, all construction facilities and equipment such as plant, materials, signage, contractors' offices, site compounds and laydown areas, etc. will be removed from site. All ground will be reinstated to an appropriate standard.

2.5 Design measures

Phase 2 of the Project, the proposed N6 GCRR, which traverses a European site has been designed in accordance with TII Publications. This summary of the key design measures of relevance to avoiding or reducing impacts to European sites are unchanged from the 2018 NIS and are as follows:

2.5.1 Drainage

To maintain the existing hydrological regime and reduce the risk of impacts to water quality in receiving watercourses:

- Flow control measures will be provided at all outfalls and discharge points along the length of the mainline of the proposed N6 GCRR to ensure discharge does not cause any adverse effects on flow rates upstream or downstream of the receiving watercourse or sewer and to allow sufficient time for infiltration to discharge to the ground
- There will be 'no worsening' of flow rates outside of the site boundary up to the 1 in 100 year storm event
- Due to the karstic nature east of the N59 Moycullen Road, a sealed drainage system is provided to protect the underlying sensitive groundwater aquifers
- The drainage design takes into account the distribution of groundwater bodies so that rainfall remains within the groundwater body to which it would naturally recharge
- Pollution control measures will be provided on all networks on the mainline of the proposed N6 GCRR prior to outfalling/discharging to ensure that receiving water bodies are not contaminated by runoff from the proposed N6 GCRR during the operational phase

2.5.2 Lighting

- The road lighting design shall meet the requirements of BS5489-1 (updated in May 2020), IS EN 13201 (unchanged since 2018), the UK DMRB TD 34-07 (unchanged since 2018) and TII addendum (DN-LHT-03038). This will ensure that light pollution is kept to a minimum. Whilst BS5489-1 was updated in May 2020 the design of the proposed N6 GCRR is compliant with the updated standard.
- The proposed road lighting installation has been considered and designed with limiting light trespass as a key priority
- There is no lighting associated with the River Corrib Bridge

2.5.3 Fencing

To avoid any direct impacts on QI Annex I habitat within any European site:

- Within or adjacent to any European site the permanent or temporary fencing will be erected prior to construction of the proposed N6 GCRR and any necessary advanced works including utility diversions, archaeological testing, management of non-native invasive plant species and ground investigations. Fencing will be erected from the proposed road side of the fence. In areas where the Assessment Boundary includes Annex I habitat within Lough Corrib SAC the permanent fencing will be located between the proposed road and the Annex I habitat and will not be located within the habitat areas.

Mammal resistant fencing will also be included, where required, to ensure that species such as Otter do not gain access to the proposed road carriageway. Mammal-resistant fencing will be installed in accordance with the specification outlined in *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes* (National Roads Authority, 2008b) and TIIs mammal resistant fencing specification (currently CC-SCD-00320/00319) and unchanged since 2018.

2.5.4 Location of site compounds and storage areas

- Construction site compounds or site offices will not be located within any European site
- No stockpiles will be located within a European site. Note there are sufficient lands included with the Assessment Boundary[16] for any necessary stockpiles
- No stockpiles will be located within an active floodplain area
- Material handling systems and site stockpiling of materials will be located at least 50m away from Annex I habitat within a European site

2.5.5 Hydrology

To maintain the existing hydrological regime and reduce the risk of impacts to water quality in receiving watercourses:

- The road drainage design provides a wetland system which promotes settlement of suspended particles followed by an attenuation/infiltration basin area upstream of all outfalls to prevent the accumulation of sediment picked up in road runoff. These ponds have been designed to provide primary settlement of sediments and to throttle storm flow runoff to greenfield flood runoff rates. All of these hybrid pond systems will be designed with silt traps and fitted with a hydrocarbon interceptor. Each pond will be fitted with a penstock system for isolation and containment of storm runoff waters in the event of a serious road spillage. The system of ponds will remove the more settleable sediment material with treatment performance of over 60% removal of sediment from the storm water discharge. This minimises the potential for local accumulation of sediment at the outfall locations with finer sediment being capable of wider dispersal in the receiving waters and avoiding any local impact
- There are no direct storm water discharges to the Coolagh Lakes

[16] Refers to lands required for the construction and / or operation of the proposed N6 GCRR plus the extents of the lands included within the planning boundary for the proposed development at Galway Racecourse

- The Project has been designed so as to minimise the loss of flood zone area associated with the River Corrib and Coolagh Lakes. The deck of the proposed River Corrib Bridge is elevated above flood levels and the supporting piers are located outside of the flood risk area. Refer to Section 5.2.2 of Appendix B of the updated NIS for further details

2.5.6 Hydrogeology

To maintain the existing hydrogeological regime and reduce the risk of impacts to groundwater quality in receiving groundwater bodies:

- There will be no groundwater lowering within groundwater bodies that support groundwater dependant terrestrial ecosystems (GWDTEs) within a European site. This is detailed in Section 5.3 of this updated NIS
- All infiltration basins include pre-treatment by a hydrocarbon interceptor and a wetland. All infiltration basins include a containment area to provide an appropriate holding time to contain accidental spillages
- All infiltration basins will be over excavated by 2m to accommodate the provision of a minimum of 2m thickness of appropriate subsoil (as per TII definition in HD45/15). In combination with the wetlands the design of the infiltration basins, provides an appropriate level of protection to prevent contamination of groundwater from the infiltration basins
- Where required, dewatering will be discharged to ground within the same groundwater body so as to maintain the existing hydrogeological regime
- The design of the proposed N6 GCRR does not allow dewatering of the bedrock aquifer to be undertaken in sensitive locations, namely Lackagh Tunnel and its western approach and the Menlough Viaduct, where there is risk of affecting the extent of groundwater bodies linked to a European site and affecting the position of groundwater divides

2.5.7 Lackagh Tunnel

To avoid construction of the Lackagh Tunnel affecting QI Annex I habitats above in Lough Corrib SAC or affecting the existing hydrogeological regime supporting wetland habitats in Lough Corrib SAC:

- The Lackagh Tunnel is a mined (drill and blast) twin bored tunnel within rock located beneath the Lough Corrib SAC
- The tunnel alignment and separation includes the following:
  - Each bore maintains at least 8.0m clear rock above the crown of the tunnel to the top of the Lough Corrib SAC ground surface
  - A 7m wide pillar separating the twin bores
- Stabilisation of the western quarry face will be completed in advance of tunnelling works including a composite support system of rock bolts, rock dowels, steel mesh and sprayed concrete
- Blast design and limitations are set out and include:
  - A conservative design approach vibration assessment determined that a maximum vibration limit of 25mm/sec at the ground level will pose no risk to habitats within Lough Corrib SAC. A target construction blast vibration limit of 20mm/sec shall be implemented ensuring the maximum vibration limit is not exceeded and that blasting will pose no risk to habitats within Lough Corrib SAC. A monitored trial blast shall be undertaken in the same bedrock formation by the blasting contractor in a controlled location that will pose no risk to sensitive receptors, including habitats within Lough Corrib SAC. The trial blast will not exceed the vibration limitations of the local sensitive receptors and therefore pose no impact. The information obtained from the trial blast will calibrate and refine the blast design to a site specific design
- The infiltration basin in Lackagh Quarry has been designed to retain the natural recharge pattern by maintaining recharge to the groundwater body below

- In order to maintain recharge catchments, any inflows into the tunnel during construction will be managed by designing them to infiltrate to the floor of the tunnel until their inflow is sealed off
- All construction works will remain above the groundwater table for the duration of the works to ensure the groundwater table is not intercepted and dewatering of the bedrock aquifer is not required. The construction schedule will be tailored so that the excavation of the lower section will occur only during the groundwater low when the water table is below the construction level
- The tunnel will be fully lined with concrete
- On the western approach to Lackagh Tunnel a watertight seal will be installed on the underside of the road base and the cutting sides to protect against groundwater inflow and prevent contamination of groundwater
- Retaining systems are included at pinch point locations to prevent encroachment on Annex I habitats
- The retaining walls on the western approach will be watertight to a level of +17.7mOD to seal out any groundwater in the subsoil or bedrock and will prevent contamination of groundwater

2.5.8 River Corrib Bridge

- The River Corrib Bridge is a clear span across the river with no instream piers
- The bridge design consists of an elevated deck across the floodplain with a minimum clearance of 8.0m over the river
- The River Corrib Bridge will be constructed using a combination of two different construction methods as outlined in Appendix D

2.5.9 Retaining walls adjacent to Lough Corrib SAC

To avoid any direct impacts on QI Annex I habitat within Lough Corrib SAC:

- The construction of the retaining wall will be undertaken within the Assessment Boundary and outside the areas of Annex I habitat and constructed as outlined in Section 2.4 above

2.6 Maintenance during Operational Phase

Phases 1, 3 and 4 of the Project will be maintained by the Galway Race Committee Trust (GRCT). Phase 2 of the Project will form part of the TII maintenance contracts and all elements including the drainage will be maintained on a regular basis to ensure all elements function as per their design and achieve the required standards.

3. Consultations

3.1 National Parks and Wildlife Service (NPWS)

A summary of the formal observations, written consultations and meetings with the National Parks and Wildlife Service (NPWS) section of the Department of Housing, Local Government and Heritage (formerly Department of Culture, Heritage and the Gaeltacht; and previous to that Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs), the points discussed, and decisions agreed is provided below.

A meeting was held with NPWS on 3 March 2023 in relation to the 2018 bat survey baseline and proposed scope of surveys for the 2023 survey season and any requirements for the Bat Derogation Licence Application.

The NPWS noted the substantial bat surveys undertaken previously by the project team which provided excellent baseline data for the Project, and the purpose of the meeting was to determine how to bring this data up to date, including the scope of potential additional bat surveys.

As a licence is required from the NPWS to undertake the radiotracking surveys and given the extensive bat surveys previously undertaken and the risk of mortality to the Lesser horseshoe bat when captured and tagged for radiotracking purposes it was agreed not to repeat these surveys at this time. Instead, Lesser horseshoe bats were to be ringed and the known bat roots visited to determine if the same pattern of bat movements exist as previously surveyed, i.e. the Menlo Castle bats roost and forage primarily in the surrounding area and that there is no linkage to Ebor Hall bat roost. These surveys were also complimented with walked transects and extensive static detector surveys. It was agreed that a review of the landscape would also be undertaken to determine if there have been any changes since the previous surveys which could alter the movement, foraging behaviour or roosting patterns of bats within the study area. A review of the results of the surveys confirmed the pattern of bat movements were unchanged and there was no need for radiotracking to be undertaken.

A further meeting was held with the NPWS on 5 March 2024 to discuss the findings of the bat surveys and discuss the draft of the Bat Derogation Licence Application. The NPWS had no further comment on the bat surveys and confirmed the timeline for the application process for the Bat Derogation Licence. A licence was approved by the NPWS on 10 April 2024 (see Appendix A.8.25 Part 1 of the updated EIAR), however this licence expired on 31 December 2024 and a new bat derogation licence application was submitted to the NPWS on 1 April 2025 (included in Appendix A.8.25 Part 2 of the updated EIAR). Derogation licences granted by the NPWS are published, along with the application and any supporting documentation, on their website at https://www.npws.ie/licensesandconsents/disturbance/application-for-derogation/bat-derogations-issued. **Please note, ABP will be able to see when the Bat Derogation Licence is granted, and obtain a copy of the final granted licence, by clicking on this link**.

The 2023 survey evidence supports the conclusion that the local Lesser horseshoe bat population does not form part of, or support, the QI population of Lough Corrib SAC or Ross Lake and Woods SAC. The local bat populations are therefore not linked to the QIs of the European sites and do not form part of this updated NIS.

The NPWS made two written submissions at the Oral Hearing in 2020: one on the 21 February 2020 and a second on the 11 March 2020[17].

In the first, the NPWS requested clarifications in relation to:

- The groundwater regime operating in the vicinity of Lackagh Quarry and its relationship to groundwater dependant qualifying interest habitats associated with the Coolagh Lakes in Lough Corrib SAC
- Dewatering in the vicinity of Moycullen Bogs NHA and associated risks to the ecology of the bog

[17] Appendix 1 of Dr Arnold's Report https://www.pleanala.ie/publicaccess/302848%20-%20Inspector's%20%20Report/Appendix%204%20ECIA.pdf?r=771146323265

- The Marsh fritillary butterfly mitigation measures
- The provision of compensatory Annex I habitats

In the second, the NPWS responded to questions raised by Dr Arnold, on behalf of An Bord Pleanála, in relation to losses of Limestone pavement habitat outside of Lough Corrib SAC, the Lough Corrib SAC boundary in the vicinity of Menlo Castle, the definition of Limestone pavement habitat, and specific relevé results/photographs.

The second NPWS submission also included the minutes of two meetings held with the NPWS during the Oral Hearing (on the 21 February 2020 and on the 9 March 2020) where the following matters were discussed:

- Hydrogeological matters in relation to Lough Corrib SAC
- Hydrogeological matters in relation to Moycullen Bogs NHA
- Compensatory habitat provision regarding Calcareous grassland and Dry heath
- Barn owl and Peregrine falcon mitigation measures
- Marsh fritillary mitigation measures

On 24 January 2020, the NPWS submitted an observation with respect to the proposed N6 GCRR, the subject of the Section 51 Application. In their observation, reference was made to the 2018 EIAR, 2018 NIS and the 2019 Request for Further Information Response. A meeting was held with NPWS on the 27 February 2020 regarding the 2018 submission, birds, eco-hydrogeology and EIAR items. A summary is provided below.

The following observations were made by the NPWS in relation to the 2018 NIS:

1. European sites and QI Annex I habitats:
    a. Noted updates to the boundary of Lough Corrib SAC which are represented in this updated NIS.
    b. Noted the additional information regarding the habitat surveys and mapping, including Annex I habitats and QI habitats within the Lough Corrib SAC in close proximity to the proposed fenceline for the proposed N6 GCRR, represented as updated habitat plans and habitat changes plans in this updated NIS.
    c. Noted the additional vegetation sampling (relevé data), provided in the 2019 RFI Response, which informed the habitat mapping, including a small area of Limestone pavement [*8240] near Menlo (Section 4.1 of the 2019 RFI Response incorporated in the updated NIS).
2. Groundwater Dependent Terrestrial Ecosystems and hydrogeology:
    a. Sought clarity on groundwater levels and groundwater head contours, on what ‘seasonal groundwater levels’ the GWDTEs rely upon, and what groundwater levels need to be maintained to avoid negatively impacting on the GWDTE in the Lough Corrib SAC. Furthermore, the delineated groundwater catchment divides and GWDTEs should be clearly mapped. This matter is addressed in the Section 4.12 of the 2019 RFI Response Report and incorporated into Section 5.3 and Section 9.1.4.3 of this updated NIS.
3. Birds:
    a. Raised the issues in relation to the potential for the proposed River Corrib Bridge to pose a collision risk to birds in its previous submission as addressed in the 2019 RFI Response Report, Section 4.15.
    b. Observed that, while no nocturnal surveys were completed, taking into account the fact that the bridge will not be lit and all available data from the recent and previous surveys, and published literature, the NPWS is of the view that the proposed bridge is unlikely to present a threat to SCIs bird species of the adjacent SPAs. This updated NIS has not deviated in these finding, supported further by more recent scientific literature.

c. Noted that issues raised in relation to habitat loss and fragmentation and the potential for this to impact SCI bird species for surrounding SPAs is addressed in Section 5.1 of the 2019 RFI Response Report.

As evident throughout this updated NIS, these observations and comments have been taken on board and implemented throughout the examination and analysis of this updated NIS.

Prior to the submission of the 2018 NIS to An Bord Pleanála in October 2018 as part of the Section 51 Application, six meetings were held by the project team with the National Parks and Wildlife Service (NPWS) section of the Department of Culture, Heritage and the Gaeltacht (formerly the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, and previous to that, the Department of Arts, Heritage and the Gaeltacht): on 2 July 2014, 26 March 2015, 24 February 2016, 29 March 2017, 18 April 2017 and 3 August 2017. A formal consultation response related to the informal EIS Scoping Report was received from the Department of Arts, Heritage and the Gaeltacht on the 10 August 2016 and two documents related to the draft EIA Report and NIS on the 16 and 18 January 2018 (Ref. G Pre00241/2016). Additional correspondence was received by ABP on the 24 January 2020 from the Department in relation to the Section 51 Application submitted to ABP in 2018.

In terms of the consultation document dated the 24 January 2020 (which incorporated responses on additional information submitted in August 2019), the following items were raised and addressed within this updated NIS:

- The Department queried the extent and nature of habitat impacts and/or changes in the Lough Corrib SAC and noted that an access route had been altered to avoid a section of Annex I Limestone pavement [*8240], thus avoiding impacts to Lough Corrib SAC. The Department queried the alteration to the boundary of Lough Corrib SAC and minor NPWS mapping errors related to the Project; this has since been revised and published by NPWS.

- Comments were raised on hydrogeological regime related to the Lackagh Tunnel on the groundwater catchment area. It is unclear what the hydrological connectivity between the groundwater dependent terrestrial ecosystems (GWDTEs), particularly the fen habitats within the Lough Corrib SAC, are. The question of whether groundwater drainage associated with tunnelling construction work, during and post development, and the inclusion of 'water-tight' barriers will not have an effect in Lough Corrib Fen 1, may need interrogation. This has been interrogated and results captured in the updated NIS.

- Acknowledge the clarification of the query raised regarding the assessment of the specific Designated Sites' conservation objectives within the updated NIS.

- Acknowledge the additional information provided regarding the risk of bird collision with the bridge, including the fact that no nocturnal surveys were completed, and considers that impact assessment to potential SCIs from neighbouring SPAs is sufficient is given that the bridge will not be lit, data from surveys conducted to date and available literature.

- Acknowledge the additional information in terms of the assessment of SCIs from neighbouring SPAs to be impacted by habitat loss and fragmentation.

Pre-application consultation and discussions with the NPWS were broad ranging covering general requirements and processes relating to scoping and preparation of the EIAR and NIS, the ecological baseline surveys and findings, valuing ecological receptors, mitigation, impact assessment, conservation objectives, derogation licences, supporting land use plans and transportation strategies and the Lough Corrib SAC boundary and QIs. The NPWS made the following comments/observations relevant to the preparation of the 2018 NIS and the appropriate assessment process, and also provided notes on a copy of the 2018 NIS:

- The NIS must include a full description of the Project

- The relevant land use plans must be assessed for the potential in combination effects

- The ecological surveys should be scoped and designed to answer the questions posed by the Habitats Directive, and related case law, noting the tests and standards that apply

- The 2018 NIS assessment should focus on the QIs and SCIs of European sites (and supporting habitats) and the full scope of the conservation objectives; including, where available, site specific conservation objectives (site specific conservation objectives are not yet available for Lough Corrib SPA) (guidance was provided by NPWS on European site boundaries, SSCOs, QIs and management plans as early as September 2014)
- Where site specific conservation objectives are not available, the current conservation objectives which are generic, as well as the attributes and targets from the conservation objectives from other sites should be used as a guide - using "restore" rather than "maintain" as a conservation aim as a precautionary approach
- Mitigation measures and strategies need to be fully developed and sufficiently detailed to meet the current legal requirements and standards
- The importance and scope of the plans and projects that are considered in the combination assessment
- The NPWS confirmed (at the meeting on 26 March 2015) the addition of the Annex I habitat Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* [3130] to the list of QIs of Lough Corrib SAC. There are no proposals to add any additional QIs to this SAC
- The NPWS are in the process of updating the digital mapping datasets into the ITM projection on modern OSI mapping. For European sites where this has not yet been completed, presenting the boundary of European sites on mapping included in the 2018 NIS should be based upon an interpretation of its location relative to its intended location on the official 6" mapping (relative to the topographical features it follows on that mapping dataset)
- The appeals process to formally finalise designated status and the boundary of Lough Corrib SAC is ongoing and the NPWS are not aware of any plans to modify or extend the boundary of Lough Corrib SAC in the vicinity of the proposed road development
- Confirmed that the QI population for the Lesser horseshoe bat in Lough Corrib SAC was the maternity roost at Eborhall House (roost 217 in the NPWS database), on the northern shore of Lough Corrib, near Cong, Co. Mayo
- The requirements and procedures to be followed if compensatory measures are required as part of any planning application under the provision of Article 6(4) of the Habitats Directive
- If monitoring/supervision of mitigation measures is required it must be included in the 2018 NIS

As evident throughout the updated NIS, these recommendations have been taken on board and implemented throughout the examination and analysis of this updated NIS.

3.2 Inland Fisheries Ireland (IFI)

Following the detailed consultations with IFI to discuss value of watercourse to inform the 2018 EIAR and 2018 NIS, as detailed below, no further consultation for this updated NIS was necessary with IFI as the proposed River Corrib bridge design and associated surrounding works had not changed since 2018 to an extent that would alter the potential impacts to the River Corrib. The specialist aquatic ecologists did contact the IFI to inform the department of their intentions to electro-fish sites on watercourses in the vicinity of the Project in August and September 2023 following notification to Inland Fisheries Ireland, under the conditions of a Department of the Environment, Climate and Communications (DECC) licence. The survey was undertaken in accordance with best practice (CEN, 2003; CFB, 2008) and Section 14 licencing requirements.

As per the 2018 NIS, two meetings were held with IFI to discuss the value of watercourses crossed by the Project for fish species: the first on 14 August 2014 as part of the route selection studies for the proposed N6 GCRR, and the second on 15 September 2016 to discuss the design of the proposed N6 GCRR.

During these meetings, and in correspondence related to same, IFI made the following observations in relation to the value of the River Corrib catchment for fish and the QIs Atlantic salmon, Sea lamprey and Brook lamprey:

- The River Corrib is a nationally important river system for Atlantic salmon
- IFI have observed Sea lamprey scaling the Salmon Weir and spawning in the upper catchment at Cong – this contradicts some published sources which stated that the species was thought to be restricted below the Salmon Weir in Galway City
- IFI had no records of spawning grounds at the proposed watercourse crossing points along the Project

3.3 Other Stakeholders

Following the submission of the Section 51 application to An Bord Pleanála, observations were made and queries raised by various stakeholders, including An Bord Pleanála, Prescribed Bodies (An Taisce, Department of Communications, Climate Action & Environment, Irish Water, National Transport Authority, Transport Infrastructure Ireland, Údarás na Gaeltachta) and general observers. The key issues relevant to this updated NIS have been summarised below:

- Queries were made regarding qualifying interests (Petrifying springs of the tufa formation (Cratoneurion) and Lesser horseshoe bat) which appear to have been omitted from further consideration. Surveys completed to date indicate that [7220*] Petrifying springs with tufa formation (Cratoneurion) do not occur within the Lough Corrib SAC boundary in the ZoI. There is also no scientific evidence collected to date to indicate a link between the Lesser horseshoe bats within the project area and the QI populations of the Lough Corrib SAC or the Ross Lake and Woods SAC. Therefore, there can be no impact to either QIs and therefore the Project will not adversely affect the integrity of Lough Corrib SAC in terms of these QIs.
- Request was made to consider the longer term potential in combination effects, resulting from disturbance and displacement, which may arise due to the commitments to having a greenway along the western bank of the River Corrib and the current application for the proposed Galway Harbour Extension, addressed in Section 12 as part of this NIS's in combination assessment.
- Consider that there could be potential tensions between mitigation measures set out in the NIS and EIAR, specifically to timing of construction activities at Lackagh Quarry in terms of minimise disturbance to wintering birds and Peregrine falcons. Blasting associated with the eastern approach to Lackagh Quarry and the cutting at Castlegar for the proposed N6 GCRR will be carried out between the months of April to September (inclusive) to minimise the exposure to wintering birds at sites within the blasting ZoI. The measures to protect the Peregrine falcons are aimed commencing activities (construction and not necessarily blasting) before nesting commences.
- Various comments were raised around the mitigation measures and monitoring, keeping records of monitoring and of adaptive actions, monitoring and recording of performance and compliance, supervision and sign-off by competent ecologists, and access to such information. The NIS captures items as may be relevant to safeguarding the European sites and there QIs and SCIs.
- General concerns were raised around construction items relevant to the Lough Corrib SAC and Annex I habitats and included risk from tunnelling, blasting and rockfall at Lackagh Quarry on Lough Corrib SAC and the construction of a road within the Lough Corrib SAC, identified and assessed in the NIS.
- A concern was raised regarding the impact on Ballindooley Lough, which is acknowledged as important for biodiversity and its ecological importance as a wintering bird site. Blasting associated with the eastern approach to Lackagh Quarry and the cutting at Castlegar-will be carried out between the months of April to September (inclusive) to minimise the exposure to wintering birds at sites within the blasting ZoI.

The queries and comments raised throughout the post-application public consultation process, including those made by An Bord Pleanála, were considered and responded to at that time, and all relevant content from those responses has been incorporated into the updated NIS.

4. Methodology

4.1 Guidance

This report has been prepared with regard to the following guidance documents on Appropriate Assessment, where relevant, reflecting the most recent documents and/or guidelines:

European Commission Guidance

- Assessment of Plans and Projects in Relation to Natura 2000 sites: Methodological Guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission, 2021)
- Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (European Commission, 2019)
- Communication from the Commission on the precautionary principle. European Commission (European Commission, 2000)

Irish Guidance

- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (Department of Environment, Heritage and Local Government, 2010 revision)
- Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPWS 1/10 & PSSP 2/10 (NPWS, 2010a)
- OPR Practice Note PN01. Appropriate Assessment Screening for Development Management (Office of the Planning Regulator, 2021)

Other general guidance on ecological impact assessment which has informed the assessment in this report, includes:

- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018)
- Environmental Guidelines Series for Planning and Construction of National Roads (National Roads Authority, 2005-2009)
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (National Road Authority, 2008a)
- Guidelines for Assessment of Ecological Impacts of National Roads Schemes (National Road Authority, 2009)
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission, 2013)
- Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017)

4.2 Desk Study

The desktop data sources, reflecting the most recent available sources, used in the compilation of this updated NIS are listed below:

- The results of ecological surveys undertaken as part of the route selection studies for the proposed N6 Galway City Ring Road (*N6 Galway City Transport Project: Route Selection Report* (Arup, 2016)[18] and the surveys undertaken to inform the 2018 NIS (see Section 4.4 and Section 9 below for details)
- The results of bird surveys carried out for the 2006 N6 Galway City Outer Bypass EIS (RPS, 2006) (Appendix G)

[18] The Route Selection Report is available from http://www.n6galwaycity.ie

- Ordnance Survey of Ireland mapping and aerial photography available from www.osi.ie
- Online data available on European sites, including habitat and species GIS datasets, and conservation objectives (and supporting) documents, as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie
- Online protected species datasets held by the National Biodiversity Data Centre from http://maps.biodiversityireland.ie
- Environmental information/data for the area available from www.epa.ie (Envision Online Environmental Map Viewer - http://gis.epa.ie)
- Information on the status of EU protected habitats and species in Ireland (NPWS, 2019a, 2019b and 2019c)
- Water Framework Directive Fish Stock Survey of Lough Corrib, June 2014 (Kelly *et al.* 2014)
- Corrib Estuary: Sampling Fish for the Water Framework Directive – Transitional Waters 2008 (The Central and regional Fisheries Board, 2009)
- Guidelines for the Assessment of Annex I Priority Petrifying Springs in Ireland. Irish Wildlife Manuals, No. 142. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland (Denyer, Eakin, & Gill 2023)
- The monitoring and assessment of four EU Habitats Directive Annex I woodland habitats. Irish Wildlife Manuals, No. 146. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland (Daly *et al.*, 2023)

4.3 Assessment Methodology

The Project (including the proposed design and any modifications made since 2018, construction methodologies and operational effects) was analysed and assessed to identify the potential impacts associated with the Project that could affect the ecological environment. From this, the Zone of Influence (ZoI) of the Project was defined. Based on the identified impacts, and their ZoI, the European sites potentially at risk of any direct or indirect impacts were identified. This assessment was undertaken in consideration of all potential impact sources and pathways connecting the Project to European sites, in view of the conservation objectives supporting the conservation condition of the sites' QIs/SCIs.

The conservation objectives relating to each European site and its QIs/SCIs are expressed generally for SACs as *"to maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected", and for SPAs "to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA".*

Following on from this, and as defined in the Habitats Directive, favourable conservation status (or condition, at a site level) of a habitat is achieved when:

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

The favourable conservation status (or condition, at a site level) of a species is achieved when:

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

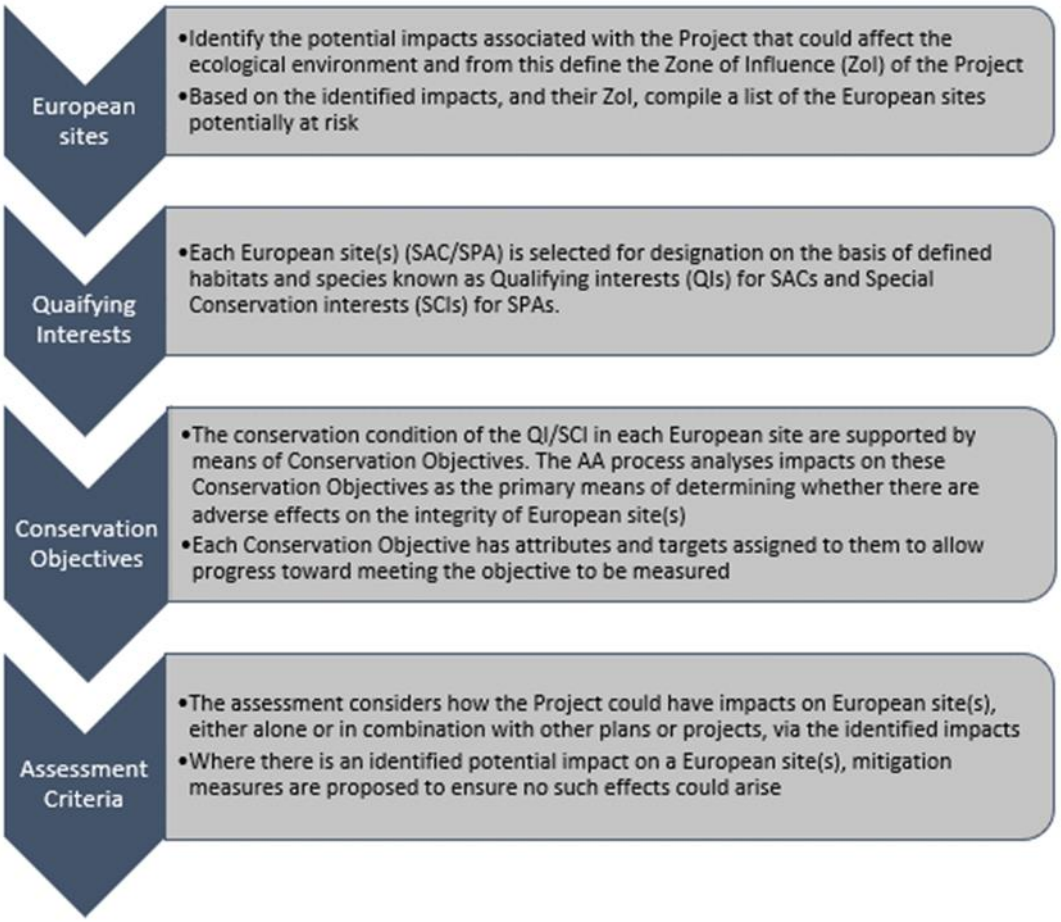
The site-specific conservation objectives (SSCOs) prepared for a given European site include a series of specific attributes and targets for the relevant QIs/SCIs against which effects on conservation condition, or integrity, can be measured, i.e. an impact which affects the achievement of favourable conservation condition, as measured by the attributes and targets, is an impact on site integrity. Although site-specific conservation objectives have been published for all relevant SACs/SPAs, specific attributes and targets have not been published for recently added QIs/SCIs. Where that is the case, sample site attributes and targets for these newly added QI/SCIs have been compiled, based on those from other relevant European sites/or similar SCIs, as a guide in assessing how conservation condition could potentially be affected by the Project. The relevant SPAs/SACs and QIs/SCIs (and the source for attributes and targets) are as follows:

- Limestone pavements [8240] has been added as a new QI for Galway Bay Complex SAC but has not been incorporated into the SSCO for Galway Bay SAC and no specific attributes and targets are available for the QI. The attributes and targets based on the more recent Conservation Objectives for Limestone pavements [8240] of the nearby East Burren Complex SAC (NPWS, 2022) are utilised. The Conservation Objectives for Limestone pavements [8240] for the East Burren Complex SAC are a more recent publication than those for the Lough Corrib SAC (NPWS, 2017a) and considers positive indicator species rather than typical species for the open and wooded habitat varieties.
- Harbour porpoise *Phocoena phocoena* [1351] has been added as a new QI for Kilkieran Bay and Island SAC and Inishmore Island SAC but has only been incorporated into the relevant SSCO for the latter European site (NPWS, 2024b) and no specific attributes and targets are available for the QI for Kilkieran Bay and Island SAC. The attributes and targets based on the Conservation Objectives for Harbour porpoise *Phocoena phocoena* [1351] are based on a cumulative list from all three European sites in Ireland for which specific attributes and targets have been published, namely Blasket Islands SAC (NPWS, 2014c), Roaringwater Bay and Islands SAC, Rockabill to Dalkey Island SAC (NPWS, 2013d)).
- Black-throated diver *Gavia arctica* [A002] has been added as a new SCI for Inner Galway Bay Complex SPA but has not been incorporated into the SSCO for Galway Bay SPA and no specific attributes and targets are available for the SCI. The SCI is also not listed for any other European site in Ireland and the attributes and targets for its related species (similar habitats, behaviour and foraging habits), Great northern diver *Gavia immer* [A003], also an SCI for Inner Galway Bay SPA have been used (NPWS, 2013b).

Having ascertained during the screening for appropriate assessment that the Project is either likely to have a significant effect on a European site(s), or that any such likelihood is uncertain or cannot be ruled out, this updated NIS has been prepared to inform and assist the competent authority, An Bord Pleanála, in carrying out its Appropriate Assessment as to whether or not the Project will adversely affect the integrity of European sites either alone or in combination with other plans and projects, taking into account the conservation objectives of the European sites.

As the assessment carried out as part of the preparation of this updated NIS found that the Project has the potential to impact on 22 European sites (refer to Section 1.2), avoidance and mitigation measures have been included as part of the Project to ensure that, in view of the European sites' conservation objectives and beyond reasonable scientific doubt, the Project will not adversely affect the integrity of the sites concerned.

This process is summarised in the diagram below.



4.4 Baseline Surveys

The following section describes the various surveys that were carried out to inform this assessment. The ecological surveys to inform the development of the proposed N6 GCCR commenced with advance surveys on the Lough Corrib SAC habitat in 2013, and continued through to 2018 to inform the Section 51 Application submitted in 2018. Further ecological surveys were undertaken in 2019 to inform the RFI Response submitted to ABP in August 2019 and further ecological surveys were undertaken between 2022 and 2024 to inform this updated NIS and the updated EIAR. This has resulted in over 10 years of ecological survey data being collected on behalf of GCC to inform this Project.

The scoping exercise undertaken for the constraints and route selection studies for the proposed N6 GCRR in 2014 identified numerous sensitive ecological receptors (principally habitats, but also flora and fauna species of significance) within the Scheme Study Area (See Plate 4.1) that could potentially be impacted by the proposed N6 GCRR. The term “Scheme Study Area”, when used, refers to the wider study area (see Section 1.1.1 of this updated NIS) at which ecological constraints were initially identified during the constraints and route selection studies for the proposed N6 GCRR (see Plate 4.1 below for the extents of the scheme study area, i.e. the ecological surveys undertaken between 2013 and 2015). This is the study area across which many of the ecological surveys undertaken to inform the proposed N6 GCRR were initially carried out. For some ecological receptors, the surveys extended beyond the area defined by the “Scheme Study Area”, where necessary.

Further extensive surveys were undertaken between 2015 and 2018 to inform the 2018 NIS within the reduced survey area for the corridor along the proposed N6 GCRR which was necessary to inform the preparation of the 2018 EIAR and NIS as per the guidelines referenced in Section 4.1 above and did not cover the full extents of the Scheme Study Area as that full extent was no longer required.

Further surveys were undertaken again in 2019 to inform the 2019 RFI Report and again between 2022 and 2024 to verify the results of the previous surveys and ensure any changes to the biodiversity baseline were captured to inform this updated NIS.

The extent of the ecological surveys over the wider Scheme Study Area and detailed within the corridor for the proposed N6 GCRR and the proposed development at Galway Racecourse, coupled with the duration of the survey period (over 10 years), has enhanced the ecological understanding within the Assessment Boundary, providing a robust scientific foundation.

The results of these surveys are presented in Section 5 and Section 9 of this updated NIS, with further detail provided where necessary in Appendices A and B (Hydrogeology and Hydrology reports), Appendix G (Historical birds survey findings), Appendix H (Current to historical habitat survey data), Appendix I and J (Breeding bird and Wintering bird survey findings), Appendix K (Fish and other aquatic survey results), Appendix L (Eco-hydrogeology summary relating to GWDTEs), Appendix M (Traffic Assessment to inform Recreational Pressure Assessment), Appendix N (Aquatic habitat summary), Appendix O (Air quality report) and Appendix P (Shading analysis report).

In general, the distribution and extent of habitats, and the distribution and abundance of flora and fauna species, is broadly consistent with that recorded previously to inform the 2018 NIS and although there were certain changes to the baseline, which are detailed in Section 5 and Section 9 of this updated NIS, the changes do not alter the conclusion reached in the 2018 NIS, i.e. that there would be no adverse effect on the integrity of any European Site. Where multiple surveys were carried out for a particular ecological receptor, over a number of survey seasons or covering different geographic locations, they are described below with the more recent surveys discussed first.

Full details of coverage for the various survey types are shown on Figures 4.1 and 4.2 in Volume 3 of this updated NIS.

Plate 4.1 Scheme Study Area

4.4.1 Ecological Surveys

This section provides an outline of the various ecological survey methodologies used to collate baseline ecological information in the preparation of this updated NIS.

Preparation for this updated NIS assessment involved a review of the previous ecological baseline information gathered to inform the development and assessment of the proposed N6 GCRR and additional surveys between 2022 and 2024 to validate and verify the results of the previous surveys and ensure any changes to the biodiversity baseline were captured to inform this updated NIS. Where changes were identified these were incorporated into the ecological baseline and are presented in this updated NIS.

The approach and scope of the ecological surveys, undertaken between 2013 and 2024, were developed with the questions and test posed by the Habitats Directive, the supporting national legislation and relevant case law, and the conservation objectives of European sites potentially affected by the proposed N6 GCRR in mind. Extensive field surveys were designed and carried out over a number of years by teams of experts with the specific intention of identifying ecological constraints, verifying prior findings and avoiding impacts with regard to the surrounding European sites.

A summary of the ecological surveys which informed the preparation of this updated NIS are provided in Table 4.1. The surveys listed below relate to the updated NIS only and do not include all surveys undertaken to inform the updated EIAR. It is noted that no additional or follow-up surveys were completed for:

- The Varnished hook-moss: During the 2014 survey (as is further detailed below) habitats within and close to site were surveyed. The findings confirmed no species and concluded the paucity was due to lack of appropriate habitat. No additional habitats that could be suitable for the species were identified in follow-up surveys and therefore no follow-up surveys were required to inform the updated NIS assessment.
- The Freshwater pearl mussel: The preliminary survey did not include the River Corrib as this section of the river does not have the appropriate geology to support *Margaritifera*. Furthermore, the river downstream of the proposed River Corrib Bridge does not support suitable Freshwater pearl mussel habitat; i.e. there is an absence of clean gravel/sand substrate, a riffle flow regime and the river is tidally influenced below the Salmon Weir in Galway City. With this section of the River Corrib overlapping the Assessment boundary and downstream ZoI, no additional surveys were required to inform the updated NIS assessment.

Table 4.1 Ecological Surveys and Survey Dates between 2013 and 2024

Survey	Survey Date(s)	Surveyor(s)
Habitat Surveys[19]		
• Lough Corrib SAC – Selected Locations (RS)	July to September 2013	Botanical, Environmental & Conservation (BEC) Consultants Ltd. Scott Cawley Ltd. and various independent botanists including: Dr Joanne Denyer Dr John Conaghan Dr Janice Fuller
• Petrifying springs survey (RS)	March to June 2014	
• Lough Corrib SAC Study Area (RS)	May to September 2014	
• Ecological Sites[20] (RS)	June to October 2014	
• Aquatic habitats	June to September 2014	

[19] Some ecological surveys were carried out during the constraints and route selection studies for the proposed N6 GCRR in 2014 and were carried out at a different spatial scale and without reference to any ZoI as it would relate to study area for the Project. These surveys later informed the additional ecological surveys undertaken to inform this updated NIS and for ease of reference are denoted with RS in parenthesis in Table 4.1.

[20] Ecological Sites, in this case, are sites of potential ecological value for the habitats present: i.e. determined to be at least of a Local Importance (higher value) (Guidelines for Assessment of Ecological Impacts of National Roads Schemes (National Roads Authority, 2009). The boundaries of the Ecological Sites were initially defined based on interpretation of orthophotography and collation of available existing habitat information, in conjunction with a ground truthing exercise to verify the orthophotography interpretation. These boundaries were then refined, where appropriate, based on the findings of the various habitat surveys undertaken.

Survey	Survey Date(s)	Surveyor(s)
• Lackagh Quarry Petrifying spring survey	June 2015	Katharine Duff Eamon O'Sullivan, Roger Goodwillie Dr Cilian Roden Michelle O'Neill Mary O'Connor.
• EIA Habitat surveys	September to December 2015 July to October 2016 May 2017 to January 2018	
• Habitat Survey (relevés)	July to October 2019	Scott Cawley Ltd.
• Lackagh Quarry Petrifying spring survey	July 2023	Dr Joanne Denyer
• Aquatic Habitat and Aquatic Vegetation Surveys: Lough Corrib SAC – Selected Locations	July – October 2023	Nick Stewart and Ross Macklin
• EIA Habitat surveys	July to October 2023	Scott Cawley Ltd., John Conaghan and Eamonn Delaney
Protected Plant Species		
• Aquatic Habitat and Aquatic Vegetation Surveys: Lough Corrib SAC – Selected Locations (incorporates the Slender naiad)	July – October 2023	Nick Stewart and Ross Macklin
• Slender naiad *Najas flexilis* (RS)	June to September, 2014	Dr Cilian Roden
• Varnished hook-moss *Hamatocaulis vernicosus* (RS)	September 2014 (no repeat surveys undertaken due to lack of suitable habitat)	Dr Rory Hodd
Mammal Surveys (Non-volant)		
• Otter survey (River Corrib and Coolagh Lakes)	August and September 2023 / October and November 2023	Triturus Environmental Ltd./Scott Cawley Ltd.
• Otter survey (River Corrib and Coolagh Lakes) (RS)	April and May, 2014	Scott Cawley Ltd.
• Mammal survey (excluding bats)	October/November 2023	Scott Cawley Ltd.
• Mammal survey (excluding bats)	October/November 2017 October 2016 April to June and October/November, 2015	Scott Cawley Ltd. and Dr Chris Peppiatt
Bat Surveys		
• Marking studies (EIA)	July 2014 to August 2016 May 2023 August 2023	Geckoella Ltd. (Tagging); Scott Cawley Ltd. (search for ringed bats)
• Radio-tracking studies (RS and EIA) (Not repeated in 2023)	July/August 2014 August 2014 September 2014 May 2015	Greena Ecological Consultancy Ltd., Geckoella Ltd.

Survey	Survey Date(s)	Surveyor(s)
Bird Surveys		
• Breeding bird surveys	April to June 2023	Scott Cawley Ltd.
• Breeding bird surveys	June 2016 May and June 2015	Dr Chris Peppiatt, Gerry Murphy, John Small
• Wintering bird survey, including Hen harrier Winter Roost Surveys	December 2022 - March 2023/September 2023 to March 2024	Scott Cawley Ltd.
• Wintering bird survey, including Hen harrier Winter Roost Surveys (RS)	September 2014 to March 2015	Scott Cawley Ltd., Dr Chris Peppiatt, Gerry Murphy, John Small and Tom Cuffe.
Fish Surveys		
• Fish surveys (including assessment of biological water quality status)	August & September 2023	Triturus Environmental Ltd.
• Fish surveys (including assessment of biological water quality status)	September 2015	Triturus Environmental Services Ltd.
Invertebrate Surveys		
• White-clawed crayfish survey	August and September 2023	Triturus Environmental Ltd.
• White-clawed crayfish survey	September 2014	Scott Cawley Ltd. and Dr Julian Reynolds
• Molluscan surveys (includes Freshwater pearl mussel and Vertigo snail species surveys) (RS)	October 2017 (two additional molluscan sites) August, 2014	Dr Evelyn Moorkens and Dr Ian Killeen

4.4.1.1 Habitat Surveys

This section outlines the various ecological survey methodologies used to collate baseline ecological information used to inform this updated NIS.

The initial phase of ecological surveys, carried out between July and September 2013, included a habitat mapping survey focussed on a few key sites in the Ballygarraun area (outside of any European sites and therefore, the results are not directly relevant to this assessment) along with a survey of the wider area for the priority Annex I habitat Petrifying springs with tufa formation (*Cratoneurion*) [*7220].

The full terrestrial extent of Lough Corrib SAC, from Coolanillaun to the Nuns Island/Waterside area in Galway City, was surveyed between March and September 2014 in tandem with wider scale surveys of aquatic habitats (which included all freshwater areas in Lough Corrib SAC within this zone) and defined Ecological Sites across Galway City and its environs. The River Corrib and Coolanillaun upstream of the pier in Menlough also lie within Lough Corrib SPA. Follow-up and validation surveys were undertaken in 2015, 2016 and 2017 and relevé surveys were undertaken in 2019, to fill information gaps and/or verify the baseline information gathered in preceding surveys.

Habitat Surveys (2023)

Lough Corrib SAC Survey Area/EIA Habitat Survey

Given the time lapse since the previous habitat surveys, a habitat survey was undertaken within the Assessment Boundary plus a 100m buffer, during August to September 2023 by Dr John Conaghan, Eamonn Delaney (of Delichon Ecology) and Scott Cawley Ltd. to verify the habitat baseline data collected between 2014 and 2019.

An additional botanical resource used during the 2023 surveys included:

- *The monitoring and assessment of four EU Habitats Directive Annex I woodland habitats.* Irish Wildlife Manuals, No. 146. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland (Daly *et al.*, 2023).

Where any habitat within the habitat survey area was found to have changed between 2019 and 2023, habitat types were re-classified, using the *Guide to Habitats in Ireland* (Fossit, 2000) for consistency with previous surveys.

Observations of species listed on the Flora (Protection) Order 2022 and species listed on the third schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) were recorded. Other species of conservation interest (e.g. species that are included on the threatened categories within Wyse Jackson *et al*. (2016)) were also noted, where present.

Where changes to habitats was noted since 2019 within the habitat survey area, the habitat's revised extent was mapped. Vascular plant nomenclature follows that of the New Flora of the British Isles Fourth Edition (Stace, 2019).

Any newly identified Annex I habitat types within the habitat survey area were classified after the *Interpretation manual of European Union Habitats EUR* (CEC, 2013) with reference to the corresponding national habitat survey reports and NPWS wildlife manuals, as applicable. The nomenclature for Annex I habitats follows that of the *Interpretation manual of European Union Habitats EUR* with abbreviated names after those used in The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview (NPWS, 2019a).

Petrifying Springs Survey

Dr Joanne Denyer was commissioned by Scott Cawley Ltd. in 2023 to undertake a survey and assessment of calcareous seepages at Lackagh Quarry. A previous survey (Table 4.1) was undertaken by Dr Rory Hodd in 2015, which culminated into the information presented in the 2018 NIS.

The aim of the 2023 survey was to map all calcareous seepages within the quarry, assess if they correspond to the Annex I priority habitat Petrifying spring [*7220] and note any changes from the 2015/2016 baseline survey.

The site was walked over in early July 2023 by Dr Joanne Denyer. Each calcareous seepage area recorded in the 2015 baseline was relocated and assessed. Additional seepages were also recorded.

For each seepage the presence of tufa, positive indicator species for Petrifying springs [*7220] (Denyer *et al*., 2023; Lyons and Kelly, 2016) and water flow were recorded. Where a seepage corresponded to the Annex I priority habitat Petrifying springs [*7220], a detailed monitoring plot was undertaken following the methodology of Denyer *et al*. (2023) and Lyons and Kelly (2016). Note that not all seepages were accessible in full due to the steep quarry face and loose rock present.

Vascular plant nomenclature follows that of the New Flora of the British Isles. 4th Edition (Stace, 2019). The bryophyte nomenclature adopted by Blockeel *et al.* (2021) was used.

Aquatic Habitats

Verification surveys were undertaken by Nick Stewart and Bob Ludgate on 28 - 30 August 2023 and were focused on the River Corrib corridor (i.e. Coolagh Lakes, Lough Inch, Ballindooley Lough, and the Terryland Stream were excluded from these surveys). A small inflatable boat was used to access along the river, launched from Menlo Pier. The boat survey extended from the meeting of the River Corrib and Friar's Cut, around 0.5 km upstream of Menlo, down to the existing N6, including the channel on the eastern side of Jordan's Island (Appendix N).

The vegetation was examined by grapnelling at regular along the course of the river, looking for areas of vegetation and recording the species present and their abundance on a three point scale. As much of the channel was found to be unvegetated because of depth, this meant that attention was mostly concentrated along the margins and around islands.

Downstream of the existing N6, the river was examined on foot from publicly accessible points, from the river edge and wading where feasible. Downstream of the Salmon Weir the river splits into several channels,

including the Eglington Canal and all of these were examined from the Weir to the first bridges downstream. However, the main channel was inaccessible due to high containing walls and it was only possible to view this visually from above.

Triturus Environmental Ltd. were commissioned by Scott Cawley Ltd. to conduct baseline aquatic surveys. Aquatic surveys of the riverine watercourses within the vicinity of the Project were conducted on the 29, 30 and 31 August 2023. Lake survey sites were undertaken on the 1, 07 and 08 September 2023.

All freshwater watercourses which could be affected directly or indirectly by the Project (e.g. bridges) were considered as part of the assessment. The courses and nomenclature for the watercourses surveyed followed Environmental Protection Agency (EPA) mapping.

Survey effort focused on instream and riparian habitats and included a fisheries assessment (electro-fishing and or fisheries habitat appraisal) (Section 4.4.1.8), white-clawed crayfish survey (Section 4.4.1.4), macrophyte and aquatic bryophyte survey and (where suitable) biological water quality sampling (Q-sampling) or macro-invertebrate sweep sampling. Environmental eDNA was also collected to support these surveys by helping detect cryptic species in addition to profiling fish assemblages at the lake sites using metabarcoding.

A broad aquatic and riparian habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's *River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003* (EA, 2003) and the Irish Heritage Council's *A Guide to Habitats in Ireland* (Fossitt, 2000). This broad characterisation helped define the watercourses' conformity or departure from naturalness. All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e. width, depth, channel form) including associated evidence of historical drainage
- Substrate type and relative condition, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.)
- Flow type at riverine sites by proportion of riffle, glide and pool in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition and bordering land use practices

Macrophytes and aquatic bryophytes
Surveys of the macrophyte and aquatic bryophyte community were conducted by instream wading at each of the survey sites, with specimens collected (by hand or via grapnel) for on-site identification.

An assessment of the aquatic vegetation community helped to identify any rare macrophyte species listed under the Flora (Protection) Order, 2022 and or Irish Red list for vascular plants (Wyse-Jackson *et al*., 2016) or habitats corresponding to the Annex I habitats, e.g., 'Water courses of plain to montane levels, with submerged or floating vegetation of the Ranunculion fluitantis and Callitricho-Batrachion (low water level during summer) or aquatic mosses [3260]' (more commonly referred to as 'Vegetation of flowing waters') [3260].

The full aquatic report with the aquatic results is provided in Appendix K Part 2 of this updated NIS.

Habitat Surveys (2019)
The 2019 habitat surveys followed the methodologies set out for the habitat baseline surveys completed in 2014, but were focussed on habitat areas within the fenceline for the proposed N6 GCRR only in specific response to the Request for Further Information by ABP in 2019 for:

- Habitat areas within the Lough Corrib SAC: Additional relevés were recorded in all habitat areas where the proposed fenceline for the proposed N6 GCRR overlaps with Lough Corrib SAC with up to five samples per each habitat type taken at each location where space permitted.
- All other habitats within the proposed fenceline for the proposed N6 GCRR: The survey included a walkover of the area outside of the Lough Corrib SAC boundary with visual verification of habitats

assessed in 2014 (methodology indicated below) and relevés of representative habitat areas for each habitat type (for habitat areas where relevés had not been historically conducted).

Additional botanical resources used during the 2019 surveys included:

- Monitoring Guidelines for the Assessment of Petrifying Springs in Ireland (Lyons & Kelly, 2016)
- The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats. Irish Wildlife Manuals, No. 102 (Martin, *et al*., 2018)

The survey methodology is outlined in Appendix H Part 2.

Habitat Surveys (2014)

Petrifying Springs Survey
A dedicated survey for this priority Annex I habitat type – Petrifying springs with tufa formation (Cratoneurion) – was undertaken by Botanical, Environmental & Conservation Consultants Ltd. (BEC) in 2014. A combination of desktop review and Geographic Information System (GIS) analysis was used to define the survey sites, which were then visited to establish the presence/absence of a petrifying spring feature. This was supplemented by the additional habitat survey work undertaken in 2014 and 2015.Surveys in 2014 did not include Lackagh Quarry; an area that was subsequently surveyed in 2015 – see 'Habitat Surveys (2015/2016)' section for details. The full survey report was published in 2015 as part of the route selection report for the proposed N6 GCRR (see Appendix A.4.2 Ecological Constraints Report of that report).

Lough Corrib SAC Survey Area
Habitat surveys were undertaken by BEC and Wetland Surveys Ireland Ltd. from May to September 2014 within the Lough Corrib SAC Habitat Survey Area as indicated in Figure 4.1 and Figure 4.2 (the full report is included in Appendix H – Part 1). The survey methodology comprised two stages: Stage 1 comprised mapping to level 3 of the Heritage Council habitat codes (Fossitt, 2000) with areas of Annex I habitat also being identified; for Stage 2, all polygons were revisited and indicator species recorded, a rapid quality-assessment score was attributed to each polygon which contained an Annex I habitat type, and relevé data was collected across the Habitat Survey Area (Figure 4.1 and Figure 4.2) to support the habitat classification given during the mapping exercise and to provide additional data on the conservation value of habitats. All habitat polygons were also attributed with an ecological valuation as per the criteria set out in Guidelines for Assessment of Ecological Impacts of National Roads Schemes: Revision 2 (National Roads Authority, 2009).

The conservation condition of each Annex I habitat within the Habitat Survey Area (Figure 4.1 and Figure 4.2) was assessed. The assessment was based on publications available from the NPWS (see *Annex I Habitat Classification* section below for references) and on the approach used for the national conservation assessment of Annex I habitats, which is carried out according to guidelines published by the EU (Evans and Arvela, 2011).

Assessment criteria were available from NPWS for the majority of the Annex I habitats recorded but where not available, the criteria relating to similar habitats were used. Annex I habitats were defined with reference to recent national studies co-ordinated by NPWS and the Interpretation manual of European Union Habitats EUR (CEC, 2013). Vegetation communities were assigned to Annex I habitat areas based on the relevé data gathered and on published definitions. In cases where published vegetation community definitions were not available, novel classifications were assigned ("Annex I Habitat Classification" below and Appendix H - Part 1).

The full details of the survey and assessment methodologies used - including the assessment criteria, Annex I habitat definitions, and vegetation community classifications – are described in the survey report included in Appendix H (Part 2).

Ecological Sites
The aim of the Ecological Sites habitat survey was to describe, classify and map the habitats of the Ecological Sites based on the Heritage Council classification (Fossitt 2000), with particular emphasis on habitats conforming to Annex I habitats (as listed in the EU Habitats Directive), and to assess their ecological importance. Any plant species of restricted distribution and ecological importance were noted.

Ecological Sites, in this case, were sites of potential ecological value; the boundaries of which were initially defined based on interpretation of orthophotography and collation of available existing habitat information, in conjunction with a ground truthing exercise to verify the orthophotography interpretation. These boundaries were then refined, where appropriate, based on the findings of the various habitat surveys undertaken.

The surveys were undertaken by Dr Joanne Denyer, Dr John Conaghan, Dr Janice Fuller, Katharine Duff and Eamon O'Sullivan from the 15 June to the 15 October 2014. The locations of the Ecological Sites surveyed are shown on Figures 4.1 to 4.2.

Annex I Habitat Classification
Reference was made to the Interpretation Manual of European Union Habitats EUR28 (CEC, 2013), and the National and Regional habitat survey reports, in terms of the criteria for classifying the different Annex I habitats and assessing their conservation condition:

- Turloughs over 10 ha: vegetation survey and evaluation (Goodwillie, 1992)
- Turlough Hydrology, Ecology and Conservation (Waldren, 2015, Ed.)
- Summary of findings from the Survey of Potential Turloughs 2015 (O'Neill & Martin, 2015)
- The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78 (O'Neill *et al.*, 2013)
- Results of monitoring survey of old sessile oak woods and alluvial forests. Irish Wildlife Manuals, No. 71 (O'Neill, & Barron, 2013)
- National Survey of Native Woodlands 2003-2008 - Volumes I and II (Perrin *et al.*, 2008).
- National survey of Limestone pavement and associated habitats in Ireland. Irish Wildlife Manuals, No. 73 (Wilson & Fernández, 2013)
- Coolagh Lakes, Lough Corrib SAC, Co. Galway: Wetland Survey and Conservation Assessment (Crushell & Foss, 2014a: unpublished report)
- Coolanillaun Bog, Lough Corrib SAC, Co. Galway: Wetland Survey and Conservation Assessment (Crushell & Foss, 2014b: unpublished report)
- Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals, No. 79 (Perrin *et al.*, 2014)
- Monitoring Guidelines for the Assessment of Petrifying Springs in Ireland (Lyons & Kelly, 2016)

Assessment criteria for *Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae [7210] which were developed during the Constraints Study (by Crushell & Foss 2014a and 2014b) were used. The Annex I habitats surveyed are listed in Table 4.2.

Table 4.2 Annex I habitats recorded across the scheme study area, the reference for assessment criteria used, and size of the assessment relevé

Annex I Habitat Code	Habitat Name [1]	Reference	Relevé Size (metres)
1220	Perennial vegetation of stony banks	N/A	N/A
1330	Atlantic salt meadows	McCorry & Ryle (2009)	2x2
4010	Wet heath	Perrin *et al*. (2014)	2x2
4030	Dry heaths	Perrin *et al*. (2014)	2x2
6210 *6210	Orchid-rich calcareous grassland (* important orchid sites)	O'Neill *et al*. (2013) O'Neill *et al*. (2013)	2x2 2x2
*6230	Species-rich Nardus upland grassland	O'Neill *et al*. (2013)	2x2
6410	Molinia meadows	O'Neill *et al*. (2013)	2x2
6430	Hydrophilous tall herb	O'Neill *et al*. (2013)	2x2
6510	Lowland hay meadows	O'Neill *et al*. (2013)	2x2
*7130	Blanket bog (active)*	Perrin *et al*. (2014	2x2
7140	Transition mires	Perrin *et al*. (2014)	2x2
7150	Rhynchosporion depressions	Perrin *et al*. (2014)	2x2
*7210	Cladium fen*	Crushell & Foss (2014a & 2014b); criteria developed for GCTP project	2x2
*7220	Petrifying springs*	Denyer *et al.*, 2023 & Lyons & Kelly (2016)	N/A
7230	Alkaline fens	Perrin *et al*. (2014, 2010)	2x2
*8240	Limestone pavement*	Wilson & Fernández (2013)	5x5
*91E0	Residual alluvial forests	O'Neill & Barron (2013)	
*3180	Turloughs*	Goodwillie (1992) Waldren, (2015, Ed.)	2x2

[1]Abbreviated Annex I habitat names are after NPWS (2019a & 2019b), full Annex I habitat titles are available in *Interpretation manual of European Union Habitats EUR28 (*CEC**,** 2013)

Field sheets were prepared in advance for recording site notes and habitat descriptions, which included conservation condition assessment criteria. Vascular plant nomenclature follows that of the New Flora of the British Isles 3rd Edition (Stace, 2010); bryophyte nomenclature follows the Checklist of British and Irish bryophytes (BBS, 2009).

It is important to note that Annex I grassland habitats were defined with reference to both the *Interpretation Manual of European Union Habitats EUR* (CEC, 2013) and the *Irish Semi-Natural Grassland Survey 2007-2012* (O'Neill *et al.*, 2013). Appendix 1 of the I*rish Semi-Natural Grassland Survey 2007-2012* contains the assessment criteria for the five Annex I grasslands surveyed during the Irish Semi - Natural Grassland Survey (ISGS). The assessment criteria listed in Appendix 1 of the I*rish Semi-Natural Grassland Survey 2007-2012* was used to assess the structure and functions of the Calcareous grassland [*6210] habitats and

Molinia meadows [*6410]. In addition to this, they were also used as a guide, where it was immediately clear when considering if a grassland community represented the Annex I habitats. In the scenario that a grassland community broadly corresponded to these criteria but did not match them exactly, as grassland habitats generally exist on a gradient between clearly not Annex I and definitely Annex I, the expert judgement of a suitably qualified and experienced botanist was applied, with reference to the *Interpretation Manual of European Union Habitats EUR28* and the *Irish Semi- Natural Grassland Survey 2007-2012*, to make the decision as to whether the grassland community corresponded to the Annex I habitat as defined by the assessment criteria, but with unfavourable structure and functions or if the grassland community was non-Annex or corresponded to another Annex I habitat.

The wooded variant of the priority Annex I habitat Limestone pavement [*8240] was recorded in some woodland areas. It should be noted that there are no guidelines or definitions for how Annex I habitat Limestone pavement [*8240] should be distinguished from non-Annex woodland with some limestone boulders or rocks in it. For the purposes of this project, and as explained in response to queries raised during the oral hearing in 2020 on Limestone pavement [*8240] classification, best expert judgement was used, applying a very broad and precautionary definition of what may be classified as wooded Limestone pavement [*8240] Annex I habitat type. Criteria were developed by BEC Consultants based on available definitions and published literature, and that were judged to be appropriate and applicable in the field, based on the unique Irish context of woodland Limestone pavement.

For the purposes of this project, wooded Limestone pavement [*8240] were those areas having a closed canopy of trees at least 3m tall with at least 50% of the surface (at polygon scale) comprising bedrock at the surface (the bedrock was normally covered by mosses) and retaining some evidence of Limestone pavement structure; that is, evidence of clints, grikes or other features confirming that the rock was more likely to be pavement structure instead of random boulders or collections of rock. Also, in the wooded limestone [*8240] pavement habitats encountered, soil was generally present but was thin (< 2cm), though could be deeper in places, for example, in old grykes, due to a build-up of humus. Rocks were sometimes completely covered by bryophytes such as *Eurhynchium striatum*, *Neckera crispa* and *Thamnobryum alopecurum*, but soil was typically lacking underneath the moss growth. These areas often occurred in mosaic with non-Annex I WN2 woodland, and differed from these woodlands by virtue of soil depth, as well as areas of exposed Limestone pavement and boulders.

In cases where it was difficult to differentiate between wooded Limestone pavement [*8240] and non-Annex woodland — for example, areas with a high proportion of scattered boulder and rock and collapsed stone walls, which added to rock cover but with deeper soils or lacking evidence of pavement structure — expert surveyor judgement was applied using all of the agreed criteria. This determined whether a polygon would be mapped as either [*8240], or in the case where small elements of the polygon included [*8240], mapped as a mosaic of [*8240] along with the other relevant habitat types present within the mosaic.

Finally, it should be noted that a conservative approach was followed and many of the polygons classified as [*8240] wooded Limestone pavement were very marginal and were on the cusp of what may or may not be considered [*8240.] It should also be noted that the majority of the polygons mapped as wooded Limestone pavement [*8240] received the lowest Annex quality rating as they are considered to be poor examples of Limestone pavement.

Ecological Evaluation

The ecological importance of habitats was assessed using the criteria listed in the Guidelines for Assessment of Ecological Impacts of National Roads Schemes (National Roads Authority, 2009). For Annex I habitats recorded, a further rapid quality assessment of the Annex I habitat (scale 1, 2, or 3) was made, based on the following criteria, whereby:

1 = the habitat was a poor example of the Annex I habitat

2 = the habitat was a good example of the Annex I habitat

3 = the habitat was an excellent example of the Annex I habitat

Field Survey
Field survey maps were prepared from aerial photographs of the Ecological Sites (1:5,000 scale minimum). The Ecological Sites were subject to a walkover survey by experienced botanists. Each habitat present was described and classified (after Fossitt for non-Annex habitats or for Annex I habitats, as per NPWS guidance from the relevant national Annex I habitat monitoring reports) and the main plant species were listed on the habitat recording form. The habitat extent was mapped onto the aerial photograph, with GPS points taken where a habitat extent could not clearly be identified from the aerial photograph. For each Annex I habitat type encountered, a relevé(s) was (were) taken using a prepared form. The relevé size was $2m^2$ for all Annex I habitats except for woodland, which was $5m^2$. The relevé form included a habitat condition assessment based on criteria which were drawn from the relevant national habitat surveys for the NPWS. Where applicable, the Annex I habitat was assigned to a vegetation community.

A photographic record of the habitats and relevé(s) for each Ecological Site was taken; two photos per relevé – one for the relevé and one for a view from the relevé. Notes on management, threats and habitat condition were also taken.

For each Ecological Site, the following were completed:

- Site form: summary description of the Ecological Site, list of habitats and notable features
- Habitat map: hand drawn polygons (attributed with the corresponding habitat codes) on aerial photograph
- Field survey notes: hand written on habitat recording forms
- Relevé forms: hand written and completed for Annex I habitats
- Photographs: photographic record (digital) of habitats and relevé(s)
- Habitat table: tabulated summary of all habitats, including habitat description, classification (Fossitt and Annex I), plant species list, habitat condition and ecological evaluation/importance

Other Areas
Within the scheme study area, those areas not covered by the surveys described above were subject to a walkover survey; the purpose of which was to determine the nature of the habitats present and establish whether any areas corresponded with Annex I habitat types. In some instances, the survey excluded residential properties and associated gardens, and commercial and industrial complexes.

Notes were taken on the habitat types present (according to the habitat categories described in Fossitt, 2000) and where habitat plots were assessed to be of a high ecological value, with the potential to correspond to an Annex I habitat type, these were subject to more detailed survey as described above under Ecological Sites. If appropriate, these were then incorporated into Ecological Sites for consideration as part of the route selection process.

Aquatic Habitats
Aquatic habitats were surveyed for the presence of Annex I habitat types by Dr Cillian Roden, from the 16 June 2014 to the 8 September 2014.

The survey sites included the River Corrib corridor, Coolagh Lakes, Lough Inch, Ballindooley Lough, and the Terryland River. The locations of the survey sites are shown on Figures 4.1 to 4.2.

Sites were accessed either from the shore or by boat. Sub-littoral vegetation was examined by snorkelling. Smaller sites (such as the Terryland River) were examined by wading or by shore-based sampling. A list of species present, the depth of the sub-littoral vegetation and the exact position of each site was determined. Depths were measured using a SCUBAPRO depth gauge accurate to 0.1m and position determined using a hand-held GPS recorder. GPS position shows approximate area surveyed by snorkel. Species present were recorded on an underwater writing slate. Samples for later examination were stored in plastic bags and identified within one day of collection. Underwater photographs were taken with a Panasonic Lumix DMC-FT3 underwater camera.

Habitat Surveys (2015/2016)

Petrifying Spring Survey
A dedicated survey of seepage lines in Lackagh Quarry to record the presence of petrifying spring habitat was carried out by Dr Rory Hodd (of Nimbosa Ecology) on the 03 June 2015. This culminated into Dr Rory Hodd's revised note on the 16 May 2017 entitled "Survey of potential Annex I habitat 7220 petrifying tufa springs in Lackagh Quarry, Galway".

The aim of the survey was to determine whether or not any of these features corresponded with the priority Annex I habitat type **Petrifying springs with tufa formation (Cratoneurion)* [*7220]. Plant species associated with each of the seepage lines were recorded and compared with the current definitions of the plant communities associated with this Annex I habitat type (CEC, 2013; NPWS, 2019b; and Lyons & Kelly, 2016).

EIA Habitat Survey
The additional habitat surveys that were undertaken to supplement the baseline data already collected for the purposes of the AA and EIA level of assessment for the proposed N6 GCRR, consisted of the following elements:

- Habitats that had been surveyed in detail in 2013/2014 (i.e. Lough Corrib SAC Study Area and the Ecological Sites) were verified in 2015, 2016 and 2017. Where habitats had changed from the 2013/14 baseline they were resurveyed as per the methodology described above under *Habitat Surveys 2014 – Ecological Sites*
- Areas that had not been surveyed in 2013/14 were subject to a full habitat survey as per the methodology described above under *Habitat Surveys 2014 – Ecological Sites*. This was carried out in 2015 with additional areas included in 2016 and 2017 as a result of changes to the Assessment Boundary as a result of the on-going iterative design process

The locations of these Habitat Survey Area are shown on Figures 4.1 to 4.2.

Habitat Surveys (2013)

Lough Corrib SAC – Selected Locations
A habitat survey was undertaken by BEC in 2013 to classify the habitats present at areas of Limestone pavement at Ballygarraun (to the east of the currently defined Lough Corrib SAC study area – see Figure 4.2). The habitat map and data from this survey were incorporated into the results from the 2014 surveys.

The full survey report was published in 2015 (Perrin, 2014) as part of the route selection report for the proposed N6 GCRR (see Appendix A.4.2 Ecological Constraints Report of that report). Some revisions to the habitat boundaries were made in 2017 following further walkover verification surveys and the report was updated accordingly and is presented in Appendix H (Part 1).

4.4.1.2 Qualifying Interest Plant Species Surveys
Aside from the botanical survey work undertaken to record and classify habitats (during which any rare/protected plant species present were recorded), dedicated surveys for the following legally protected plant species were carried out: Varnished hook-moss *Hamatocaulis vernicosus* and the Slender naiad *Najas flexilis*. Both of these plant species are listed on Annex II of the Habitats Directive and listed as QI species of Lough Corrib SAC (with Slender naiad also listed on Annex IV of the Habitats Directive), and are protected under the Flora (Protection) Order, 2022.

Varnished hook-moss
Varnished hook-moss surveys were not required in 2023 due to the lack of historical records combined with there being no suitable habitat within the Assessment Boundary for the Project. Species is not considered present within the Assessment Boundary and, as concluded in the 2018 NIS, conservation objectives of the QI populations will not be affected.

Varnished hook-moss survey was undertaken by Dr Rory Hodd from 2 to 7 September 2014.

Potential sites for survey were selected in consultation with ecologists undertaking habitat mapping within the Scheme Study Area. Potential sites were identified based on where fen occurred, and where brown moss species (i.e. a suite of moss species indicative of, and generally restricted to, fen habitats) had been noted. Sites where fen transitions into bog, or where transition mire or intermediate fen had been noted, were prioritised as they had the most potentially suitable habitat for the species.

Nine potential sites were surveyed for the presence of Varnished hook-moss (Figure 5). The nearest known site for Varnished hook-moss, at Gortachalla Lough, north of Moycullen, was also visited to establish the species' habitat preferences in this specific area. Each site was extensively searched for areas where conditions were suitable for the growth of this species, and areas where plant species with similar requirements were found. Any areas which were deemed potentially suitable were thoroughly searched and the moss flora of these areas examined in detail.

Slender naiad

Triturus Environmental Ltd. were commissioned by Scott Cawley Ltd. to conduct baseline aquatic surveys. Aquatic surveys of the riverine watercourses within the vicinity of the Project were conducted on the 29, 30 and 31 August 2023 and lake survey sites were undertaken on the 01, 07 and 08 September 2023, collectively referred to as the aquatic survey sites.

Macrophytes and aquatic bryophytes (Appendix K – Part 2) as well as aquatic habitat surveys (Appendix N) were completed in 2023 (see 'Macrophytes and aquatic bryophytes' under Habitat Surveys (2023)). Slender naiad was not recorded at any of the aquatic survey sites during any of the surveys.

Slender naiad survey was undertaken by Dr Cillian Roden from June to September 2014, as part of the aquatic Annex I habitat survey, as described above in the Aquatic Habitats section.

As a submerged aquatic plant species of clear, low-nutrient lakes, potential survey sites within the Scheme Study Area were Lough Inch, the Coolagh Lakes and Ballindooley Lough – see Figures 4.1 to 4.2. As described for aquatic habitats, sub-littoral vegetation was examined by snorkelling.

4.4.1.3 Mammal Surveys

Otter Lutra lutra

A terrestrial fauna survey (excluding bats) was undertaken in October and November 2023 by Scott Cawley Ltd. The Survey Area covered a 150m buffer around the Assessment Boundary. This included surveys for Otter where the status and activity of Otter holts was recorded along with any evidence of activity, including paths, tracks, feeding signs, latrines or couches. Additionally, the presence of Otter was determined during the August and September 2023 aquatic surveys, through the recording of otter signs within 150m upstream and downstream of each sampling point. Notes on the age and location of signs (ITM coordinates) were made, in addition to the quantity and visible constituents of spraint (i.e. remains of fish, crustaceans, molluscs etc.).

Previous Otter surveys undertaken include:

- Mammal surveys undertaken by Scott Cawley Ltd. and Dr Chris Peppiatt over four survey periods: 30 April to 5 June 2015, 28 October to 8 November 2015, 25 to 28 October 2016 and 9 to 20 October 2017 and included:
  - A corridor of approximately 500m was surveyed for mammal species, including Otter, as part of the multi-disciplinary walkover survey. This included the Lough Corrib SAC in the vicinity of the Project. The status and activity of Otter holts was recorded along with any evidence of activity, including paths, tracks, feeding signs, latrines or couches.
  - As part of the survey, two infra-red motion-activated cameras were installed between 9 July and 4 August 2015 (under NPWS Licence No. 024/2015) to monitor a number of small burrows along a stream bank located adjacent to playing fields at University of Galway (UoG and formerly known as National University of Galway) to confirm the presence/absence of Otter.
- An Otter survey of the River Corrib, from Coolanillaun to the Waterside area in Galway City, undertaken by Scott Cawley Ltd. from the 15 April to 7 May 2014:

- The survey included all area of Otter Habitat (defined as being a 10m width of riverbank each side of the river in the Threat Response Plan: Otter (2009-2011) (NPWS, 2009)) within the boundary of the Lough Corrib SAC. The Otter Survey Area is shown on Figure 6.
- The status and activity of any Otter holts was recorded along with any evidence of activity, including paths, tracks, feeding signs, sprainting sites or couches (Otter resting places).

4.4.1.4 White-clawed Crayfish Surveys

White-clawed crayfish *Austropotamobius pallipes* surveys were undertaken at the aquatic survey sites (as detailed for '*Slender naiad'*, in Section 4.4.1.2) in August-September 2023 under a National Parks and Wildlife (NPWS) open national licence (no. C24/2023), to capture and release crayfish to their site of capture. As per Inland Fisheries Ireland aquatic biosecurity recommendations, the crayfish sampling started at the uppermost site(s) of the catchment/sub-catchments in the Survey Area to minimise the risk of transfer of invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds *et al.* (2010). An appraisal of white-clawed crayfish habitat at each site was conducted based on physical habitat attributes, water chemistry and incidental records in mustelid spraint.

Additionally, a desktop review of crayfish records within the wider area was completed.

The full aquatic report with the White-clawed Crayfish results is provided in Appendix K Part 2 of the updated NIS.

White-clawed crayfish surveys were undertaken by Scott Cawley Ltd. and Dr Julian Reynolds, under licence from the NPWS (Licence No. C120/2014), from the 23 August 2014 to 6 September 2014.

The watercourses surveyed are shown on Figure 7. Depending on the size of the waterbody, it was either surveyed using sweep-netting with hand nets (following Reynolds *et al*. 2010) or trapped using crayfish traps of appropriate mesh size. Where trapping was undertaken, traps were checked for crayfish and baited each morning and were left out over two or three nights.

4.4.1.5 Freshwater Pearl Mussel Survey

No surveys were undertaken for Freshwater pearl mussel in 2023 for this updated NIS due to the lack of suitable habitat within the Assessment Boundary and downstream of the Project.

Surveys for the Freshwater pearl mussel *Margaritifera margaritifera* were undertaken by Dr Evelyn Moorkens and Dr Ian Killeen within the Scheme Study Area in August 2014 as part of the route selection studies for the proposed N6 GCRR.

This survey did not include the River Corrib as this section of the river does not have the appropriate geology to support *Margaritifera*. Furthermore, the river downstream of the proposed River Corrib Bridge does not support suitable Freshwater pearl mussel habitat; i.e. there is an absence of clean gravel/sand substrate, a riffle flow regime and the river is tidally influenced below the Salmon Weir in Galway City.

4.4.1.6 Breeding Bird Surveys

Breeding bird surveys were undertaken within the Assessment Boundary and a 50m buffer (Breeding Birds Survey Area) between 25 - 28 April 2023, 25 - 26 May 2023, 30 May 2023 - 01 June 2023 and 27 - 29 June 2023 by Scott Cawley, using a methodology adapted from the Bird Monitoring Methods - A Manual of Techniques for Key UK Species (Gilbert *et al.*, 2011).

The Breeding Bird Survey Area was slowly walked between dawn and 12 (noon) in a manner allowing the surveyor to come within 50m of all habitat features. Birds were identified by sight and song, and general location and activity were recorded using the British Trust for Ornithology (BTO) species and activity codes.

The full breeding bird survey results undertaken in 2023 are provided in Appendix I (Part 2).

Breeding bird surveys were conducted by Dr Chris Peppiatt, Gerry Murphy and John Small over three visits in May/June 2015 using a methodology adapted from the Breeding Bird Survey (Gilbert *et al.*, 2011). Additional areas were covered, over two visits, in June of 2016 as a result of changes to the Assessment

Boundary at that time due to design development. Lands within, and adjacent to, the Assessment Boundary were slowly walked in a manner allowing the surveyor to come within 50m of all habitat features – see Figures 8.1 to 8.2 and Figure 9.1 to Figure 9.2 for survey corridor. Birds were identified by sight and song, and general location and activity were recorded using the British Trust for Ornithology (BTO) species and activity codes.

The full breeding bird survey results undertaken in 2015 and 2016 are provided in Appendix I (Part 1).

The conservation status of the bird species recorded during these various surveys considered:

- SCI species of SPAs within the ZoI of the Project
- Bird species listed on Annex I of the EU Birds Directive (2008/144/EC)

4.4.1.7 Wintering Bird Surveys

Wintering bird surveys were undertaken, once per month, between December 2022 and March 2023 and between September 2023 and March 2024 by Scott Cawley Ltd. using a methodology based on the Bird Monitoring Methods - A Manual of Techniques for Key UK Species (Gilbert *et al*., 1998). The Wintering Birds Survey Area included a 300m buffer of the Assessment Boundary. The Wintering Bird Survey Area was initially surveyed visually using binoculars/scope from a vantage point(s) at the edge of the study area followed by a walkover of the area to identify birds which may not be visible from a distance (e.g. waders) or cryptic species such as snipe, and evidence of usage by wildfowl such as swans or geese (e.g. droppings).

Birds were identified by sight and general location and activity were recorded using the British Trust for Ornithology (BTO) species and activity codes. Wintering bird surveys were also completed within the Scheme Study Area which was surveyed once a month during daylight hours from September 2014 to March 2015 by Dr Chris Peppiatt, Gerry Murphy, John Small, Tom Cuffe and Scott Cawley Ltd. Due to the diverse nature of the sites surveyed, surveys were conducted using a combination of methodologies. In general, the approach was a 'look-see' methodology (based on Gilbert *et al.* 2011).

The wintering bird survey sites forming the Wintering Bird Survey Area of the 2014/2015 surveys are shown on Figure 10 and formed more discrete wintering bird survey areas that were only resurveyed during the 2022/2023 and 2023/2024 surveys where they overlapped the 300m buffer area. The types of wintering birds sites fall within the lakes and aquatic habitats, wetlands, peatlands, quarries, agricultural areas and amenity areas.

Wetland and Peatland Sites

Where possible, sites were surveyed from vantage points (e.g. Ballindooley Lough and Coolagh Lakes) and any species utilising the area, and their activity, were recorded. Larger sites were surveyed using a hybrid methodology of thorough walks through the site with point counts and/or vantage points undertaken along the Project, where possible. The wintering bird survey sites that overlapped fully or partially with the 300m buffer of the 2022/2023 and 2023/2024 surveys included:

- River Corrib
- Terryland River
- Ballindooley Lough
- Coolagh Lakes
- Moycullen Bogs NHA at Ballagh and Tonabrocky
- Cappagh Road Peatland

The wintering bird survey sites only surveyed during the 2014/2015 surveys as they fell outside the 300m buffer of the 2022/2023 and 2023/2024 surveys included:

- Lough Inch northeastern peatland
- Lough Inch southern peatland

- Lough Inch southwestern peatland

Hen harrier Winter Roost Surveys
Separate wintering Hen harrier roosting surveys were carried out between December 2022 and March 2023 and between September 2023 and March 2024 at two locations:

- Ballindooley Lough and surrounds
- Coolough Lakes and surrounds

These surveys were carried out by Scott Cawley Ltd., with the survey methodology focused on vantage point surveys of the areas to determine presence/absence of roosting Hen harrier at these locations.

The full winter bird survey results from 2022 to 2024 are provided in Appendix J Part 2.

These recent surveys repeated the Hen harrier Roost Surveys undertaken at Ballindooley Lough and the Coolagh Lakes in 2014/2015. This involved vantage point surveys of the areas from 1.5 hours before sunset to 0.5 hours after sunset to record any Hen harriers in the area.

Quarries, Agricultural Areas, and Amenity Areas
Two quarries (Lackagh Quarry and Roadstone) were included within the 2022/2023 and 2023/2024 survey area (Angliham Quarry lies outside the 300m buffer of the Assessment Boundary and was only surveyed during the 2014/2015 wintering bird survey) using a hybrid methodology of walks and/or vehicle-based transects through the site with point counts and/or vantage points undertaken along the transect.

Agricultural and amenity areas were surveyed during all three survey periods using a combination of vehicle-based surveys and roadside views where possible, with some areas requiring a walk-through to determine usage by wintering birds.

The full winter bird survey results are provided in Appendix J.

4.4.1.8 Fish Surveys

Fish Surveys (2023)
Undertaken on a catchment-wide scale, the surveys of the aquatic survey sites (see ‘Slender naiad’ in Section 4.4.1.2) provide a 2023 baseline assessment of the aquatic ecology, including fisheries and biological water quality, as well as protected species and habitats in the vicinity of the Project, inclusive of proposed watercourse crossings.

All freshwater watercourses which could be affected directly or indirectly by the Project and associated infrastructure (e.g. bridges) were considered as part of the current assessment. The courses and nomenclature for the watercourses surveyed followed Environmental Protection Agency (EPA) mapping.

Survey effort focused on instream and riparian habitats and included a fisheries assessment (electro-fishing and or fisheries habitat appraisal), and (where suitable) biological water quality sampling (Q-sampling) or macro-invertebrate sweep sampling. Environmental eDNA was also collected to support these surveys by helping detect cryptic species in addition to profiling fish assemblages at the lake sites using metabarcoding.

Fisheries assessment (electro-fishing)
A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on watercourses in the vicinity of the Project in August and September 2023 following notification to Inland Fisheries Ireland, under the conditions of a Department of the Environment, Climate and Communications (DECC) licence. The survey was undertaken in accordance with best practice (CEN, 2003; CFB, 2008) and Section 14 licencing requirements.

Furthermore, a fisheries habitat appraisal of the aquatic survey sites, inclusive of five lake sites, was undertaken to establish their importance for salmonid, lamprey, European eel (*Anguilla anguilla*) and other fish species. The baseline assessment also considered the quality of spawning, nursery and holding habitat for salmonids and lamprey within the vicinity of the survey sites.

The fisheries appraisal for the lakes was accompanied by eDNA lake metabarcoding to profile the fish stocks.

Lake macro-invertebrate communities

The 5 no. lake sites were sampled for macro-invertebrates via sweep netting in September 2023. A standard pond net (250mm width, mesh size 500µm) was used to sweep macrophytes and submerged vegetation to capture macro-invertebrates. The net was also moved along the lake bed to collect epibenthic and epiphytic invertebrates from the substratum (as per Cheal *et al*., 1993). A 3-minute sampling period was employed.

To ensure appropriate habitat coverage, the sampling period was also divided amongst the range of meso-habitats present at the survey sites to get a representative sample for sub-habitats.

The full aquatic report with the fish results is provided in Appendix K - Part 2.

Fish Surveys (2015)

The initial fish surveys were undertaken by Triturus Environmental Services Ltd. in September 2015.

All equipment and PPE used was disinfected with Virkon® prior to and post-survey completion, and best practice precautions were employed to prevent the potential spread of invasive species and water-borne pathogens, according to standard Inland Fisheries Ireland (IFI) biosecurity protocols (available at http://www.fisheriesireland.ie/fisheries-research-1/73-biosecurity-protocol-for-field-survey-work-1).

Fyke Netting Survey

Boat based fyke netting surveys were undertaken at Ballindooley Lough and the Coolagh Lakes. In advance of setting the nets a high-resolution transducer was used to locate fish markings and establish a depth profile of the lake basins. This facilitated the positioning of the fyke nets near shelf drop offs and helped establish distributional patterns of fish. Five 1.5m diameter (D shaped) fyke nets, with multi panel mesh, were placed in the margins of the lakes in the littoral zones (windward bank) and in shallow bay areas overnight, and retrieved within 24 hours. The fish captured were measured by two personnel and length frequency graphs and species composition graphs were constructed. All fish were processed quickly and returned alive to the lakes.

The full fish survey report is provided in Appendix K Part 1.

4.4.2 Hydrological Surveys and Monitoring

The Project crosses catchments/sub-catchments that drain to European sites including the River Corrib (the location where the proposed N6 GCRR crosses the River Corrib lies within Lough Corrib SAC) and four other watercourse catchments/subcatchments (Sruthán na Líbeirtí, the Trusky Stream, the Bearna Stream, the Tonabrocky Stream and the Knocknacarragh Stream), all of which flow into Galway Bay; some directly into that part of Galway Bay designated as Galway Bay Complex SAC and Inner Galway Bay SPA with the remainder entering the bay to the west of the European sites' boundaries.

Hydrological surveys including water quantity and quality monitoring were undertaken in 2024 to verify and validate the results from the previous surveys undertaken between 2014 and 2018 to inform this updated NIS.

The hydrological study included both a desk review and field surveys. The desk study included consultation with relevant regulatory bodies, a review of published hydrological literature, aerial photography, and topographical and hydrometric information related to waterbodies within the zone of influence of the Project. Field surveys undertaken included walkover assessment (with the most recent walkover undertaken in 2024 to inform this updated NIS), stream and river surveys and water quality monitoring which along with the findings and data collated during the desk review informed the hydrological modelling. Information presented during the oral hearing in 2020 with respect to hydrology has also been taken into account in the assessments undertaken to inform this updated NIS.

The full hydrological survey methodology is provided in Appendix B.

4.4.3 Hydrogeological Surveys and Monitoring

The Project traverses several groundwater bodies that support groundwater dependant wetland habitats within European sites (e.g. the Coolagh Lakes which form part of the qualifying interests of Lough Corrib SAC). Hydrogeological surveys including groundwater quantity and quality monitoring were undertaken in 2023 and 2024 to verify and validate the results from the previous surveys undertaken between 2014 and 2018 to inform this updated NIS. A hydrogeological site walkover also took place in 2024. In addition, the hydrogeological study undertaken to inform the 2018 NIS and the information presented during the oral hearing in 2020 with respect to hydrogeology was reviewed and used to inform this updated NIS.

The hydrogeological study included both a desk review and field surveys/ground investigations. The hydrogeological field surveys and ground investigation works were designed, planned and carried out so as to avoid any impacts on European sites and were subject to screening for appropriate assessment by Galway County Council – which determined that ground investigation works were not likely to have a significant effect on any European site.

The field surveys included a survey of pre-existing monitoring wells, a survey of karst features and ground investigation including groundwater monitoring installations. The ground investigations included boreholes, trial pits, window sampling[21] and geophysical surveys, hydrogeological monitoring and testing. In summary, these investigations comprised:

- 37 No. groundwater monitoring wells
- 20 No. groundwater level monitoring rounds[22]
- 14 No. groundwater quality monitoring rounds
- 15 No. infiltration test
- 16 No. variable head permeability tests
- 8 No. packer tests
- 2 No. step pumping test

The full hydrogeological survey methodology used to gather hydrogeological data for the full extent of the Project (including the locations of ground investigation works) is provided in the supporting Hydrogeology Assessment Report in Appendix A and the Lackagh Tunnel Geotechnical and Hydrogeology Appraisal Report in Appendix F.

In addition to the above, as part of the work undertaken to inform the 2018 NIS, a specific focus study was undertaken to understand the groundwater regime around the Coolagh Lakes, an area of Annex I habitats, including QI habitats for the Lough Corrib SAC, specifically with regards to the Lackagh Quarry. An Eco-hydrogeology Summary Report for Lough Corrib SAC was submitted at the oral hearing in 2020 in response to queries raised by the Inspector appointed by ABP. That report was reviewed for this updated NIS and that review did not alter the findings of hydrogeological assessment reported in the 2018 NIS. A copy of the Eco-hydrogeology Summary Report for Lough Corrib SAC is included in Appendix L.

[21] A window sample is used to bore shallow boreholes, usually up to 5mbgl depending on the soil type, to obtain soil samples for assessment.

[22] Groundwater monitoring of water level and water quality was undertaken between February 2015 and April 2017 then also between November 2023 and July 2024. The February 2015 to April 2017 monitoring included a total of 16 groundwater monitoring rounds. Water level measurements on individual wells were also taken during commissioning, well testing and spot checks. In total 54 individual wells were regularly measured, which comprised of 34 project specific wells, 16 (2006 GCOB wells) and 4 private wells. A period of monitoring following the well installation and results are presented in the Ground Investigation Reports in Appendix A.9.1a, A.9.1b, A.9.1c and A.9.1d of the updated EIAR. Groundwater sampling was undertaken in 18 groundwater monitoring wells (refer to Appendix 10.3 and 10.4 of the updated EIAR for details) The November 2023 to July 2024 included a total of four rounds of the wells that were sampled for water quality during 2015 to 2017. This comprised of 16 wells, which were the same as those sampled in 2015 to 2017 with the exception of two locations (refer to Appendix 10.3 and 10.4 of the updated EIAR for details).

4.4.4 Geotechnical Baseline – Lackagh Tunnel

Site specific ground investigation (GI) works were undertaken in 2015 and 2016 to identify the existing geological environment and ground conditions at Lackagh Quarry. The ground conditions (type of material, depth to rock and its strength) at Lackagh Quarry have remained unchanged since 2018, as there have been no events that would result in changes. As such no additional ground investigations were required and the data obtained from the 2015 and 2016 GI investigations which comprise of the items below still apply:

- Desk study and site walkover
- One horizontal borehole
- Four vertical boreholes
- Geophysical Survey (surface and downhole)

The locations of the GI relevant to investigating the geological baseline and ground condition at Lackagh Quarry, are shown on Figure 3.12 of the Lackagh Tunnel Report (Appendix F). This Lackagh Tunnel Report was reviewed and updated to include any clarifications made during the 2020 oral hearing in response to queries raised by ABP at that time. Any of these updates did not result in any changes to the conclusions of the 2018 NIS or the conclusions of this updated NIS.

5. Existing Ecological Baseline

The local ecological baseline, including European sites, is described in this section of this updated NIS and reflects the current status and the results of surveys undertaken in 2022 to 2023 to update/validate the previous survey results. The hydrological and hydrogeological baseline data is also outlined here and reflects the findings of the surveys undertaken in 2023 and 2024. The hydrological and hydrogeological baseline data is related to the assessment of the ecological impacts as they include potential pathways for impacts from the Project to affect European sites locally.

5.1 Changes to the Baselines since 2018 NIS

In general, the distribution and extent of habitats, and the distribution and abundance of flora and fauna species, is broadly consistent with that recorded previously to inform the appropriate assessment presented in the 2018 NIS. Since October 2018, the NPWS has updated the spatial data for designated areas, particularly affecting Lough Corrib SAC, the only European site intersected by the Project. The site's boundary has been slightly revised, reducing the overlap with the Project from approximately 4 hectares in 2018 to about 3.8 hectares in 2024.

In 2019, the Special Conservation Interests (SCIs) for Inner Galway Bay SPA were modified to include Black-throated diver and exclude Shoveler. In March 2024, bottlenose dolphin and harbour porpoise were added as qualifying interests at 16 marine and coastal SACs, with the closest to the Project being Inishmore Island SAC and Kilkieran Bay and Islands SAC. Fauna baseline updates show minor changes, but the distribution and abundance of qualifying species remain consistent with 2018 data.

Overall, the hydrological and hydrogeological conditions supporting the conservation of habitats and species have remained unchanged.

There have been minor changes to the habitat baseline within and around Lough Corrib SAC but no changes to the location or extent of QI habitats within, or in the vicinity of, the Project. The more significant changes in habitat types are indicated below in Section 5.2.

5.3 Underlying Geology and Habitats

As per the 2018 NIS, the western part of the Scheme Study Area is underlain by granite and the eastern by limestone and, as a consequence, the nature of the habitats present across the Assessment Boundary are generally acidic in nature west of the N59 Moycullen Road and calcareous to the east.

West of the N59 Moycullen Road, and, other than some land use changes, largely unchanged since the 2018 NIS, the habitats generally consist of a mosaic of agricultural fields, peatland/heath habitats and scrub, separated into distinct habitat blocks of varying sizes by the local road network and the associated linear residential development. The character of the agricultural fields varies from intensively managed farmland through to abandoned fields overgrown with scrub and bracken. The peatland habitat blocks consist of predominantly wet heath, dry heath and bog mosaics. These peatland habitat blocks vary in size and include some smaller, more isolated, remnant patches of heath. Small areas of fen and transition mire are also present. Given the close proximity of Galway City there are also large expanses of urban and residential development adjacent to the Project, particularly around Ballyburke/Rahoon area and where the proposed N6 GCRR crosses the N59 Moycullen Road at Dangan.

East of the N59 Moycullen Road, and, other than some land use changes, largely unchanged since the 2018 NIS, there are two distinct habitat zones; the area from the River Corrib to the N84 Headford Road is comprised of a patchwork of semi-natural woodland, Limestone pavement, scrub and calcareous grassland fields. East of the N84 Headford Road is predominantly improved agricultural grasslands, set amongst isolated patches of scrub, semi-natural woodland and Limestone pavement of varying sizes, surrounded by residential and industrial development in Parkmore, Ballybrit, Briarhill and Doughiska. There are also two wetland complexes of note in this section, namely the Coolagh Lakes and Ballindooley Lough. There are also some isolated patches of semi-natural habitats, calcareous grassland and Limestone pavement, in the Coolagh/Doughiska area.

The habitat types recorded along the Project during the most recent surveys between 2022 and 2024 (and also included in the 2018 NIS) are as follows:

- Flower beds and borders (BC4)
- Buildings and artificial surfaces (BL3)
- Spoil and bare ground (ED2)
- Recolonising bare ground (ED3)
- Exposed siliceous rock (ER1)
- Exposed calcareous rock (ER2), including the priority Annex I habitat *8240
- Limestone/marl lakes (FL3), including the Annex I habitat 3140
- Mesotrophic lakes (FL4)
- Eutrophic lakes (FL5)
- Turloughs (FL6), which corresponds with the priority Annex I habitat *3180
- Other artificial lakes and ponds (FL8)
- Calcareous springs (FP1), including the priority Annex I habitat *7220
- Reed and large sedge swamps (FS1), including the priority Annex I habitats *7210 and the Annex I habitat 6430
- Tall-herb swamps (FS2), including the Annex I habitats 6430/*7210
- Eroding/upland rivers (FW1)
- Depositing/lowland rivers (FW2), including the priority Annex I habitat 3260 (3260 was reassessed and reclassified, on a precautionary basis, as Annex I habitat since the 2018 NIS)

- Drainage ditches (FW4)
- Improved agricultural grassland (GA1)
- Amenity grassland (improved) (GA2)
- Marsh (GM1)
- Dry calcareous and neutral grassland (GS1), including the priority Annex I habitat *6210/Annex I habitat 6210
- Dry meadows and grassy verges (GS2), including the Annex I habitat 6510
- Dry-humid acid grassland (GS3), including the priority Annex I habitat *6230
- Wet grassland (GS4), including the Annex I habitat 6410
- Dense bracken (HD1)
- Dry siliceous heath (HH1), which corresponds with the Annex I habitat 4030
- Dry calcareous heath (HH2), which corresponds with the Annex I habitat 4030
- Wet heath (HH3), which corresponds with the Annex I habitat 4010
- Rich fen and flush (PF1), including the Annex I habitats 7230/*7210
- Poor fen and flush (PF2)
- (Mixed) broadleaved woodland (WD1)
- Mixed broadleaved/conifer woodland (WD2)
- (Mixed) conifer woodland (WD3)
- Scattered trees and parkland (WD5)
- Hedgerows (WL1)
- Treelines (WL2)
- Oak-ash-hazel woodland (WN2), including the priority Annex I habitat *8240
- Wet willow-alder-ash woodland (WN6), including the priority Annex I habitat *91E0
- Scrub (WS1), including the priority Annex I habitat *8240
- Ornamental/non-native shrub (WS3)
- Recently-felled woodland (WS5)

The following habitats are in addition since the 2018 NIS due to additional surveys undertaken in 2019, 2022 and 2023 (e.g.: BL1 and WD4), borderline habitats around the Assessment Boundary (e.g.: PB3 and PF3) and reclassification of habitats:

- Stone walls and other stonework (BL1)
- Depositing/lowland rivers (FW2), was included in the 2018 NIS, but has been reassessed and reclassified to the corresponding priority Annex I habitat 3260
- Lowland blanket bog (PB3), including the Annex I habitat *7130
- Transition mire and quaking bog (PF3), including the Annex I habitat 7140
- Conifer Plantation (WD4)

The following habitats were present in the 2018 NIS but are no longer present on site:

- Active quarries and mines (ED4) – the quarry continues to be disused, is no longer an active quarry and has been reclassified as ED3
- Immature woodland (WS2) was a borderline species now outside the Assessment Boundary or ZoI

Habitat mapping of the local area, which has been updated to take account of the findings of the most recent surveys undertaken in 2022 and 2023, is provided showing:

- Fossitt (2000) habitat classifications:
  - Current status of habitat in accordance to Fossitt Codes presented Figures 15.1 to 15.5
  - 2018 status of habitat in accordance to Fossitt Codes presented Figures 16.1 to 16.5
- Priority Annex I or Annex I habitat classification:
  - Current status of habitat in accordance to Annex I habitat types (refer to Figures 17.1.A to 17.5.A
  - 2018 status of Annex I habitat types presented Figures 18.1 to 18.5

5.4 Hydrogeological Baseline

This section has been updated to include the information provided during the oral hearing in 2020 to clarify groundwater body boundaries and flows, particularly with regard to the groundwater dependent terrestrial ecosystems (GWDTEs). The underlying hydrogeological baseline environment supporting the conservation condition of the QI/SCI habitats and species of the European sites within, and in the vicinity of, the Project has not changed since the 2018 NIS.

The Project traverses the following groundwater bodies (GWB is the boundary that marks the catchment within which all recharge and groundwater flow is contained) – refer to Figures 11.1.1 and 11.1.2 for locations relative to the Project:

- Spiddal GWB is traversed by the Project
- Maam – Clonbur GWB is traversed by the Project
- Ross Lake GWB is traversed by the Project
- Lough Corrib Fen 1 GWB is traversed by the Project and incorporates the following two GWBs:
  - Lough Corrib Fen 1 (Menlough) GWB north of Coolagh Lakes, and feeding the upper Coolagh Lake (which flows to the River Corrib) via a spring
  - Lough Corrib Fen 1 (Lackagh) GWB, a small compartmentalised GWB (<0.04km^2) east of Coolagh Lakes between Lough Corrib and Lackagh Quarry
- Lough Corrib Fen 2 GWB is within 500m of the Project
- Clare-Corrib GWB is within 500m of the Project and includes:
  - Clare-Corrib (Ballindooley West) GWB
  - Clare-Corrib (Ballindooley East) GWB
  - Clare-Corrib (Terryland) GWB
- Clarinbridge GWB is traversed by the Project

Unchanged since the 2018 NIS, the western part of the study area, from the R336 Coast Road west of Bearna Village to the N59 Moycullen Road, is underlain by the Galway Granite Batholith. The Spiddal GWB and the Maam – Clonbur GWB lie within this, with Spiddal GWB contributing groundwater to Galway Bay Complex SAC and Inner Galway Bay SPA (see Figures 11.2.1) and Maam – Clonbur GWB contributing to the Lough Corrib SAC and Lough Corrib SPA (and Galway Bay Complex SAC and Inner Galway Bay SPA,

via the River Corrib). However, both are considered poor aquifers and most rainfall would run off to streams and rivers, with a small component of groundwater discharging to Galway Bay.

Unchanged since the 2018 NIS, the eastern part of the study area, from the N59 Moycullen Road to the N6 Junction at Coolough, is underlain by limestone. This area lies within the Visean Undifferentiated Limestone aquifer that has karst conduit groundwater flow (Plate 5.1). This aquifer is subdivided into the Ross Lake GWB, the Lough Corrib Fen 1 GWB, the Lough Corrib Fen 2 GWB, the Clare-Corrib GWB and the Clarinbridge GWB (Plate 5.2 below). In terms of their connectivity to European sites:

- Ross Lake GWB, the Lough Corrib Fen 1 (Menlough) GWB, the Lough Corrib Fen 2 GWB and the Clare-Corrib GWB are connected to Lough Corrib SAC
- Ross Lake GWB, the Lough Corrib Fen 2 GWB, the Clare-Corrib GWB are connected to the Lough Corrib SPA
- All GWBs, by way of the River Corrib, are connected to the Galway Bay Complex SAC and Inner Galway Bay SPA

The Ross Lake GWB contributes groundwater to the River Corrib (Plate 5.2 below), which in this area lies within Lough Corrib SAC and Lough Corrib SPA (see Figures 11.2.1 and 11.2.2).

Unchanged since the 2018 NIS, the Lough Corrib Fen 1 GWB extends east from the River Corrib to the townland of Coolough and has been divided into the Lough Corrib Fen 1 (Menlough) GWB (point 2 on Plate 5.2 below) and Lough Corrib Fen 1 (Lackagh) GWB (point 8 on Plate 5.2 below). Lough Corrib Fen 1 (Menlough) GWB lies north of Coolagh Lakes and Lough Corrib Fen 1 (Lackagh) GWB forms a small GWB (<0.04km^2) between Lough Corrib and Lackagh Quarry. Groundwater flows westwards within the Lough Corrib Fen 1 (Menlough) GWB and the Western Coolagh Karst Spring (K25) within this GWB supplies the Coolagh Lakes, which drain into the River Corrib. Western Coolagh Spring (K25) is a karst spring and forms part of the Lough Corrib Fen 1 (Menlough) GWB - see refer to Appendix A, of which an extract is shown in Plate 5.1 below. Western Coolagh Spring (K25) provides groundwater flow to the upper lake of Coolagh Lakes, connecting the groundwater flow from Lough Corrib Fen 1 (Menlough) GWB to the Lough Corrib SAC. Due to the compartmentalisation of the aquifer by buried valleys/palaeokarst, the groundwater in Lough Corrib Fen 1 (Lackagh) GWB is largely contained. Due to the thick clay subsoil there are no observed discharges from the limestone bedrock to the Eastern Coolagh Spring and the compartmentalisation prevents discharge to Western Coolagh Spring. Instead, groundwater flow from Lough Corrib Fen 1 (Lackagh) is likely to flow eastwards to Lackagh Quarry during peak groundwater levels. There is a potential for seepage from the limestone aquifer through the clayey subsoil to the Eastern Coolagh Spring but due to the low permeability and thickness of the clayey subsoil, these potential seepages are of a very low flow rate. If present, seepages from the subsoil to the Eastern Coolagh Spring would represent a very small fraction of the groundwater contribution to Coolagh Lakes, and, therefore, the River Corrib and associated European sites, compared to the karst inflow at Western Coolagh Spring (K25), which provides the main groundwater contribution flow to Coolagh Lakes. This interaction is explained further in Appendix A.

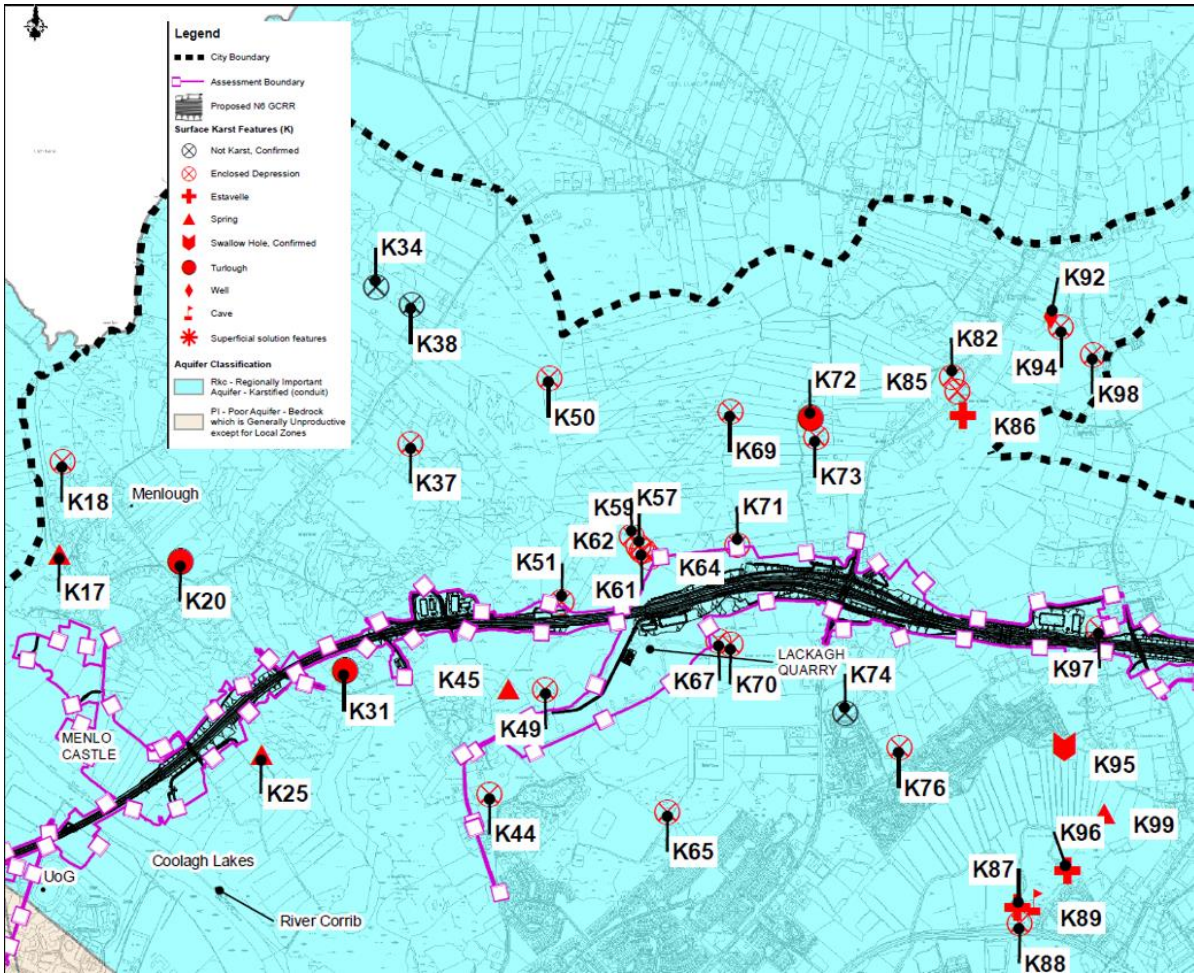


Plate 5.1 Extract from Figure 1.02 of Appendix A showing locations of Western Coolagh Spring (K25) and the Eastern Spring (K45)

Unchanged since the 2018 NIS, the Lough Corrib Fen 2 GWB (point 3 on Plate 5.2 below) lies within the unmitigated hydrogeological ZoI (refer to Figure 11.3.001 to 11.3.010 and Figures 12.1.001 to 12.1.008)This GWB contributes groundwater to the River Corrib which is part of Lough Corrib SAC and Lough Corrib SPA and flows downstream to Galway Bay which is part of Galway Bay Complex SAC and Inner Galway Bay SPA.

Unchanged since the 2018 NIS, the Clare-Corrib GWB (point 4 on Plate 5.2 below) is divided up into three sections: Ballindooley West, Ballindooley East (west and east respectively of Ballindooley Lough) and Terryland (the area between the River Corrib and Terryland River). These groundwater bodies contribute to the River Corrib (Lough Corrib SAC and Lough Corrib SPA) and Terryland River catchments which ultimately drain to Galway Bay and Galway Bay Complex SAC and Inner Galway Bay SPA (see Figure 11.1.2 and Figure 11.2.2 together with to 11.3.001 to 11.3.010 and Figures 12.1.001 to 12.1.008). Clare-Corrib GWB includes Ballindooley Lough and the surrounding wetlands but Ballindooley Lough lies up gradient of the Project and therefore, beyond the ZoI of groundwater-related effects.

Unchanged since the 2018 NIS, the Clarinbridge GWB also contributes groundwater to Galway Bay and hence Galway Bay Complex SAC and Inner Galway Bay SPA (see Figure 11.1.2 and Figure 11.2.2).

This is illustrated on Plate 5.2 below. The full results of the hydrogeology study, including groundwater level measurements, are presented in Appendix A.

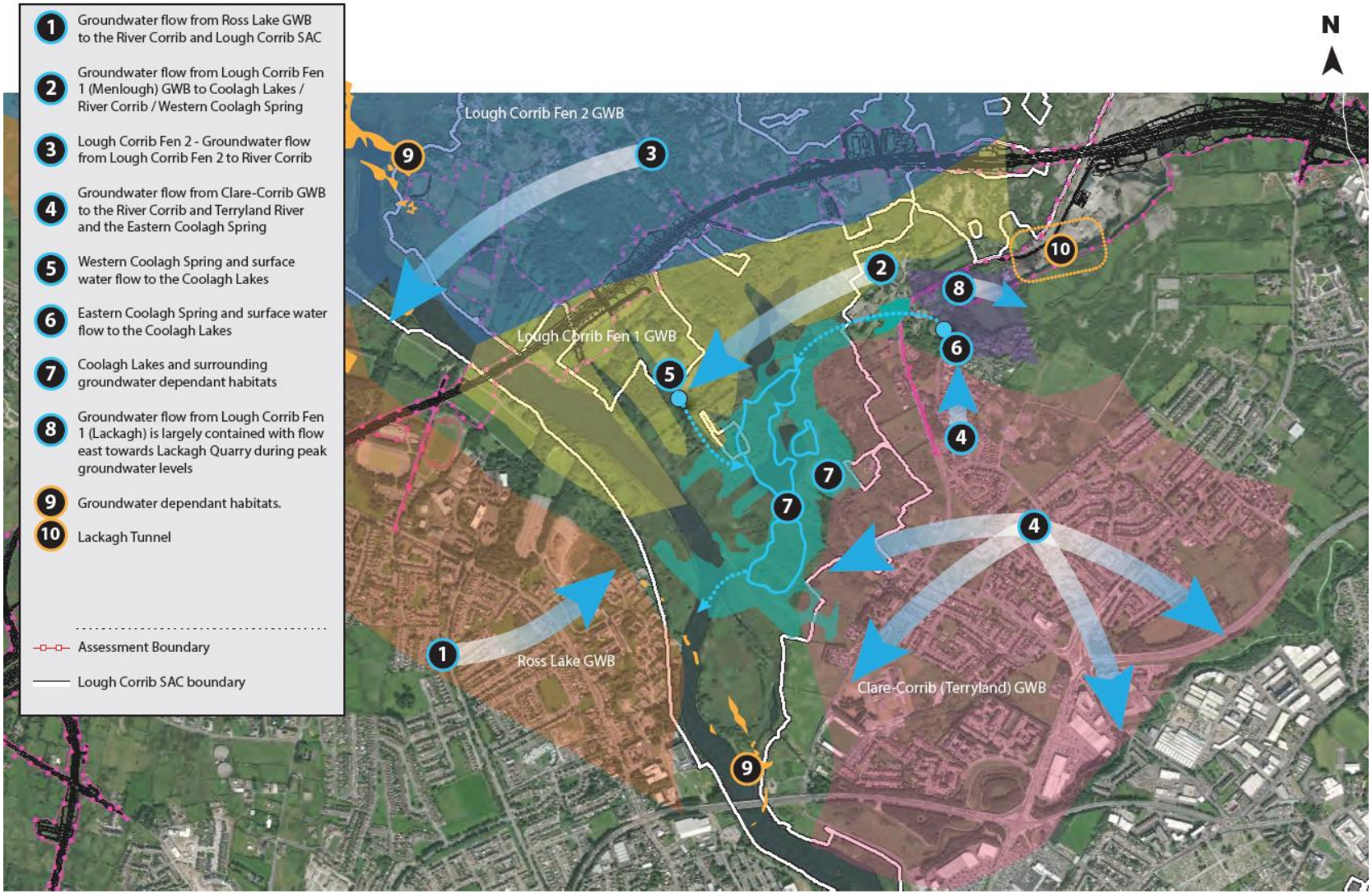


Plate 5.2 Generalised Hydrogeology Interactions with European Sites

5.4.1 Eco-hydrology Summary for Lough Corrib SAC

At the oral hearing in 2020, an Eco-hydrogeology Summary Report for Lough Corrib SAC was submitted in response to queries raised by the Inspector appointed by ABP. A copy of this report is included in Appendix L and is summarised below.

The groundwater investigations (Appendix L) indicated that the predominant groundwater flow of the regional groundwater system is towards the surface water features (the River Corrib and Terryland River) and identified four locations where the geology is interrupted by deep buried valleys (River Corrib, Coolagh Lakes/Lackagh Quarry, N84 Headford Road and N83 Tuam Road), which locally interrupt the regional groundwater gradient and either impound and/or deviate the regional trend.

The Coolagh Lakes are largely fed by groundwater, as indicated above, most notably the Western Coolagh Karst Spring. The Coolagh Lakes, part of the Lough Corrib SAC, support various Annex I habitats, including the following QI habitats:

- [3140] Hard oligo - mesotrophic waters with benthic vegetation of *Chara* spp.
- [6410] Molinia meadows on calcareous, peaty or clayey - silt - laden soils (*Molinion caeruleae*)
- [7210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae**
- [7230] Alkaline fens

The Coolagh Lakes and associated habitats and biodiversity are reliant on each other, but also the lake water quality and quantity and are therefore GWDTEs. The hydrogeological regime, particularly the groundwater contribution, needs to be maintained so that the conservation objectives for the QI habitats are not diminished or degraded.

The hydrogeological setting and interaction between groundwater, the Coolagh Lakes and the River Corrib were therefore specifically explored (Appendix L) in terms of both lake water level and water quality and any interaction with the Lackagh Quarry.

The Coolagh Lakes comprises of lakes in topographic depressions within an extent of thick, low permeability silt and clay subsoil deposits, which are bound to the north and east by limestone and are part of the palaeolandscape. Due to the thickness and low permeability of the fill sediment, any groundwater contribution through the base of the lakes is unrealistic. The Western Coolagh Spring is located at the margin of this significant vertical palaeolandscape feature, and is the dominant water source to the Coolagh Lakes [fed by groundwater from the Lough Corrib Fen 1 (Menlough) GWB]. The flow at Western Coolagh Spring is seasonal, with peak flows occurring in the winter and flow reducing in the summer to the extent that flow ceases.

Other than Western Coolagh Karst Spring there are no other karst springs around the periphery of the lakes. It is noted that the only other 'spring' feature associated with Coolagh Lakes is a pond at the head of a drain, which has been named Eastern Coolagh Spring, located within the thick clay deposits in the valley floor, with no measurable flow at the spring or immediately downstream, expected to be restricted to subsoil seepage.

The catchment to the Western Coolagh Spring comprises the Lough Corrib Fen 1 (Menlough) GWB. The catchment for seepages to Coolagh Lakes comprises Lough Corrib Fen 1 (Menlough) GWB, Lough Corrib Fen 1 (Lackagh) GWB and the Clare-Corrib GWB. The catchment to Coolagh Lakes does not include Lackagh Quarry.

The level of the River Corrib can influence the water level in the Coolagh Lakes as the river responds more rapidly than the groundwater levels (and Western Coolagh Spring) and water levels can rise slightly higher than the Coolagh Lakes during storm events (by up to 25cm). This can lead to water from the river entering the lower lake and mixing with the lake water; unlikely to enter the upper lake, but the rise of water level in the lower lake will cause impoundment in the upper lake.

Groundwater from Western Coolagh Spring and surrounding monitoring boreholes indicted a high alkalinity (>180mg/l total alkalinity $CaCO_3$), in line with the habitat description for Coolagh Lakes supporting alkaline fen. It was also noted that the total alkalinity of the Western Coolagh Spring was slightly lower than other water samples from boreholes in limestone, most likely due to the faster flow through the aquifer which has reduced limestone contact time. As discussed above, the inflow from River Corrib during storm events, will cause dilution in the lower lake and water quality in the lower lake can fluctuate (natural fluctuation); not the case for the upper lake.

In additional to the regional groundwater system there is also local perching of the groundwater table at specific stratigraphic horizons. One horizon in particular, an argillaceous limestone observed in Lackagh Quarry, perches recharge in the Menlough/Lackagh Quarry area and sits above the limestone. The Lackagh Quarry has removed this perched groundwater horizon and infiltration is directly to the quarry and then directly to the regional aquifer via the quarry floor. Boreholes logged to the west of the quarry did indicate locations where leakage occurs from the perched horizons down to the regional groundwater table. Groundwater levels in these areas will show localised recharge spikes in response to storm event related which will be temporary as the regional groundwater table equilibrates.

The regional groundwater table at Lackagh Quarry diverts in two directions due to a buried valley west of the quarry. The flow is west to the River Corrib and south, then southwest to the River Corrib, south of the Coolagh Lakes. The perched aquifer would have contributed to the groundwater system feeding the Coolagh Lakes, but now feeds into the Lackagh Quarry as described above and is no longer connected to the Coolagh Lakes. Therefore, groundwater from Lackagh Quarry does not drain to Coolagh Lakes. This regime will not be modified by the proposed N6 GCRR, or the Project, and as such the groundwater at Lackagh Quarry will remain separate to Coolagh Lakes.

5.5 Hydrological Baseline

The findings of the hydrological surveys undertaken in 2024 have not resulted in any changes to the underlying hydrological baseline environment supporting the conservation condition of the QI/SCI habitats and species of the European sites within, and in the vicinity of, the Project to an extent that affects the findings presented in the 2018 NIS and this updated NIS.

Unchanged since the 2018 NIS, the Project crosses the catchments/sub-catchments of eight watercourses, as listed below in Table 5.1. The River Corrib channel lies within Lough Corrib SAC. All other watercourses flow into Galway Bay; some directly into that part of Galway Bay designated as Galway Bay Complex SAC and Inner Galway Bay SPA with the remainder entering the bay to the west of the European sites' boundaries. The full results of the hydrology study are presented in Appendix B with the drainage catchment crossed by the Project shown on Figures 13.1 and 13.2. The Q values are described further in Appendix K Part 1 and Part 2 for 2018 and 2023 respectively.

Table 5.1 Watercourses/Waterbodies crossed by, or within the ZoI of, the Project and links to European sites

Watercourse System (2023 Survey Points)	Biological Water Quality[23] (2018)	Biological Water Quality (2023)	Link to European Site(s)
Sruthán na Líbeirtí (F1, F2, F3) & Newvillage Stream (F4)	Q3	F1, F2, F3 – Q3 F4 – Q2-3	Galway Bay c.3.6km west of Galway Bay Complex SAC and Inner Galway Bay SPA
Trusky Stream (E2, E3, E5), Cloghscoltia Stream (E1), & Freeport Stream (E4)	Q3	E1, E5 – Q3 E4 – Q2-3 E2, E3 – No flowing water to collect sample	Galway Bay at Bearna Village c.1.4km west of Galway Bay Complex SAC and Inner Galway Bay SPA

[23] After Toner *et al*., 2005: Q5, Q4-5 and Q4 = Unpolluted, Class A; Q3-4 = Slightly polluted, Class B; Q3 or Q2/3 = Moderately polluted Class C; and, Q2, Q1/2 or Q1 = Seriously polluted Class D. Biological water quality classification does not apply to surface water lakes (e.g. Coolagh Lakes and Ballindooley Lough)

Watercourse System (2023 Survey Points)	Biological Water Quality[23] (2018)	Biological Water Quality (2023)	Link to European Site(s)
Bearna Stream (D1, D2, D6) and tributary (Oddacres Stream – D4 & Loughinch Stream – D5)	Q4/Q3	D1, D4 – Q3 D2 – Q4 D5 – Q2-3 D6 – Q3-4	Rusheen Bay – within Galway Bay Complex SAC and Inner Galway Bay SPA
Tonabrocky Stream (D3)	Q4	D3 – Q4 C9 – no access as stream was culverted underground	Rusheen Bay – within Galway Bay Complex SAC and Inner Galway Bay SPA
Knocknacarra Stream (C1, C2, C3, C4, C5, C8) and tributaries (C6, C7) & Tonabrocky Stream (C9)	Q3	C1 – Q3 C6 – Q3 C2, C3, C4, C5, C7, C8 – Culverted underground (no access	Rusheen Bay – within Galway Bay Complex SAC and Inner Galway Bay SPA
River Corrib (B1)	Q4	Q3	Galway Bay Complex SAC and Inner Galway Bay SPA (Galway City)
Coolagh Lakes (L3, L4) (and unnamed pond - L5)	N/A	N/A	Within Lough Corrib SAC
Ballindooley Lough (L2) (and unnamed Pond - L1)	N/A	N/A	Supports wintering bird species listed as SCIs of Lough Corrib SPA and/or Inner Galway Bay SPA

The water quality sampling results, including the results from the 2024 hydrological surveys are presented in the Hydrology Assessment Report in Appendix B (see Annex A of that report). The results showed consistently good quality water at all of the sites with nutrient, Biochemical Oxygen Demand (BOD), sediments and heavy metal concentrations well within acceptable limits based on the surface water regulations. Bacterial faecal contamination was identified at all locations, possibly associated with the presence of agricultural activities and point septic tank and slurry pit sources within the respective catchments.

The western watercourses (Bearna, Trusky and Sruthán na Líbeirtí Streams) associated with the granite bedrock and peatland areas showed slightly lower pH, lower alkalinity and hardness, and elevated iron concentrations in comparison to the eastern limestone watercourses. The most alkaline and highest hardness waters were found within Ballindooley Lough followed by the Coolagh Lakes.

Full descriptions of these river catchments, and both the Coolagh Lakes and Ballindooley Lough, are provided in Section 3.7 of Appendix B Hydrology Assessment Report).

5.6 Flora and Fauna Species

The diverse range of habitats present across the Scheme Study Area supports an equally diverse species assemblage, and this is also reflected within the Assessment Boundary.

The number of bat species present, and their distribution across the survey area, can be considered consistent (minor deviations in population dynamics) with that presented in the 2018 NIS and 2018 EIAR, which supports populations of the following bat species: the Lesser horseshoe bat *Rhinolophus hipposideros*, Leisler's bat *Nyctalus leisleri*, the Common pipistrelle bat *Pipistrellus pipistrellus*, Soprano pipistrelle bat *Pipistrellus pygmaeus*, Nathusius' pipistrelle bat *Pipistrellus nathusii*, Brown long-eared bat *Plecotus auritus*, Daubenton's Bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri* and the Whiskered bat *Myotis mystacinus*.

Otter *Lutra lutra* populations are consistently associated with the River Corrib, the Bearna Stream catchment and Galway Bay with no material changes in activity recorded along the River Corrib and in, around and downstream of the Assessment Boundary (considered a throughfare for Otters rather than resting area) since the 2018 NIS.

Other mammal species present include Badger *Meles meles*, Pine marten *Martes martes*, Wood mouse *Apodemus sylvaticus*, Red squirrel *Sciurus vulgaris*, Irish stoat *Mustela erminea hibernica*, Irish hare *Lepus timidus hibernicus*, Hedgehog *Erinaceus europaeus* and the Pygmy shrew *Sorex minutus*, Fox *Vulpes vulpes*, Rabbit *Orytolagus cuniculus*, Mink *Mustela vison* and the Bank vole *Myodes glareolus*. This is unchanged since the 2018 NIS.

Galway Bay supports a diverse range of marine mammal species, including: Harbour seal *Phoca vitulina*, Grey seal *Halichoerus grypus*, Common dolphin *Delphinus delphis* and Harbour porpoise *Phocoena phocoena*. All cetacean species are also protected under the Habitats Directive (Annex IV). This is unchanged since the 2018 NIS.

As noted in the 2018 NIS, although not present in the River Corrib, there are populations of the White-clawed crayfish *Austropotamobius pallipes* and the Freshwater pearl mussel *Margaritifera margaritifera* upstream of the Project within the River Corrib catchment. A Marsh fritillary butterfly *Euphydryas aurinia* population is present in the western part of the study area, associated with the mosaic of rough grassland, heath and bog habitats there.

Wetland habitats associated with the River Corrib, the Coolagh Lakes and Ballindooley Lough also support a rich mollusc assemblage, including the Marsh whorl snail *Vertigo antivertigo* which is listed as vulnerable in the Irish Red Data List of molluscs (Byrne *et al*., 2009). This is unchanged since the 2018 NIS.

A diverse range of both breeding and wintering bird species have been recorded during the surveys carried out in the preparation of the 2018 NIS and this updated NIS. This includes many bird species which are listed as SCIs for the surrounding SPA sites.

The winter bird surveys undertaken for this Project between 2014 and 2024, recorded the following bird species, which are listed as SCIs for SPA sites locally for their wintering populations: Bar-tailed *godwit Limosa lapponica*, Light-bellied brent goose *Branta bernicla hrota*, Black-headed gull *Chroicocephalus ridibundus*, Cormorant *Phalacrocorax carbo*, Common gull *Larus canus*, Coot *Fulica atra*, Curlew *Numenius arquata*, Golden plover *Pluvialis apricaria*, Grey heron *Ardea cinerea*, Hen harrier *Circus cyaneus*, Lapwing *Vanellus vanellus*, Great northern diver *Gavia immer*, Redshank *Tringa totanus*, Shoveler *Anas clypeata*, Teal *Anas crecca*, Turnstone *Arenaria interpres*, Tufted duck *Aythya fuligula* and Wigeon *Anas penelope* with the Gadwall *Anas strepera* and the Ringed plover *Charadrius hiaticula* confirmed in the recent 2023/2024 and 2022/2023 surveys respectively. Many of these were also recorded along the River Corrib corridor, which is consistent with the findings of the wintering bird surveys undertaken to inform the 2006 Galway City Outer Bypass Project (RPS, 2006) (Appendix G), repeatedly associated with the Coolagh Lakes, Ballindooley Lough, and also along the coastal areas west of the western extent of the proposed GCRR. See Appendix J for the wintering bird survey results and Table 5.3 below for which European sites these species are listed as SCIs for their wintering populations.

The breeding bird surveys undertaken for this Project between 2014 and 2024 repeatedly recorded the following bird species, which are listed as SCIs for SPA sites locally for their breeding populations: Black-headed gull, Common tern *Sterna hirundo* and Cormorant, with the Common gull, confirmed as a breeding bird in the 2023 surveys. See Appendix I for the results of the breeding bird surveys and Table 5.3 below for which European sites these species are listed as SCIs for their breeding populations.

The baseline with respect to fish is consistent with that presented in the 2018 NIS, with the exception of a recording of the presence of the invasive species zebra mussel at Coolagh Lough, and a recording of European eel in Ballindooley Lough by employing eDNA sampling techniques in 2023. In the western part of the study area, with the exception of the Bearna Stream which supports Atlantic salmon *Salmo salar*, Sea trout *Salmo trutta* forma *trutta*, Brown trout *Salmo trutta* and European eel *Anguilla anguilla*, the watercourses are generally of a limited value for fish species. The River Corrib supports species such as Atlantic salmon, Sea lamprey *Petromyzon marinus*, Brook lamprey *Lampetra planeri* and the European eel. The Coolagh Lakes support coarse fish species such as Perch *Perca fluviatilis* and Roach *Rutilus rutilus* with Pike *Esox lucius*, Rudd *Scardinius erythropthalmus* and Tench *Tinca tinca* also present in Ballindooley

Lough. The Corrib Estuary and Galway Bay are important transitional and marine fisheries habitat, supporting a range of fish species (The Central and Regional Fisheries Boards, 2009).

The Common frog *Rana temporaria* and the Smooth newt *Triturus vulgaris* are widespread in wetland habitats locally. The Common lizard *Zootoca (Lacerta) vivipara* were recorded across the western part of the study area. The baseline status of these species is considered consistent over the survey years.

Slender cottongrass *Eriophorum gracile*, a species protected under the Flora (Protection) Order, 2022, was recorded from the Tonabrocky and Coolanillaun areas. Although the Small white orchid *Pseudorchis albida* (also an FPO protected species) is known from the locality, it was not recorded during any of the surveys carried out in relation to the Project. No additional rare or protected plant species of relevance to this updated NIS were recorded in 2023.

5.7 Non-native Invasive Species

There are three non-native invasive plant species listed on the Third Schedule of the Birds and Habitats Regulations present within, or in close proximity to, the Project. The locations of these invasive species are summarised below in Table 5.2. None of these infestations are in the vicinity of a European site, with the exception Japanese knotweed located in UoG lands (first, underlined, entry in Table 5.2) which is located approximately 25m from the Assessment Boundary (Figure 15.1 and Figure 16.1).

Two additional non-native invasive fauna species were recorded in 2023, namely Zebra mussel *Dreissena polymorpha* and Roach *Rutilus rutilus.* Both species are listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011. All records of both species occur within Lough Corrib SAC. Zebra mussel *Dreissena polymorpha* occurs in the River Corrib near the location of the proposed crossing of the proposed N6 GCRR, downstream of the Project at Jordan's island and in the Coolagh Lakes. Roach *Rutilus rutilus* occurs in the Coolagh Lakes.

Table 5.2 Summary of Non-native Invasive Species Recorded within the Study Area of the Project

Common Name (Scientific Name)	Location
Japanese knotweed* *(Reynoutria japonica)*	2023 Findings: • <u>The nearest infestation to the Lough Corrib SAC boundary: Still present in 2023 as per the 2015-2017 surveys in woodland/scrub, between Ch. 8+800 and Ch. 8+950 of the proposed N6 GCRR at the UoG Sporting Campus, adjacent to the Assessment Boundary</u> • Still present in 2023 as per the 2015-2017 surveys, with additional new records in area of scrub, north of Bóthar Diarmuida Junction, within and adjacent the Assessment Boundary between Ch. 1+800 and Ch. 1 + 900 along the N59 Link Road South • Still present in 2023 as per the 2015-2017 surveys along the Coolough Road, and a new record at Carraig Bán adjacent to the Assessment Boundary • Still present in 2023 as per the 2015-2017 surveys, with two additional new records in an area of rough grassland, within the Assessment Boundary between Ch. 12+200 and Ch. 12+250 of the proposed N6 GCRR at the N84 Headford Road Junction • New record identified in 2023 from along eastern side of the Troscaigh Road (L5387) at Ch. 1+575 of the proposed N6 GCRR • New record identified in 2023 in a field approximately 680 m southeast of the proposed N6 GCRR near Knocknacarra Community Centre between Ch. 4+750 and Ch. 4+950 of the proposed N6 GCRR • New record identified in 2023between hedge and fence, c.20 west of previously recorded location along Rahoon Road, 200m west of the Assessment Boundary, near Bóthar Stiofáin Junction Ch. 2+200 (N59 Link Road South) • New record identified in 2023 in residential area within the Assessment Boundary between Ch. 0+200 and Ch. 0+250 along the N59 Link Road North • New records identified in 2023 from within and just outside the Assessment Boundary near Bushypark Junction between Ch. 0+150 and Ch. 0+250 on the N59 Link Road North New records identified in 2023 on cycle/footpath margin, and grassy verge just outside the Assessment Boundary at Lynch Junction between Ch. 15+800 and 15+850 on the proposed N6 GCRR
	2018 Findings (not confirmed during 2023, but cannot be excluded from prior locations):

Common Name (Scientific Name)	Location
	• Along farm track, south of proposed Bearna West Roundabout, adjacent to the proposed N6 GCRR (c.14m outside Assessment Boundary) at Ch. 0+010 • In rough grassland field with scrub outside of Sli Geal residential estate, near Ballyburke, c.45m outside of the Assessment Boundary. Southeast of Ch. 5+275 of the proposed N6 GCRR • South of the proposed N6 GCRR. Located along minor watercourse. This watercourse is downstream of the proposed N6 GCRR but is crossed further downstream by the proposed N59 South Link Road. Adjacent to residential property located east of the proposed drainage outfall at Rahoon. Approximately 85m outside of the Assessment. Boundary Ch. 6+840 of the proposed N6 GCRR • At Rahoon Road, 180m west of the Assessment Boundary, near Bóthar Stiofáin Junction Ch. 2+200 (N59 Link Road South) • In area of recolonising bare ground within the Assessment Boundary. Ch. 8+370 of the proposed N6 GCRR • Beside an area of scrub at Ballinfoyle off the N84, approximately 30m south of the Assessment Boundary. Ch. 12+375 of the proposed N6 GCRR
Himalayan knotweed* *(Persicaria wallichii)*	2023 Findings: • Still present in 2023, but there is an increase in area since 2015-2017 surveys. Located c.80m (east) and c.135m (west) from the proposed N6 GCRR between Knocknafroska and the N59 Moycullen Road
	2018 Findings (not confirmed during 2023, but cannot be excluded from prior locations): • South of the proposed N6 GCRR, c.41m from the Assessment Boundary at Ch. 8+330
Rhododendron* *(Rhododendron ponticum)*	2023 Findings: • Still present in 2023 as per 2015-2017 surveys, in woodland within the proposed fenceline for the proposed N6 GCRR along eastern side of the Troscaigh Road (L5387) at Ch. 1+600
	2018 Findings (not confirmed during 2023, but cannot be excluded from prior locations): • Recorded in woodland along the eastern side of the Troscaigh Road (L5387), north of the proposed N6 GCRR (Ch. 1+580), directly adjacent to Assessment Boundary (within 3m) • South of the proposed N6 GCRR (Ch. 6+800), located along a minor watercourse. This watercourse is downstream of the mainline for the proposed N6 GCRR but is crossed further downstream by the proposed N59 South Link Road. It is adjacent to a residential property located east of the proposed drainage outfall at Rahoon. Approximately 85m outside of the Assessment Boundary
Three cornered garlic* *(Allium triquetrum)*	Only recorded in 2023, approximately 100m due east of the proposed drainage outfall at AR 0/05 between Ch. 0+850 and Ch. 1+000 on the proposed N6 GCRR
Giant rhubarb* *(Gunnera tinctoria)*	• Only recorded in 2023 along a farm track, approximately 7m north of the proposed N6 GCRR, near Aughnaurra, at Ch. 8+200 • In field c.420m southwest of the River Corrib and c.320m west of the proposed N6 GCRR, near N59 Moycullen Road, north of the Bushypark Junction.
Old man's beard † *(Clematis vitalba)*	• Only recorded once in 2023, in a reedy excavated attenuation pond just north of the existing Coolagh Roundabout to west side of M6/N6 junction. c.Ch. 16 +500 on the proposed N6 GCRR)
Butterfly bush † (*Buddleia sp.*)	Species recorded at more than 68 locations around study area and is a common species
Zebra mussel* *(Dreissena polymorpha)*	• Only recorded in 2023, in the River Corrib near the location of the proposed crossing of the proposed N6 GCRR c.Ch. 9+350 • Recorded in Coolagh Lough (upper and lower) • Recorded c.2km downstream of the project at Jordan's Island
Roach* (*Rutilus rutilus*)	• Only recorded in 2023, in Coolagh Lough (upper and lower)

* Non-native Invasive Species Listed in the Third Schedule of the Birds and Habitats Regulations

† Identified as requiring management on road schemes by Transport Infrastructure Ireland (TII 2020a) and identified as posing a threat to Annex I habitats with European sites as recommended by the Inspector's appointed ecologist, Dr Arnold [appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021].

5.8 European sites

There are 23 European sites (18 SACs and five SPAs) located within or in the vicinity of the ZoI for the Project (see Figure 14). This has increased from the 19 sites presented in the 2018 NIS to include:

- Kilkieran Bay and Island SAC and Inishmore Island SAC - two nearby marine/coastal SACs due to the recent evaluation and inclusion of cetacean QIs for various coastal and marine SACs in March 2024
- Maumturk Mountains SAC and The Twelve Bens/Garraun Complex SAC - the inclusion of two additional European sites on a precautionary basis based on the Appropriate Assessment undertaken by the Inspector appointed by ABP and appended to ABP's Inspector's Report date 22 June 2021

Table 5.3 below lists these sites, their distance from the Assessment Boundary, and the sites Qualifying Interests/Special Conservation Interests. As discussed in Section 2.2.2, the Project crosses only one of these, namely Lough Corrib SAC.

Table 5.3 European sites (SACs and SPAs) within or in the vicinity of Identified Zone of Influence (ZoI)

Site Name	Distance[24]	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs)
Special Areas of Conservation		
Lough Corrib SAC [000297]	Crossed by the proposed N6 GCRR	[1029] Freshwater pearl mussel *Margaritifera margaritifera* [1092] White-clawed crayfish *Austropotamobius pallipes* [1095] Sea lamprey *Petromyzon marinus* [1096] Brook lamprey *Lampetra planeri* [1106] Atlantic salmon *Salmo salar* (only in fresh water) [1303] Lesser horseshoe bat *Rhinolophus hipposideros* [1355] Otter *Lutra lutra* [1393] Varnished hook-moss *Drepanocladus (Hamatocaulis) vernicosus* [1833] Slender naiad *Najas flexilis* [3110] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae)* [3130] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* [3140] Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites) [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [7110] * Active raised bogs [7120] Degraded raised bogs still capable of natural regeneration [7150] Depressions on peat substrates of the *Rhynchosporion* [7210] * Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7220] * Petrifying springs with tufa formation (*Cratoneurion*) [7230] Alkaline fens [8240] * Limestone pavements [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

[24] Distance in km/m from the Assessment Boundary

Site Name	Distance[24]	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs)
		[91D0] * Bog woodland *S.I. No. 384/2022 - European Union Habitats (Lough Corrib Special Area of Conservation 000297) Regulations 2022*. NPWS (2017a) *Conservation Objectives: Lough Corrib SAC 000297. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [1]
Galway Bay Complex SAC [000268][25]	145m	[1140] Mudflats and sandflats not covered by seawater at low tide [1150] Coastal lagoons* [1160] Large shallow inlets and bays [1170] Reefs [1220] Perennial vegetation of stony banks [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts [1310] Salicornia and other annuals colonising mud and sand [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1355] Otter *Lutra lutra* [1365] Harbour seal *Phoca vitulina* [1410] Mediterranean salt meadows (*Juncetalia maritimi)* [3180] Turloughs* [5130] *Juniperus communis* formations on heaths or calcareous grasslands [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites) [7210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae** [7230] Alkaline fens [8240] Limestone Pavements *S.I. No. 548/2021 - European Union Habitats (Galway Bay Complex Special Area of Conservation 000268) Regulations 2021.* NPWS (2013a) *Conservation Objectives: Galway Bay Complex SAC 000268. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
Connemara Bog Complex SAC [002034]	6.02km	[1065] Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia* [1106] Atlantic salmon *Salmo salar* (only in fresh water) [1150] * Coastal lagoons [1170] Reefs [1355] Otter *Lutra lutra* [1833] Slender naiad *Najas flexilis* [3110] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3130] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or Isoeto-Nanojuncetea [3160] Natural dystrophic lakes and ponds [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

[25] Inner Galway Bay is also a Ramsar site, under the Ramsar Convention (Ramsar site No. 838) and is a marine protected site under the OSPAR Convention - Galway Bay Complex MPA (O-IE-0002969)

Site Name	Distance[24]	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs)
		[4010] Northern Atlantic wet heaths with *Erica tetralix* [4030] European dry heaths [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [7130] Blanket bogs (* if active only) [7140] Transition mires and Quaking bogs [7150] Depressions on peat substrates of the *Rhynchosporion* [7230] Alkaline fens [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles *S.I. No. 549/2023 - European Union Habitats (Connemara Bog Complex Special Area of Conservation 002034) Regulations 2023.* NPWS (2015a) *Conservation Objectives: Connemara Bog Complex SAC 002034. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
Ross Lake and Woods SAC [001312]	10.35km	[1303] Lesser horseshoe bat *Rhinolophus hipposideros* [3140] Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. *S.I. No. 656/2019 - European Union Habitats (Ross Lake and Woods Special Area of Conservation 001312) Regulations 2019.* NPWS (2018) *Conservation Objectives: Ross Lake and Woods SAC 001312. Version 1*. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.
Black Head-Poulsallagh Complex SAC [000020]	10.53km	[1170] Reefs [1220] Perennial vegetation of stony banks [2130] Fixed coastal dunes with herbaceous vegetation (grey dunes) [1395] Petalwort *Petalophyllum ralfsii* [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [4060] Alpine and Boreal heaths [5130] *Juniperus communis* formations on heaths or calcareous grasslands [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites) [6510] Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [7220] Petrifying springs with tufa formation (*Cratoneurion*) [8240] Limestone pavements [8330] Submerged or partially submerged sea caves *S.I. No. 758/2021 - European Union Habitats (Black Head-Poulsallagh Complex Special Area of Conservation 000020) Regulations 2021* NPWS (2014a) *Conservation Objectives: Black Head-Poulsallagh SAC 000020. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
Lough Fingall Complex SAC [000606]	11.17km	[1303] Lesser horseshoe bat *Rhinolophus hipposideros* [3180] * Turloughs [4060] Alpine and Boreal heaths [5130] *Juniperus communis* formations on heaths or calcareous grasslands [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites)

Site Name	Distance[24]	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs)
		[7210] * Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [8240] * Limestone pavements NPWS (2019d) *Conservation Objectives: Lough Fingall Complex SAC 000606. Version 1.* National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.
Rahasane Turlough SAC [000322]	12.77km	[3180] * Turloughs *S.I. No. 503/2017 - European Union Habitats (Rahasane Turlough Special Area of Conservation 000322) Regulations 2017.* NPWS (2020) *Conservation Objectives: Rahasane Turlough SAC 000322. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Moneen Mountain SAC [000054]	13.25km	[1065] Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia* [1303] Lesser horseshoe bat *Rhinolophus hipposideros* [3180] * Turloughs [4060] Alpine and Boreal heaths [5130] *Juniperus communis* formations on heaths or calcareous grasslands [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites) [7220] * Petrifying springs with tufa formation (*Cratoneurion*) [8240] * Limestone pavements *S.I. No. 518/2021 - European Union Habitats (Moneen Mountain Grassland Special Area of Conservation 000054) Regulations 2021* NPWS (2021a) *Conservation Objectives: Moneen Mountain SAC 000054. Version 1.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
East Burren Complex SAC [001926]	13.46km	[1065] Marsh fritillary butterfly *Euphydryas* (*Eurodryas, Hypodryas) aurinia* [1303] Lesser horseshoe bat *Rhinolophus hipposideros* [1355] Otter *Lutra lutra* [3140] Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. [3180] * Turloughs [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [4060] Alpine and Boreal heaths [5130] *Juniperus communis* formations on heaths or calcareous grasslands [6130] *Calaminarian* grasslands of the *Violetalia calaminariae* [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites) [6510] Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [7210] * Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7220] * Petrifying springs with tufa formation (*Cratoneurion*) [7230] Alkaline fens [8240] * Limestone pavements [8310] Caves not open to the public [91E0] * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

Site Name	Distance[24]	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs)
		S.I. No. 463/2023 - European Union Habitats (East Burren Complex Special Area of Conservation 001926) Regulations 2023. NPWS (2022) *Conservation Objectives: East Burren Complex SAC 001926. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Gortnandarragh Limestone Pavement SAC [001271]	13.48km	[8240] * Limestone pavements *S.I. No. 492/2018 - European Union Habitats (Gortnandarragh Limestone Pavement Grassland Special Area of Conservation 001271) Regulations 2018* NPWS (2019) *Conservation Objectives: Gortnandarragh Limestone Pavement SAC 001271. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
Kiltiernan Turlough SAC [001285]	13.85km	[3180] * Turloughs *S.I. No. 547/2023 - European Union Habitats (Kiltiernan Turlough Special Area of Conservation 001285) Regulations 2023.* NPWS (2021b) *Conservation Objectives: Kiltiernan Turlough SAC 001285. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Castletaylor Complex SAC [000242]	13.96km	[3180] * Turloughs [4060] Alpine and Boreal heaths [5130] *Juniperus communis* formations on heaths or calcareous grasslands [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites) [8240] * Limestone pavements *S.I. No. 73/2018 - European Union Habitats (Castletaylor Complex Special Area of Conservation 000242) Regulations 2018.* NPWS (2021c) *Conservation Objectives: Castletaylor Complex SAC 000242. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Ballyvaughan Turlough SAC [000996]	15.00km	[3180] * Turloughs *S.I. No. 205/2019 - European Union Habitats (Ballyvaughan Turlough Special Area of Conservation 000996) Regulations 2019* NPWS (2021d) *Conservation Objectives: Ballyvaughan Turlough SAC 000996. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Ardrahan Grassland SAC [002244]	15.07km	[4060] Alpine and Boreal heaths [5130] *Juniperus communis* formations on heaths or calcareous grasslands [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [8240] * Limestone pavements *S.I. No. 522/2019 - European Union Habitats (Ardrahan Grassland Special Area of Conservation 002244) Regulations 2019.* NPWS (2024) Conservation Objectives: Ardrahan Grassland SAC 002244. Version 2. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Kilkieran Bay and Island SAC [002111]	25.42km	[1140] Mudflats and sandflats not covered by seawater at low tide [1150] Coastal lagoons [1160] Large shallow inlets and bays [1170] Reefs

Site Name	Distance[24]	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs)
		[1351] Harbour Porpoise *Phocoena phocoena* [1355] Otter *Lutra lutra* [1365] Harbour Seal *Phoca vitulina* [1833] Slender Naiad *Najas flexilis* [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1410] Mediterranean salt meadows (*Juncetalia maritimi*) [21A0] Machairs (* in Ireland) [3130] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [6510] Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) *S.I. No. 144/2024 - European Union Habitats (Kilkieran Bay and Islands SAC 002111) Regulations 2024* NPWS (2014b) *Conservation Objectives: Kilkieran Bay and Islands SAC 002111. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
Inishmore Island SAC [000213]	29.19km	[1014] Narrow-mouthed Whorl Snail *Vertigo angustior* [1150] Coastal lagoons [1170] Reefs [1220] Perennial vegetation of stony banks [1230] Vegetated Sea cliffs of the Atlantic and Baltic coasts [1351] Harbour Porpoise *Phocoena phocoena* [2110] Embryonic shifting dunes [2120] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2130] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2170] Dunes with Salix repens ssp. argentea (*Salicion arenariae*) [2190] Humid dune slacks [21A0] Machairs (* in Ireland) [4030] European dry heaths [4060] Alpine and Boreal heaths [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6510] Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [8240] Limestone pavements [8330] Submerged or partially submerged sea caves NPWS (2024b) Conservation Objectives: Inishmore Island SAC 000213. Version 2. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Maumturk Mountains SAC [002008]	31.57km	[1106] Salmon *Salmo salar* [1833] Slender Naiad *Najas flexilis* [3110] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [4010] Northern Atlantic wet heaths with *Erica tetralix* [4060] Alpine and Boreal heaths [7130] Blanket bogs (* if active bog)

Site Name	Distance[24]	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs)
		[7150] Depressions on peat substrates of the *Rhynchosporion* [8220] Siliceous rocky slopes with chasmophytic vegetation *S.I. No. 431/2021 - European Union Habitats (Maumturk Mountains Special Area of Conservation 002008) Regulations 2021* NPWS (2017b) *Conservation Objectives: Maumturk Mountains SAC 002008. Version 1.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
The Twelve Bens/Garraun Complex SAC [002310]	44.70km	[1029] Freshwater Pearl Mussel *Margaritifera margaritifera* [1106] Salmon *Salmo salar* [1355] Otter *Lutra lutra* [1833] Slender Naiad *Najas flexilis* [3110] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3130] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [4060] Alpine and Boreal heaths [7130] Blanket bogs (* if active bog) [7150] Depressions on peat substrates of the *Rhynchosporion* [8110] Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani)* [8210] Calcareous rocky slopes with chasmophytic vegetation [8220] Siliceous rocky slopes with chasmophytic vegetation [91A0] Old sessile oak woods with Ilex and Blechnum in the British Isles *S.I. No. 548/2023 - European Union Habitats (Twelve Bens/Garraun Complex Special Area of Conservation 002031) Regulations 2023* NPWS (2017c) *Conservation Objectives: Twelve Bens/Garraun Complex SAC 002031. Version 1.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht
Special Protection Areas		
Lough Corrib SPA [004042]	66m	Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] - wintering Gadwall (*Anas strepera*) [A051] - wintering Shoveler (*Anas clypeata*) [A056] - wintering Pochard (*Aythya ferina*) [A059] - wintering Tufted Duck (*Aythya fuligula*) [A061] - wintering Common Scoter (*Melanitta nigra*) [A065] - breeding Hen Harrier (*Circus cyaneus*) [A082] - post-breeding/roost Coot (*Fulica atra*) [A125] - wintering Golden Plover (*Pluvialis apricaria*) [A140] - wintering Black-headed Gull (*Chroicocephalus ridibundus*) [A179] - breeding Common Gull (*Larus canus*) [A182] - breeding Common Tern (*Sterna hirundo*) [A193] - breeding Arctic Tern (*Sterna paradisaea*) [A194] - breeding Wetlands & Waterbirds [A999] *S.I. No. 455/2012 - European Communities (Conservation of Wild Birds (Lough Corrib Special Protection Area 004042)) Regulations 2012.*

Site Name	Distance[24]	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs)
		NPWS (2023a) *Conservation Objectives: Lough Corrib SPA 004042. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Inner Galway Bay SPA [004031]	1.06km at Oranmore Bay and Rusheen Bay	Black-throated Diver *Gavia arctica* [A002] - wintering Great Northern Diver (*Gavia immer*) [A003] - wintering[26] Cormorant (*Phalacrocorax carbo*) [A017] - breeding Grey Heron (*Ardea cinerea*) [A028] - wintering Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] - wintering Wigeon (*Anas penelope*) [A050] - wintering Teal (*Anas crecca*) [A052] - wintering Red-breasted Merganser (*Mergus serrator*) [A069] - wintering Ringed Plover (*Charadrius hiaticula*) [A137] - wintering Golden Plover (*Pluvialis apricaria*) [A140] - wintering Lapwing (*Vanellus vanellus*) [A142] - wintering Dunlin (*Calidris alpina*) [A149] - wintering Bar-tailed Godwit (*Limosa lapponica*) [A157] - wintering Curlew (*Numenius arquata*) [A160] - wintering Redshank (*Tringa totanus*) [A162] - wintering Turnstone (*Arenaria interpres)* [A169] - wintering Black-headed Gull (*Chroicocephalus ridibundus*) [A179] - wintering Common Gull (*Larus canus*) [A182] - wintering Sandwich Tern (*Sterna sandvicensis*) [A191] - breeding Common Tern (*Sterna hirundo*) [A193] - breeding Wetlands & Waterbirds [A999] *S.I. No. 515/2019 - European Union Conservation of Wild Birds (Inner Galway Bay Special Protection Area 004031) Regulations 2019* NPWS (2013b) *Conservation Objectives: Inner Galway Bay SPA 004031. Version 1.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
Cregganna Marsh SPA [004142]	4.14km	Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] - wintering *S.I. No. 514/2019 - European Union Conservation of Wild Birds (Cregganna Marsh Special Protection Area 004142) Regulations 2019.* NPWS (2023b) *Conservation Objectives: Cregganna Marsh SPA 004142. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Connemara Bog Complex SPA [004181]	9.27km	Cormorant (*Phalacrocorax carbo*) [A017] - breeding Merlin (*Falco columbarius*) [A098] - breeding Golden Plover (*Pluvialis apricaria*) [A140] - breeding Common Gull (*Larus canus*) [A182] - breeding *S.I. No. 390/2021 - European Union Conservation of Wild Birds (Connemara Bog Complex Special Protection Area 004181) Regulations 2021*

[26] A recently listed QI for Inner Galway Bay SPA with no specific published conservation objective, attributes or targets. There are no other European sites for which the species is listed in Ireland. The conservation objectives, attributes and targets listed for the Black-throated diver (both are wintering species with similar behaviours and habitat/forage needs.

Site Name	Distance[24]	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs)
		NPWS (2023c) *Conservation Objectives: Connemara Bog Complex SPA 004181. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
Rahasane Turlough SPA [004089]	12.75km	Whooper Swan (*Cygnus cygnus*) [A038] - wintering Wigeon (*Anas penelope*) [A050] - wintering Golden Plover (*Pluvialis apricaria*) [A140] - wintering Black-tailed Godwit (*Limosa limosa*) [A156] - wintering Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] - wintering Wetlands & Waterbirds [A999] *S.I. No. 311/2012 - European Communities (Conservation of Wild Birds (Rahasane Turlough Special Protection Area 004089)) Regulations 2012.* NPWS (2023d) *Conservation Objectives: Rahasane Turlough SPA 004089. Version 1.* National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

More detailed ecological baseline information is provided in Section 9 to further inform the detailed examination and assessment of the potential impacts of the Project on individual European sites that lie within its ZoI. The process of identifying the potential impacts of the Project (including those identified by the Inspector appointed by ABP), defining the ZoI, and determining which European sites are potentially at risk of impacts is set out below in Sections 6 to Section 8.

6. Potential Impacts of the Project

Through the development of the Project, elements were included in the design to address some of the potential impacts discussed below. The design progressed in tandem with environmental studies which were undertaken to both inform both the baseline environmental data and the design to minimise impacts to the receiving environment. Therefore, the identification and avoidance of potential impacts followed an iterative process between the design and environmental teams as follows:

- Potential impacts were identified by the environmental team
- Data on the potential impacts was assessed by the design team to establish design solutions to eliminate a potential impact, and the design was updated to include these advanced solutions
- The updated design was reassessed by the environmental team
- The final design has addressed, where possible, the identified potential direct and indirect impacts and where potential direct and indirect impacts were not designed out, mitigation measures were incorporated

The design measures are presented in Section 2.5 above and how these measures avoid or minimise the potential for the Project to impact on European sites is discussed further below.

The impact assessment has been updated to incorporate the modifications made to the proposed N6 GCRR since 2018 and all relevant clarifications and amendments presented in the 2019 RFI Response and at the oral hearing in 2020 in response to queries raised by An Bord Pleanála, statutory consultees, and other participating third parties, and the assessment undertaken by the Inspector appointed by ABP and presented in ABP's Inspector's Report dated 22 June 2021.

The Inspector appointed by ABP, following review of the appointed ecologist Dr Arnold's Appropriate Assessment Report [appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021], concluded in Section 12.9 of the Inspector's Report dated 22 June 2021, that the proposed N6 GCRR, "*individually or in combination with other plans or projects, would not adversely affect the integrity of the Lough Corrib …SAC; Galway Bay Complex …SAC; Lough Corrib SPA or inner Galway Bay SPA in view of the Conservation Objectives of those sites*" and "*any possibility of adverse effects on the integrity of other European sites in the wider area due to in-combination effects has been firmly excluded with the application of mitigation measures…"*. The Inspector did however include additional potential impact pathways, screened in additional European sites for appropriate assessment and included additional mitigation measures. All of these have been taken into account, on a precautionary basis, in the preparation of this updated NIS and are summarised below:

Dr Arnold appointed by ABP concurred with the potential impact pathways set out in the 2018 NIS and included these in ABP's appropriate assessment appended (as Appendix 6) to ABP's Inspector's Report dated 22 June 2021. They also included three additional potential pathways which have been included in this updated NIS and described below. As such, all of the potential impact pathways identified in the 2018 NIS have been retained and updated where relevant in terms of ecological findings or updated literature in this updated NIS. As per the 2018 NIS, the Project has the potential to have the following types of impacts on the receiving ecological environment:

- Direct loss of habitat area
- Fragment and potential isolation of habitat areas and/or the territories of fauna species, including the dissection of areas of the Lough Corrib SAC north and south by the proposed N6 GCRR
- Tunnelling and deep excavations affecting the structural integrity[27] of the rock mass supporting the surface-level habitats

[27] Structural Integrity of the rockmass that supports the mosaic of Limestone pavement and Calcareous grassland is the physical and mechanical geotechnical properties that control the behaviour of the geotechnical Limestone pavement environment

- Tunnelling and excavations affecting the existing hydrogeological regime and/or construction works affecting groundwater quality from contaminated surface water runoff and/or an accidental spillage or pollution
- Affect water quality in receiving watercourses during construction from contaminated surface water runoff and/or an accidental spillage or pollution event affecting habitats and/or species, and has been expanded to discuss the additional QIs/SCIs detailed in Section 4.3 of the updated NIS
- Affect air quality which in turn can affect the vegetation composition and structure of nearby habitats
- Introduce or spread non-native invasive species
- Disturb fauna species (e.g. through noise, vibration, artificial lighting or increased human presence) resulting in the displacement of affected species from breeding/resting places or supporting habitat, potentially at key life-cycle stages
- Create a barrier to species movements as a consequence of constructing/introducing a new road carriageway into the natural environment
- Pose a mortality risk to aquatic species through accidentally dropping construction materials into watercourses when constructing new structures over watercourses
- Shade habitats beneath elevated structures, or next to high embankment or retaining walls, causing a reduction in sunlight and direct precipitation affecting the vegetation composition and structure
- Pose a mortality risk to fauna species from road traffic collisions or collisions with bridge structures

As noted above and in light of the approach adopted by the Ecologist appointed by ABP (Dr Arnold) in their Appropriate Assessment Report prepared in February 2021, and appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021, and on a precautionary basis, the potential impact pathways have been updated to include the potential impact pathways identified by Dr Arnold, over and above those considered and assessed in the 2018 NIS as follows:

- Potential deterioration/decline in European site QIs/SCIs due to associated effects from loss of supporting habitats/populations
- Increase in recreational pressure
- Increase in construction-related traffic

In addition to these new potential impact pathways, there have been other amendments necessary in this updated NIS as a result of the following:

- Updated European site boundaries and the most recent published QIs/SCIs for each European site at the time of publication (see Table 5.3 of the updated NIS) and their relevant attributes and targets are considered
- Updated baseline habitat and species, although changes have been minor, have required some level of minor updates to the impact assessment to capture the biodiversity baseline variances recorded, the updates are not material and do not affect the conclusions of the impact assessment
- Two nearby European sites, for which Harbour porpoise has been added as a QI in March 2024, due to the potential for the Project to affect water quality in Galway Bay: Inishmore Island SAC and Kilkieran Bay and Islands SAC

6.1 Habitat Loss & Fragmentation

Unchanged since the 2018 NIS, the Project will cause a direct loss or fragmentation of habitat areas within the receiving ecological environment by traversing or cutting through habitat areas. Across the study area this includes habitat types such as grasslands (both semi-natural and those improved/managed for amenity or agricultural purposes), scrub, woodland, wetlands, Limestone pavement and watercourses, and as outlined in Section 5.2, many of these habitats also correspond with Annex I habitat types.

As noted in Section 2.2.2, the Project overlaps with, i.e. traverses through or adjacent to, only one European site, namely Lough Corrib SAC, at four locations: at the termination of the proposed drainage outfall from the N59 Link Road North at Kentfield; at the site of the proposed River Corrib Bridge between Dangan and Menlough; to the west of the Coolagh Lakes; and, to the west and north of Lackagh Quarry where the Project will consist of a tunnel (Lackagh Tunnel) and approach road infrastructure (Ch. 10+620 to Ch. 11+800). Therefore, this is the only European site at risk of direct habitat loss or fragmentation effects. The Project will result in the loss of habitat area (and in places some level of habitat fragmentation) from that part of Lough Corrib SAC through which the Project traverses, between the River Corrib (Ch. 9+250 of the proposed N6 GCRR) and Lackagh Quarry (Ch. 11+800 of the proposed N6 GCRR). This is unchanged from the 2018 NIS. In total, c.3.8ha of Lough Corrib SAC lies within the Assessment Boundary for the Project.

6.1.1 Direct Habitat Loss in Lough Corrib SAC

Habitat loss has the potential to affect the conservation objectives of Lough Corrib SAC through the loss of QI habitat or the loss of habitat supporting the QI habitats or species (e.g. Otter habitat and/or breeding or resting sites).

Tunnelling and deep excavations associated with the proposed Lackagh Tunnel have the potential to result in habitat losses, potentially beyond the immediate footprint of the proposed N6 GCRR, and this is discussed separately below in Section 6.2 and Section 6.3.

6.1.2 Habitat Loss Affecting SCI Bird Species

Although the Project does not directly impact upon any SPA sites, and will not result in any habitat loss or habitat fragmentation within any SPA sites, it does pass through, and will result in habitat loss in potential "*ex-situ*" sites[28] where SCI listed bird species were recorded. This impact could result in the loss of important supporting habitat areas outside of the SPA boundary affecting the conservation objectives to maintain the distribution of areas used by SCI birds and those relating to population trends. This is discussed below in relation to SCI bird species listed for either their breeding or wintering populations for surrounding SPA sites.

Unchanged since the 2018 NIS, there are four SPA sites locally which have bird species listed as SCIs for their wintering populations: Lough Corrib SPA, Inner Galway Bay SPA, Connemara Bog Complex SPA and Cregganna Marsh SPA. Rahasane Turlough SPA, was also considered due to the connection with Cregganna Marsh SPA SCI populations (Greenland white-fronted geese). However, there were no records of Greenland white-fronted geese (the sole SCI species for Cregganna Marsh SPA) from any of the winter bird sites surveyed for the Project over the various survey periods from 2013 to 2024. Therefore, habitat loss associated with the Project poses no risk to the wintering Greenland white-fronted geese population at Cregganna Marsh SPA or the connected Rahasane Turlough SPA populations. In terms of the Rahasane SPA, the species confirmed during the various surveys are not considered as part of the SPA's SCI populations as the SPA is a considerable distance (*c.*13km) from the Project, beyond normal core foraging ranges for the wintering SCIs observed at the wintering sites (Wigeon flight distance for forage is <3km (Johnson *et al.*, 2009 and Legagneux, *et al.*, 2014) and Golden Plover core forage range 3km as reported in Scottish Natural Heritage: Assessing Connectivity with Special Protection Areas (SPAs) Guidance Version 3, 2016).

Unchanged since the 2018 NIS, the Project will result in varying degrees of habitat loss in nine of the winter bird sites where bird species listed as SCIs of the surrounding SPAs, for their wintering populations, were recorded (Lough Corrib SPA and Inner Galway Bay SPA): WB01, WB02, WB03, WB07, WB08, WB10, WB16, WB23 and WB45.

[28] The need to consider use of habitat areas outside of an SPA by SCI bird species is set out in Section 3.1 and 5.2 of the *Inner Galway Bay Special Protection Area (Site Code 4031), Conservation Objectives Supporting Document, Version 1* (NPWS, 2013b). These areas are termed '*ex-situ'* sites and are defined as areas of habitat situated within the immediate hinterland of the SPA, or in areas ecologically connected to it, which support SCI bird species. There is no information or evidence to confirm whether any of the bird species recorded in habitats outside of European sites, which are within the ZoI of the Project, are birds from either Lough Corrib SPA and/or Inner Galway Bay SPA, or are not part of the population from either European site. Therefore, a precautionary approach is being taken in assuming that any habitat areas supporting SCI bird species are potentially '*ex-situ*' sites under that definition, and are assessed accordingly.

Overall, the areas of habitat loss are small relative to the extent of each affected winter bird survey site. The habitat types being lost are also common and widespread in the wider locality, in particular the peat/heathland habitats between Bearna and the N59 Moycullen Road, which extend to the northwest into Connemara. WB16 (the Lackagh Quarry), WB23 (Galway Racecourse) and WB24 (which UoG pitches) consist of modified habitats, and also constitute limited extents in context of the habitat types within the wider locality. Similarly, for birds (as highly mobile species), habitat fragmentation is only likely to be an issue where it would result in the fragmented habitat patches being unviable in the long-term due to their reduced size, and consequently limit the availability of large areas of a given habitat type locally. In most cases the Project clips these winter bird sites along their boundaries (WB01, WB02, WB03, WB07, WB08, WB10 and WB23) and the effects of habitat fragmentation are minimal, particularly given that for some winter bird sites (e.g. WB01) the habitats represented are only a small proportion of those same habitats in the locality. The temporary stables at Galway Racecourse will affect sections of amenity grassland in the eastern extent of WB23. This is a limited area of habitat, temporarily displaced to house the temporary stableyard.

6.1.3 Habitat Fragmentation

Habitat fragmentation is the process by which habitat loss divides habitat blocks into smaller more isolated patches and can happen at both a landscape scale or to discrete habitat areas. Habitat fragmentation can affect how ecosystems function, their resilience to change and, with regard to species, affect interactions within or between populations, population density or species richness.

Unchanged since the 2018 NIS, there are only two areas within Lough Corrib SAC that are traversed by the Project and are, therefore, at risk of habitat fragmentation or isolation effects.

The first is west of Lackagh Quarry. However, as the proposed N6 GCRR passes underneath Lough Corrib SAC at this location, via Lackagh Tunnel, and the habitats above will be protected and retained, ecological connectivity will be maintained and habitat areas within the SAC will not be fragmented or isolated.

The second is at the site of the proposed River Corrib Bridge for the proposed N6 GCRR. At this crossing point of the Lough Corrib SAC the proposed N6 GCRR will be elevated as a clear span bridge structure across the river corridor. Although an area of beech-dominated mixed broadleaved woodland (neither, a qualifying interest habitat of Lough Corrib SAC or supporting one) will be severed by the embankment associated with the proposed N6 GCRR on the eastern approach to the proposed River Corrib Bridge, it is weakly connected (narrow corridors and/or disconnected nearby habitat units) to neighbouring woodlands north and south and has no direct connectivity to woodland areas within the Lough Corrib SAC. The clear span bridge structure, along with the five large culvert structures in the embankment of the proposed N6 GCRR through the woodland area, maintain the functioning of the ecological corridor within Lough Corrib SAC.

Summary

The Project will result in the loss of habitat areas, with some of this habitat loss occurring within and adjacent to Lough Corrib SAC. The Project will also result in the loss/fragmentation of habitat area from local sites that support wintering bird species listed as SCIs for their wintering populations at local SPA sites (Lough Corrib SPA and Inner Galway Bay SPA).

Although the Project will traverse Lough Corrib SAC at the River Corrib and to the west of Lackagh Quarry, the Lackagh Tunnel avoids any habitat fragmentation or isolation effects and the clear-span bridge crossing the River Corrib will ensure the ecological functioning of the river corridor is maintained.

6.2 Habitat Degradation as a result of Tunnelling/Excavations

Unchanged since the 2018 NIS, the Project includes elements of tunnelling and excavations, both of which have the potential to cause habitat degradation within the receiving ecological environment. Where tunnelling or deep excavations will be required to construct the Project, they pose a risk of structural fracturing or collapse of rock masses/faces which support habitats either above (in the case of underground tunnelling) or adjacent to (in the case of deep cuttings/excavations) the works area. This could result in the loss of habitat area or, in the case of Limestone pavement [*8240] where the surface structure of the habitat

is a critical component of that habitat type, structural degradation of the habitat. Tunnelling or deep excavations could also have hydrogeological effects, and these are discussed in Section 6.3 below.

The proposed Lackagh Tunnel and its approaches are the only tunnelling/excavation elements of the Project that lie within, or in close proximity to, a European site (Lough Corrib SAC) and have the potential to give rise to these types of impacts. The proposed Galway Racecourse Tunnel lies more than 2.5km from the nearest European sites and poses no risk of affecting bedrock structure. As with the proposed Lackagh Tunnel, there is the potential for hydrogeological effects which are discussed in Section 6.3 below.

Summary

The Project will involve tunnelling under Lough Corrib SAC and excavating deep cuttings within and immediately adjacent to the Lough Corrib SAC boundary. This has the potential to result in the loss, or degradation, of QI Annex I habitat area in Lough Corrib SAC which has the potential to affect the site's conservation objectives and adversely affect the integrity of this European site.

6.3 Habitat Degradation as a result of Hydrogeological Impacts

Unchanged since the 2018 NIS, construction activities, and operation of the Project, have the potential to interact with the hydrogeology of receptors by changing the groundwater regime upon which the receptor is dependent. The potential direct or indirect impacts of the Project on the existing hydrogeological regime, which could potentially affect the terrestrial ecosystems fed by or dependent on groundwater, are discussed in this section.

The following groundwater bodies (GWB) are traversed by or potentially impacted by the Project. The locations of these GWB relative to the Project and European sites are shown on Figure 11.1.1 and Figure 11.1.2 and discussed further below:

- Spiddal GWB
- Maam – Clonbur GWB
- Ross Lake GWB
- Lough Corrib Fen 1 GWB [29]
- Lough Corrib Fen 2 GWB
- Clare-Corrib GWB
- Clarinbridge GWB

Unchanged since the 2018 NIS, the characteristics which determine the potential for hydrogeological impacts on European sites are:

- The proximity to the European site (i.e. is the European site within the drawdown zone of influence or areas of potential pollution?)
- The level of aquifer connectivity between the European site and the Project (i.e. is the feature in the same groundwater body as the Project, or is there a hydraulic divide between the feature and the Project?)
- The groundwater flow direction in the vicinity of the European site
- The requirement for dewatering, which depends on the excavation depth (whether in a road cutting or tunnel) of the Project relative to the seasonal fluctuation in groundwater level
- The water quality of the feature and the groundwater from which it receives its base flow

[29] As described above in Section 5.3 of this updated NIS, and in more detail in Section 4.2.2 of Appendix A, the Lough Corrib Fen 1 GWB was divided into two distinct groundwater bodies, based on the findings of the hydrogeological investigations: Lough Corrib Fen 1 (Menlough) GWB and the Lough Corrib Fen 1 (Lackagh) GWB

6.3.1 Potential Hydrogeological Impacts during Construction

Groundwater levels

Unchanged since the 2018 NIS, the Project has the potential to cause an impact on groundwater levels in the receiving environment as it will require the lowering of groundwater levels by dewatering of the bedrock aquifer during construction within those excavations deeper than the seasonal groundwater fluctuation. Dewatering will be undertaken using passive dewatering (gravity) where possible otherwise active dewatering (pumping) will be required. Dewatering of the bedrock aquifer will lower water levels locally (the extent of which depends on the properties of the aquifer), which can impact on groundwater by modifying the quantity of water carried by aquifer pathways and have impacts to GWDTEs.

In addition to the drawdown, groundwater levels are also at risk if karst flow paths are encountered. If karst pathways are present, then there is a risk of the groundwater carried by the flow paths being modified in volume. This may occur if pathways receive increased runoff from the Project or if increased water erosion of sediment along the pathways occurs. Pathways may also be modified from poured concrete at structures migrating into the aquifer potentially restricting flow paths to receptors.

Decommissioning of the existing wells within Galway Racecourse will change the groundwater flow regime on a local scale. The hydrogeological assessment undertaken concludes that as these wells are proposed to be replaced by new wells in different locations to the existing wells, the impact of moving the zone of contribution will be negligible in relation to the overall integrity of the aquifer.

As detailed in the 2018 NIS, a number of requirements have been incorporated into the design in order to protect the existing hydrogeological regime and remain unchanged, these include:

- No dewatering of the bedrock aquifer will occur during construction at Menlough Viaduct, Lackagh Tunnel (or its approaches) or Galway Racecourse Tunnel. Furthermore, the construction sequence will take into account the seasonal groundwater fluctuation. During the winter groundwater high it may be necessary to limit the depth of works so that dewatering is not required
- Any groundwater intercepted will be collected and piped to either the surface water receptor it would naturally have drained to within the Galway Granite Batholith (i.e. the western part of the proposed N6 GCRR between the Bearna West Roundabout and the N59 Moycullen Road) or, in the Visean Undifferentiated Limestone aquifer (i.e. east of the N59 Moycullen Road), intercepted groundwater will be controlled and infiltrated back to the same groundwater body
- Construction dewatering of the bedrock aquifer may seasonally be required in the limestone cutting between Castlegar and the N83 Tuam Road (Ch. 13+050 to Ch. 13+650 of the proposed N6 GCRR) during peak groundwater levels. Any groundwater intercepted will be discharged back to the same GWB

Groundwater pollution

Unchanged since the 2018 NIS, during construction, there is a risk of groundwater pollution from accidental spillages on site as well as from fines being transported during storm events and recharging to ground. Spillages and runoff has a high risk to groundwater where karst pathways are present, like those associated with the Western Coolagh Karst Spring which feeds the Coolagh Lakes and associated QI GWDTEs. If karst is present, as in the eastern extent of the Project which incorporates the proposed development at Galway Racecourse (the temporary and permanent stables), then pollutants can travel significant distances relatively quickly, without natural attenuation or dilution that would occur in non-karst pathways (such as fracture or matrix flow). If such contaminants are acidic in nature then they could further impair the karst structures and decrease the alkalinity of the water, specifically of relevance to the alkaline-reliant QI GWDTEs associated with the Coolagh Lakes. Similarly, if karst pathways are present then there is a risk of poured concrete migrating into the aquifer, which could potentially contaminate flow paths to receptors.

There is no hydrogeological connectivity between the Lough Corrib SPA and the Clarinbridge GWB. There is limited hydraulic connection between the drainage swallow hole at the temporary and permanent stables (Clarinbridge GWB) and the Lough Corrib SAC as the regional groundwater flow direction is primarily towards the coast rather than west towards to the Terryland River. At times of high-water levels, the Clarinbridge GWB likely provides a portion of the input to the Terryland River, when its normal flow is

reversed back into the Lower River Corrib. The dilution at this time is optimal. Potential impact to the Lough Corrib SAC from possible groundwater impacts arising in the Clarinbridge GWB is negligible.

In terms of design requirements, for the Lough Corrib Fen 2 GWB, Clare-Corrib GWB, Clarinbridge GWB, Ross Lake GWB, Lough Corrib Fen 1 (Menlough) GWB and Lough Corrib Fen 1 (Lackagh) GWB, (the latter four supplying Lough Corrib SAC and associated GWDTEs; latter two specifically the Coolagh Lakes), the runoff from the construction will be managed on site, collected and treated prior to disposal by infiltration basins to the same GWBs.

A direct pathway is present between the swallow hole at Galway Racecourse and Galway Bay through the shared Clarinbridge GWB. A pollution event, of a sufficient magnitude, has the potential to affect the receiving groundwater environment to an extent that it could undermine the conservation objectives supporting groundwater dependent habitats in the Inner Galway Bay SPA and Galway Bay Complex SAC.

Groundwater recharge

As explained in the 2018 NIS, and relevant to this updated NIS, vegetation removal during construction will lead to an increase in the quantity of effective rainfall. Generally, where vegetation is removed then there is an increase of run off rather than recharge, as most effective rainfall becomes overland flow to surface water. If karst is present, then runoff may rapidly drain to ground at point recharge locations where flow paths are encountered.

All groundwater intercepted during construction will be managed and discharged within the same GWB. Groundwater intercepted during construction will remain within the surface water catchment that they would naturally have been received by. The recharge rate will not change in the Galway Granite Batholith. A temporary minor increase in the recharge rate (between 0.1m and 0.4m) is estimated in the Visean Undifferentiated Limestone aquifer from increased recharge below the Assessment Boundary of the Project.

Loss of aquifer area

As per the 2018 NIS, the Project will have an imperceptible impact on the Galway Granite Batholith aquifer or the Visean Undifferentiated Limestone aquifer from loss of aquifer area as in both cases the volumes lost are very small (refer to Appendix A). The loss of aquifer area does not have any long-term effects on any groundwater dependant habitats in European sites. This is unchanged in this updated NIS.

6.3.2 Potential Hydrogeological Impacts during Operation

Groundwater levels and recharge

Unchanged since the 2018 NIS, there will be no active dewatering required during the operational phase but passive dewatering of the bedrock aquifer will occur at a number of cutting locations and the drainage associated with the Project will cause the groundwater levels to adjust locally. No QI GWDTEs will be impacted by passive dewatering during the operational phase. All groundwater intercepted by the proposed road drainage will be discharged to the same GWB, thereby maintaining the overall recharge rate to the aquifers and resulting in an imperceptible impact on groundwater levels and no impact on QI GWDTEs. Point discharges to groundwater from the infiltration basins will lead to local increases in the groundwater table. However, overall there will not be any net change to groundwater levels or recharge rate arising from this and no impacts on GWDTEs.

Decommissioning of the existing wells within Galway Racecourse will change the groundwater flow regime on a local scale. The project hydrogeologist considered, that as these wells are proposed to be replaced by new wells in different locations to the existing wells, the impact of moving the zone of contribution will be negligible in relation to the overall integrity of the aquifer.

Groundwater pollution

Unchanged since the 2018 NIS, the drainage design, including the design of the infiltration basins, minimises the risk of a pollution event during operation affecting groundwater quality. Risk of spillage is low (<0.5%) and any impacts that do accidentally occur will be temporary.

All infiltration basins are designed to include the following features as standard design: a containment area, a hydrocarbon interceptor and a wetland treatment component. Infiltration to ground will diffuse and provide

slow pathways to the groundwater table that will naturally promote settlement of fines. In the groundwater there will be significant dilution of any pollutants that enter that system and also some attenuation of any fines. If any contaminants are acidic in nature then they could impair the karst structures and decrease the alkalinity of the water, specifically of relevance to the alkaline-reliant QI GWDTEs associated with the Coolagh Lakes.

A direct pathway is present between the swallow hole at Galway Racecourse and Galway Bay through the shared Clarinbridge GWB. A pollution event, of a sufficient magnitude, has the potential to affect the receiving groundwater environment to an extent that it could undermine the conservation objectives supporting groundwater dependent habitats in the Inner Galway Bay SPA and Galway Bay Complex SAC.

The overburden across the study area consists of glacial till derived from the underlying bedrock. The bedrock changes at the N59 Moycullen Road, from a granite (in the west) to a limestone bedrock (in the east) which have different chemical compositions. If limestone derived material is placed over granite bedrock, surface water run-off or groundwater movements through the material have the potential to impact local areas of peatland habitats by changing the pH of the local groundwater. Although, the magnitude of such an impact on groundwater pH is likely to be imperceptible. Due to the chemically inert nature of granite, if it is transported and used on embankments on limestone then there are no water quality concerns in terms of hydrogeology.

Summary

As assessed in the 2018 NIS, and unchanged in this updated NIS, the Project has the potential to affect the existing hydrogeological regime supporting groundwater dependant habitats (GWDTE) within any European sites (or potential *ex-situ* bird sites) within the hydrogeological ZoI.

The Project will not have any perceptible effect on the aquifers or groundwater bodies through changing recharge rates or loss of aquifer volume. Groundwater effects could arise through groundwater drawdown and/or impacts on groundwater quality during construction and/or operation. This has the potential to result in the loss, or degradation, of habitat area supporting the QIs/SCIs of a European site which has the potential to affect the sites' conservation objectives and adversely affect the integrity of those European sites.

6.4 Habitat Degradation as a result of Hydrological Impacts

Unchanged since the 2018 NIS, the types of hydrological impact fall into two broad categories of quantitative and qualitative impacts.

Quantitative hydrological impacts represent changes to the natural flow regime in the aquatic system in terms of changes to the water balance, flow depth, velocities, temperature and density leading to changes in the hydrodynamics of the aquatic system. These changes can be brought about by direct encroachment of the waterbody or by altering the recharge to a waterbody generally by the presence of the Project and its associated road drainage system within the catchment area.

Hydraulic structures such as bridges, culverts, channel diversions and outfalls can, if not appropriately designed, impact negatively on upstream and downstream water levels and on flow velocities. If a bridge or culvert opening is too narrow or a diversion channel undersized it may impede flow during times of floods thus causing water levels upstream of the structure to be raised above what would occur in the absence of the structure. If in-stream culvert structures and associated channel diversions and transitions are too wide or steep this can significantly affect the mean and low flow regime of the stream in terms of velocity and water depth changes resulting in low velocities and low water depths which can alter the local sedimentology and flow regime resulting in benthic impacts and potential fishery impacts.

Hard paved areas and local changes in the topography by Project can alter the groundwater and surface water recharge regime. The Project and its associated drainage system can capture surface runoff, unsaturated soil interflow and groundwater flows from up gradient and divert them to point surface and groundwater discharge points. Surface water drainage from the carriageway, grassed margins and embankment slopes can lead to localised increased flows and flooding in the receiving watercourses. The road formation can act as a large stone drain causing a diversion of recharge flows and in deep cuttings into the water table, a dewatering effect on the groundwater system which impacts both surface and groundwater systems.

Constructional activities such as temporary encroachments of watercourses for construction purposes of a bridge, culvert, outfall, temporary access road and temporary diversion can give rise to changes in the local flow regime which may alter velocities and depths and potentially give rise to changes to the hydrological flow regime and changes to channel morphology (channel deposition and erosion).

Qualitative hydrological impacts represent changes to the chemistry of the receiving waterbodies generally arising from road drainage discharges. Water quality impacts include those on receiving watercourses at storm outfalls from routine road runoff (generally sediment associated contaminants, heavy metals, hydrocarbons and suspended solids, de-icing agents (salt and grit) and to a lesser extent nutrients, organics, and coliforms). A wide range of heavy metals are known to occur in road drainage waters, the primary metals of concern are Cadmium (Cd), Lead (Pb), Copper (Cu) and Zinc (ZU). Salt and grit applications to road surfaces to mitigate icy conditions, will result in an increased salinity, pH, conductivity and total dissolved solids concentrations to receiving aquatic system. Increased salinity of watercourses can alter the ecological balance of the aquatic system and increase the bioavailability of chemical contaminants.

The proposed road drainage and associated storm outfalls provide a potential direct pathway for contaminant from accidental spillages associated with HGV's (agricultural, oil/chemical spillages, bulk liquid, cement, etc.) to gain access to receiving watercourses.

6.4.1 Potential Hydrological Impacts during Construction

As detailed in the 2018 NIS, construction activities pose a significant risk to watercourses, particularly contaminated surface water runoff from construction activities entering nearby watercourses. Construction activities within and alongside surface waters associated with bridge and culvert construction, outfalls and channel diversions can contribute to the deterioration of water quality and can physically alter the stream/river bed and bank morphology with the potential to alter erosion and deposition rates locally and downstream. Activities within or close to the watercourse channels can lead to increased turbidity through re-suspension of bed sediments and release of new sediments from earthworks. Consequently, in-stream works can potentially represent a severe disruption to aquatic ecology.

The main contaminants arising from construction runoff are unchanged since the 2018 NIS and include:

- Elevated silt/sediment loading in construction site runoff

  Elevated silt loading can lead to long-term damage to aquatic ecosystems by smothering spawning grounds and gravel beds and clogging the gills of fish. Increased silt load in receiving watercourses stunts aquatic plant growth, limits dissolved oxygen capacity and overall reduces the ecological quality with the most critical period associated with low flow conditions. Chemical contaminants in the watercourse can bind to silt which can lead to increased bioavailability of these contaminants

- Spillage of concrete, grout and other cement based products

  These cement based products are highly alkaline (releasing fine highly alkaline silt) and extremely corrosive and can result in significant impact to watercourses altering the pH, smothering the stream bed and physically damaging fish through burning and clogging by the fine silt of gills

- Accidental spillage of hydrocarbons from construction plant and at storage depots/construction compounds

- Faecal contamination arising from inadequate treatment of on-site toilets and washing facilities

Hydrological Regime

As the proposed River Corrib Bridge structure is clear span and does not require any in-stream works to construct the supporting piers, construction works will not affect the flow or flooding regime of the River Corrib.

Unchanged since the 2018 NIS, any effects on the existing hydrological regime of any watercourses draining to Galway Bay (Sruthán na Líbeirtí (Liberty Stream), the Trusky Stream, the Bearna Stream and tributaries, the Tonabrocky Stream, and the Knocknacarragh Stream) would be temporary and would not have long-term hydrological effects on the receiving environment downstream in Galway Bay Complex SAC or Inner Galway Bay SPA.

Surface Water Quality

As detailed in the 2018 NIS, and unchanged in the updated NIS, during construction, contaminated surface water runoff and/or an accidental spillage or pollution event into any of the watercourses crossed by the Project has the potential to have a significant negative impact on water quality, and consequently downstream in Galway Bay. The effects of frequent and/or prolonged pollution events in a river system can be extensive and far-reaching and can have significant long-term effects. In an extreme scenario, with a pollution event of sufficient magnitude, it could result in the mortality of aquatic species. Water quality impacts could affect freshwater aquatic species in the receiving environment, any wetland habitats downstream connected to the receiving watercourses, and potentially the receiving estuarine, coastal and marine environment. Any impacts to coastal and marine habitats could affect cetacean species that may utilise Galway Bay, including QIs from Kilkieran Bay and Island SAC and Inishmore Island SAC.

6.4.2 Potential Hydrological Impacts during Operation

As discussed in Section 2.2.4.1, some of the proposed surface water outfalls for the proposed N6 GCRR discharge directly to surface watercourses, located primarily in the western section of the study area (over the western 10.15km of the 17.5km length of the proposed N6 GCRR). The remaining 7.35km, to the east of the River Corrib will be discharged to groundwater or to existing public storm and foul sewer systems in the absence of surface water drainage features. The realigned N84 Headford Road and slip roads for the N84 Headford Road Junction will discharge to a small ditch that inflows to Ballindooley Lough. The two short sections of tunnel in the eastern section will discharge to the public foul sewer via pumping.

Hydrological Regime

Unchanged since the 2018 NIS, the proposed drainage outfalls have the potential to affect the general flow and morphological regime of a receiving watercourse during operation by increasing the volume and rate of runoff during storm events. However, the design includes the provision of attenuation ponds and flow control to restrict the outfall discharge to a more natural greenfield flood runoff rate, thereby avoiding potential significant impacts to channel morphology and flow regime.

The presence of new structures on watercourses has the potential to affect the existing flooding regime of the river/stream concerned. However, the assessment for the OPW Section 50 applications showed that all culverts provided are suitably sized to prevent any potential flood impacts both under present day statistics and in the short to medium term climate change conditions.

The only major watercourse bridge structure is the proposed River Corrib Bridge. The morphology of the River Corrib is significantly influenced by ambient flow and flooding conditions in the river, which in the case of the River Corrib are controlled through the Salmon Weir in Galway City. The potential increase in flow volume to the river arises from increased impervious area by the road pavement area, the provision of road and embankment drainage with a direct pathway via the road drainage system to the receiving watercourse and potential interception of groundwater and diversion of drainage waters that would not otherwise have reached the outfall point. The hard-paved areas and the road drainage system reduces the time of concentration for rainwater to arrive at the outfall and thus increase the rate of runoff over the natural greenfield condition.

In terms of the flooding regime, a detailed hydraulic assessment of the River Corrib and the proposed bridge structure was carried out as part of the Section 50 of the Arterial Drainage Act 1945 (as amended) application for the River Corrib Bridge. This assessment involved development of a detailed 2-dimensional hydraulic model of the River Corrib reach from Menlough to the Salmon Weirs Barrage and included the Jordan Island channel and the Coolagh Lakes to predict flood levels and allow testing of various bridge configurations as part of the design and optioneering studies for the bridge.

The modelling of return period flood flows with inclusion for statistical error provided flood levels at the proposed bridge site and these predicted flood levels clearly demonstrate that the proposed bridge structure will have no discernible impact on water levels and the flow regime either upstream or downstream nor is there any flood risk issues for the Project with the proposed bridge deck and the storm drainage system sufficiently elevated above extreme flood levels.

Hydraulic analysis shows no discernible impact on flood levels at the design flood event which is the 100 year with inclusion of a climate change (CC) allowance of 20%. The predicted flood level for this design

flood condition (100yr +CC) is 7.63m OD. At such a flood level, both river bank piers will be located just outside of the flood risk area well outside the flood conveyance zone. At the estimated 1000 year flood level of 7.524m OD associated with a peak flood flow of 545 cumec, the proposed bridge piers remain outside floodplain area in the flood zone (refer to Figure 5.2.2 in Appendix B) and, therefore, no encroachment of the floodplain area will occur at the bridge crossing. The water quality/attenuation ponds are also shown to remain outside the flood risk zones.

In order to avoid any potential scour risk associated with the construction of the bridge structure, the abutments will be sufficiently set back from the channel bank edge with foundations located at depth. This will protect the river channel from changes in morphology whereby the channel over time would naturally migrate towards one of the abutments. However, there is little potential for bank erosion at the proposed River Corrib crossing location as the river channel is straight, regular and cut into bedrock.

Surface Water Quality

As discussed in Section 0 and unchanged since the 2018 NIS, there are three drainage networks which discharge directly to the Lough Corrib SAC, namely S15, which drains the proposed N59 Link Road North and outfalls to an existing drainage ditch which ultimately outfalls to the River Corrib (part of both Lough Corrib SAC and Lough Corrib SPA at this location), S18A and S18B which both directly discharge to the River Corrib. Additionally, there are two road drainage networks (S14A and S14B) which outfall indirectly to the Lough Corrib SAC via an existing stream[30] which flows to the west of Aughnacurra residential estate.

All drainage outfalls within the catchments of the Bearna Stream and the Knocknacarragh Stream will ultimately discharge to Galway Bay within Galway Bay Complex SAC and Inner Galway Bay SPA. The remaining surface water catchments to which the road drainage outfalls (Sruthán na Líbeirtí (Liberty Stream) and the Trusky Stream) also discharge to Galway Bay but to the west of Galway Bay Complex SAC and Inner Galway Bay SPA.

The drainage network and discharge points across the Project, including those in the River Corrib catchment, are shown on Figures 2.1 to 2.15.

These outfalls have a potential to affect water quality in the receiving watercourses from routine contaminants that are contained in road drainage waters and also potentially by contamination arising from large liquid spillages as a result of an accident on the Project.

All road drainage outfall discharges will undergo first flush water quality treatment in a wetland and pond system and will be fitted with an oil and petrol interceptor to capture hydrocarbons. Assessment of the potential impact both at individual outfalls and the cumulative load from the five surface outfalls on the water quality of the River Corrib was assessed using 2-dimensional hydrodynamic and transport dispersion modelling and using the TII HAWRAT package. The findings from this assessment (Section 4.2 of Appendix B) clearly show that the proposed routine discharge and first flush events will be sufficiently diluted by the River Corrib flow, even during low flow conditions, as not to have any perceptible water quality impact either locally or downstream. The assessment shows that water quality treatment of the first flush event through detention and slow-release over a 24 hour period is an important measure as it reduces localised impacts near the outfall point such that predicted heavy metal and suspended sediment concentrations do not exceed any environmental threshold levels and easily satisfy the surface water regulations.

To assess the localised impacts of the outfall drainage discharges to the River Corrib after treatment the 2-dimensional hydrodynamic model of the River Corrib developed as part of the assessment for the 2018 NIS for assessing the proposed river bridge crossing was run for first flush events of 15mm rainfall on the hard-paved area discharging at the various River Corrib outfalls (see Section 4.2 of Appendix B). The plume migrates with the flowing river downstream towards Galway City and therefore exposure duration is limited to the discharge period of approximately 12 hours. The maximum predicted concentrations throughout the model domain show that the plume hugs the near bank side of the river for quite a distance downstream before fully mixing across the river channel and has an imperceptible impact on water quality in the River

[30] It should be noted that a section of this stream is partially culverted through Ard na Locha and is referenced as a sewer on Figure 2.6.

Corrib (Figures 4 to 9 of Appendix B). This modelled was reviewed again for this updated NIS and the findings and assessment are unchanged.

There is significant buffering between the Project and the Galway Bay Complex SAC and Inner Galway Bay SPA which minimises the potential impact of pollution runoff on these sites. The overall scale of the Galway Bay Complex SAC and Inner Galway Bay SPA and the large flushing by tidal waters over spring and neap tides eliminates any potential impact that the Project could have on the water quality of the Galway Bay Complex SAC and Inner Galway Bay SPA.

It is anticipated that the Project (which will take traffic from existing roads) will provide some benefit to water quality in receiving watercourses as most of the existing road network does not have sustainable urban drainage systems to protect surface and groundwater alike.

The risk of pollution to both surface and groundwater resulting from accidental spillage has been considered. The risk is influenced by the type of roadway, length of road, the traffic volume, and proportion and type of heavy goods vehicles (HGV's). As per the 2018 NIS, a spillage risk assessment of the Project has been carried out in accordance with the TII Publications DN-DNG-03065 (HD45/15) June 2015 (formerly NRA Design Manual for Roads and Bridges DMRB) – presented in Tables 9 and 10 of Appendix B. The spillage assessment shows the Project will have very low magnitude of risk for individual outfalls or grouped catchment outfalls. The overall combined probability of a serious HGV spillage entering a watercourse from the Project is low at 0.09%. A similar assessment was carried out for the proposed outfalls to groundwater via an infiltration basin and is presented in Table 10 of Appendix B and similarly show very low probabilities. Both assessments were reviewed again for this updated NIS and the findings are unchanged.

Notwithstanding the very low spillage risk for this Project all storm outfalls will include pollution control facilities at their outfalls. All outflows will generally pass through large detention ponds that will be fitted with a penstock or similar restriction at the outfall to the receiving channel. In the event of a serious spill, these controls can be put in place to block the outflow of contaminants allowing time for clean up to take place.

Summary

The Project has the potential to affect water quality in the receiving environment during construction. This has the potential to impact on aquatic, estuarine and marine QI habitats and species downstream of the Project in Lough Corrib SAC and Galway Bay Complex SAC, habitats and SCI bird species downstream in Lough Corrib SPA and Inner Galway Bay SPA, and wetland habitats at potential "*ex-situ*" sites where SCI bird species of Lough Corrib SPA and Inner Galway Bay SPA were recorded. This has the potential to result in the degradation of QI/SCI habitats and habitat areas supporting the QI/SCI species of these European sites which has the potential to affect the sites' conservation objectives and adversely affect the integrity of these European sites.

6.5 Habitat Degradation as a result of Air Quality Impacts

The potential air quality impacts assessment has been reviewed with the Project Air Quality expert and their updated assessment which has been updated since the 2018 NIS to take account of TII's *Air Quality Assessment of Specified Infrastructure Projects* which were published in 2022. Emissions from car exhausts, engine, brake and tyre wear, can contribute to increased deposition of pollutants such as oxides of nitrogen (NO_x, NO_s) and ammonia (NH_4) in the vicinity of a road carriageway. This can affect the ecosystems and vegetation present, influencing plant growth rates and species composition, diversity, and abundance. Dust emissions associated with construction works could, in extreme circumstances, affect adjoining habitats (potentially burying sensitive habitats or plant species).

The current understanding of air quality impacts from roads and their interaction/effects on ecology are set out in the TII guidance document *Air Quality Assessment of Specified Infrastructure Projects (TII, 2022)* , and two UK reports: *The Ecological Effects of Diffuse Air Pollution from Road Transport* (Bignal *et al.*, 2004) and *The Ecological Effects of Air Pollution from Road Transport: An Updated Review* (Natural England, 2016).

The parameters measured for air pollutant in TII's 2022 Air Quality Standards focuses on potential increased deposition of pollutants such as oxides of nitrogen (NO_x, NO_s), ammonia (NH_4) and acid deposition in the vicinity of a road carriageway. An updated assessment of these potential pollutants as a result of the forecasted traffic from the updated traffic modelling have been taken into account in this updated NIS. The effects of air pollution on vegetation and habitats are generally greatest within 50-100m of the road carriageway but effects can extend up to 200m. The only European site in the vicinity which could be affected is Lough Corrib SAC.

Summary

The Project has the potential to affect vegetation and habitats in Lough Corrib SAC through air quality impacts during construction and/or operation which has the potential to affect the conservation objectives and adversely affect the integrity of this European site.

6.6 Habitat Degradation as a result of Shading Impacts

Elevated structures, sections of high embankment or high retaining walls have the potential to have shading effects on habitats beneath or in the vicinity of these features. Shading effects on the vegetation composition and structure of impacted habitats arise through a reduction in sunlight and/or direct precipitation affecting plant growth and species composition/abundance. Shading impacts on vegetation can only affect habitat areas beneath or in close proximity to the Project.

Unchanged since the 2018 NIS, the proposed River Corrib Bridge and the elevated embankment on its eastern approach (Ch. 9+250 – Ch. 9+600 of the proposed N6 GCRR) and the section of embankment, retaining structure and bridge over Bóthar Nua (Ch. 9+850 – Ch. 10+150 of the proposed N6 GCRR occur within, or adjacent to, Lough Corrib SAC and this is the only European site at risk from shading effects. Although the Project also passes through or lies adjacent to Lough Corrib SAC for Lackagh Tunnel and its approaches between Ch. 10+600 and Ch. 11+800 of the proposed N6 GCRR, shading impacts will not arise in this area as the proposed road carriageway is either at grade, in cutting, underground, or passing through Lackagh Quarry which lies below the level of the surrounding lands.

Summary

The Project has the potential to affect habitats in Lough Corrib SAC as a consequence of shading impacts during operation which has the potential to affect the conservation objectives and adversely affect the integrity of this European site.

6.7 Habitat Degradation as a result of Introducing or Spreading Non-native Invasive Plant Species

Non-native invasive plant species have been recorded along, or in close proximity to the Project[31] (see Section 5.7 and Figures 15.1 to 15.5). Therefore, construction works have the potential to accidentally cause their introduction/spread to habitat areas within European sites crossed by, or downstream of, the Project. This includes along the haul routes shown on Figures 3.1 and 3.2. This has the potential to have long-term effects on plant species composition, diversity and abundance in affected habitats.

Unchanged since the 2018 NIS, given the presence of non-native invasive plant species cover in the immediate vicinity of the Project, there is the potential that these species will recolonize vegetated areas within the Assessment Boundary post-construction. As such, there is also a risk that routine maintenance works may inadvertently spread contaminated vegetation cuttings.

Summary

The Project has the potential to affect habitats along the Project during construction and/or operation as a result of introducing or spreading non-native invasive plant species, which has the potential to affect the conservation objectives and adversely affect the integrity of nearby European sites.

6.8 Disturbance/Displacement

In conjunction with any displacement effects associated with habitat loss, increased human presence and/or noise and vibration associated with construction works, has the potential to displace any fauna species from both breeding/resting places and from foraging habitat. This section discusses those species that are relevant to the assessment of effects on European sites.

Unchanged since the 2018 NIS, disturbance/displacement effects from the Project could only affect the QI species of a SAC site that is crossed by, or in close proximity to, it. The same applies in relation to SPA sites with the additional requirement to consider *ex-situ* sites, beyond the SPA boundary, that are important in supporting the SPAs SCI population(s). With regard to SAC sites, only Lough Corrib SAC, and its QI species Otter, Atlantic salmon, Sea lamprey and Brook lamprey, is likely to be subject to some level of disturbance during construction and/or operation[32].

Otter

The results of the recent Otter surveys undertaken in 2023 to inform this updated NIS and the previous surveys undertaken for this Project, indicate no Otter breeding places (holts) or resting places (couches) were observed within the construction disturbance ZoI (150m) (Section 4.4.1.3 and Section 5.6). The records indicate transient use of the River Corrib within the Assessment Boundary, rather than permanent use (supported by the lack of holts/couches observed over the survey period). The Project will not result in any permanent disturbance or displacement effects with regard to sedentary otter populations. However, signs of Otter were recorded widely along the River Corrib corridor. Therefore, increased human presence and/or noise and vibration associated with construction works, particularly associated with the construction of the proposed River Corrib Bridge, has the potential to (at least temporarily) displace commuting or foraging Otter.

Otter are known to tolerate human disturbance, including road traffic, under certain circumstances (Bailey & Rochford, 2006; The Environment Agency, 2010; Irish Wildlife Trust, 2012; and, Reid *et al.* 2013). This is also evidenced by the presence of Otter signs along the River Corrib through the UoG Campus (see Figure 6), the presence of an active Otter couch site within 50m of the Quincentenary Bridge, and the presence of Otter (including holt sites) in the urban centre of Galway City. Otter are also nocturnal in habitat, and this greatly reduces the risk of displacement given that the majority of construction works likely to take place during normal daylight working hours. There will be blasting at Ballagh for approximately 9 months which

[31] Non-native invasive aquatic plant species were not recorded in aquatic habitats impacted by construction works.

[32] The other QI species of Lough Corrib SAC are not at risk of disturbance effects as they are either not present in the River Corrib (White-clawed crayfish or the Freshwater pearl mussel – see Section 9.1.2.3 and Section 9.1.2.6, respectively) or the QI populations are remote from the study area as is the case for the Lesser horseshoe bat (Section 9.1.2.5).

will cause some level of disturbance to Otter using the Bearna Stream (the lower reaches of which are within Galway Bay Complex SAC) and the Tonabrocky Stream. However, this will only affect Otter temporarily, will not affect any Otter holts, and with Otter known to tolerate certain levels of disturbance and habituate to it, this will not have long-term effects on Otter usage of the Bearna Stream catchment. Considering the above, disturbance due to increased human presence, noise and vibration associated with construction works in the vicinity of the River Corrib, Coolagh Lakes, and Bearna Woods, does not pose a risk of resulting in long-term disturbance/displacement of Otter from these river/lake systems.

Similarly, Otter would not be adversely affected by disturbance during operation given that, based on the findings of the Otter surveys carried out in 2023 and previously between 2014 and 2016, they are currently using habitat in the vicinity of the UoG Campus and the existing Quincentenary Bridge (an existing busy road). There is no artificial lighting associated with the proposed River Corrib Bridge and therefore, there is no risk of displacement effects from this impact source.

Unchanged since the 2018 NIS, the Project will not result in any long-term disturbance or displacement of Otter, during construction or operation.

Atlantic salmon, Brook lamprey and Sea lamprey

Increased human presence, and noise and vibration associated with the construction works (including the installation of any temporary piles required to construct bridge abutments) could result in the displacement of fish species from the area. Given the temporary nature of any vibration associated with pile driving, and the short-term nature of general construction works (which if carried out during normal working hours, would be of a limited duration each day), disturbance levels will not permanently displace fish species from the River Corrib in the vicinity of the Project.

Given that the existing Quincentenary Bridge does not result in any disturbance or displacement effects to fish species in the River Corrib, operation of the Project does not pose any disturbance displacement risk. There will be no artificial lighting associated with the proposed River Corrib and therefore, there is no risk of displacement effects from this impact source.

Unchanged since the 2018 NIS, the Project will not result in any long-term disturbance or displacement of Atlantic salmon, Brook lamprey or Sea lamprey, during construction or operation, will not affect the conservation objective attributes and targets supporting the conservation condition of these species in Lough Corrib SAC (see Table 9.13).

Cetacean Species

As detailed in Section 4.3, Cetacean species are a new consideration since the 2018 NIS.

Drawing on European sites designated for Harbour porpoise *Phocoena phocoena*/Bottlenose dolphin *Tursiops truncatu*s, the conservation objectives are to (maintain or) restore the favourable conservation condition of the species, which includes the following attribute and target related specifically to disturbance:

- Disturbance (i.e. human activities should occur at levels that do not adversely affect the Harbour porpoise/Bottlenose dolphin community at the site)

The Project does not propose any direct activities within the Galway Bay area and will not impact cetaceans by means of human-related disturbances.

SCI Bird Species

Increased human presence, and noise and vibration associated with general construction works (and also including any impulse noise disturbance, such as blasting, that might be required to facilitate construction works) has the potential to disturb, and potentially displace, birds from important habitat areas. This could apply to areas both within SPA sites, or at associated *ex-situ* supporting habitat area remote from the SPA site itself.

Summary

Unchanged since the 2018 NIS, the Project has the potential to affect habitat usage by SCI bird species during construction and/or operation, both within SPA sites and at important *ex-situ* habitat areas which have the potential to affect the conservation objectives and adversely affect the integrity of SPA sites.

6.9 Barrier Effect

The Project could potentially pose a physical barrier to aquatic species movement either as a result of physical construction or during operation where the design of watercourse crossing structures restricts the movement of aquatic species along river/stream corridors, particularly during periods of high water or flood. The Project traverses the following watercourses: Sruthán na Líbeirtí, the Trusky Stream, the Bearna Stream, the Tonabrocky Stream, the Knocknacarragh Stream and the River Corrib.

Unchanged since the 2018 NIS, the River Corrib is the only watercourse crossed by the Project within a European site, namely Lough Corrib SAC.

However, given the construction methodology (as outlined in Appendix D), the proposed River Corrib Bridge does not require the provision of a temporary crossing structure to facilitate construction works and neither are any in-stream works required. Bankside works will be required to install the drainage outfalls to the River Corrib on both banks of the river (Figures 2.1 to 2.15); and this will result in the severance of the bankside habitat used by Otter, at least temporarily, during construction. Nevertheless, considering all of the above, the River Corrib channel will remain unobstructed by construction works and therefore construction works will not pose any physical barrier to aquatic species movement along the river corridor.

As the proposed River Corrib Bridge is a clear span structure (elevated c.10m over the river), and will not have any in-stream supporting structures, it poses no risk of a barrier to aquatic species' movement along the River Corrib during operation.

The Project crosses the Bearna Stream and the Tonabrocky Stream. Otter were also recorded in the Bearna Stream catchment. Two culvert structures are proposed on these watercourses which have the potential to present a barrier to Otter movement during construction (as in-stream works are required) and during operation. Although where the Project crosses these watercourses they are not within Galway Bay Complex SAC, the lower portion of the Bearna Stream does lie within this European site. Otter using these watercourses are likely to form part of that European site's Otter population.

Disturbance/displacement of aquatic species from sections of river/stream channel during construction could also potentially act as a "barrier" to species movement. This is assessed above under Disturbance/Displacement, the conclusion of which was that neither construction or operational disturbance poses any risk of affecting the conservation objectives of Lough Corrib SAC's QI species.

Drawing on European sites designated for Harbour porpoise/Bottlenose dolphin, the conservation objectives are to (maintain or) restore the favourable conservation condition of the species, which includes the following attribute and target related specifically to barriers:

- Access to suitable habitat (i.e. Harbour porpoise/Bottlenose dolphin range within the site should not be restricted by artificial barriers to site use)

The Project will not pose any physical barriers in Galway Bay, will in no way limit the access of cetaceans to Galway Bay, and will not impact cetaceans by means of barrier effects.

Summary

Unchanged since the 2018 NIS, the Project will not result in a barrier to aquatic species movement during construction or operation. However, it may present a barrier effect to Otter within the Bearna Stream catchment.

6.10 Mortality Risk from Construction works and Road Traffic

The introduction of the Project into a rural landscape will permanently increase the risk of road traffic collisions with terrestrial fauna species. This section discusses those species that are relevant to the assessment of effects on European sites.

During construction of the proposed River Corrib Bridge, there is a risk of construction materials accidentally falling into the River Corrib and killing/injuring aquatic species such Otter, Atlantic salmon, Brook lamprey and Sea lamprey. At this location, the River Corrib lies with Lough Corrib SAC and these species are listed as QIs for this European site. As the Project is remote from all other European sites, this potential impact only poses a risk to the conservation objectives of Lough Corrib SAC.

Evidence of Otter activity was widespread along the River Corrib and at the Coolagh Lakes, both of which form part of Lough Corrib SAC. Otter were also recorded in the Bearna Stream catchment and, although where the Project crosses the catchment is not part of the Galway Complex SAC, Otter using these watercourses are likely to form part of that European site's Otter population. The introduction of a new road, including a new bridge structure, across the River Corrib floodplain and in close proximity to the wetland complex at the Coolagh Lakes introduces a risk of road traffic collisions with Otter as do the new crossings of the Project over watercourses in the catchment of the Bearna Stream. This has the potential to affect the conservation objectives of Otter in both Lough Corrib SAC and Galway Bay Complex SAC.

Summary

Unchanged since the 2018 NIS, the Project has the potential to result in the mortality of the QI aquatic species of Lough Corrib SAC during construction of the River Corrib Bridge. It also has the potential to result in the mortality of Otter through the increased risk of road traffic collisions which could affect the Otter populations of Lough Corrib SAC and Galway Bay Complex SAC. These impacts have the potential to affect the sites conservation objectives and adversely affect the integrity of these European sites.

6.11 Collision Risk with Bridge Structures

Bird Use of the River Corrib Corridor

The results of surveys undertaken for the Project from 2024 back to 2014 were reviewed along with the results of the bird data collected for the 2006 Galway City Outer Bypass (GCOB) project (Appendix G). As presented in the 2018 RFI Response and discussed during the oral hearing in 2020, the 2006 GCOB data is of relevance to this assessment, despite the age of that data. To clarify, the 2006 data is considered and incorporated into overall discussion and assessment as part of the recent ecological information and is by no means the only data relied upon in the 2018 NIS or this updated NIS.

The results of the extensive ecological surveys and information generated for the Project, including surveys in 2023 and 2024 along with the 2006 GCOB riverine-targeted bird assessments in River Corrib, provide a baseline of the suite and abundance of bird species that would be expected to forage/commute along the River Corrib in the vicinity of the Project, including the following species listed as SCIs for the European sites considered in this evaluation (Table 5.3):

- Black-headed gull
- Common gull
- Common tern
- Cormorant
- Coot
- Curlew
- Grey heron
- Hen harrier
- Lapwing
- Merlin

The most frequently recorded SCIs of relevance during the surveys undertaken between 2022 to 2024 for the Project include the Black-headed gull, Common gull, Cormorant and Coot, with the fewer sightings of Grey heron, Curlew and Common tern in the riverine corridor and could be considered at-risk species from the proposed River Corrib Bridge.

Collision with Structures

From the literature review carried out, bird collisions with man-made structures are common and well documented (Banks, 1979; Kelm, 1990; Kelm, 2008; Jenkins *et al.*, 2010; Lucas *et al.*, 2008; Longcore *et al.*,

2012; Erickson *et al.*, 2001). Buildings and windows (Kelm, 2008), power lines (Jenkins *et al.*, 2010), wind turbines (Lucas *et al.*, 2008) and communication towers (Longcore *et al.*, 2012) are all documented as the primary structures causing bird collisions leading to mortality (Erickson *et al.*, 2001). Less widely documented are avian collisions with bridges.

The Fehmarnbelt Fixed Link EIA (FEBI, 2013) details results of a bird collision study carried out at the Oresund Bridge by Nilsson *et al.* (2009 (as reported in FEBI, 2013). The bridge connects Denmark and Sweden, includes cable-stay sections and is approximately 8km in length. In 2000, shortly after the bridge opened, 344 bird carcasses were recovered following one collision event. The incident was assumed to be an effect of low visibility in combination with high pylons. After opening of the bridge in 2000, a collision of estimated thousands of birds occurred on the night of the 8 October 2000 (Bengtsson, 2000 in FEBI, 2013). Subsequent studies on bird movements around the bridge recorded collision events in autumn of 2001 (291 birds), 2002 (103 birds), 2003 (65 birds) and 2008 (21 birds) as reported in FEBI (2013). A review of the 2001 data showed that passerine species comprised 94% of collision victims, a finding that has similarly been reported at lighted towers and associated guy wires in the US and Canada (Longcore *et al.*, 2013), 96% of victims were migrating birds and 73% were nocturnal migrants (Nilsson and Green 2002 as reported in FEBI 2013).

The composition of collision victims in later studies (Nilsson 2003 as reported in FEBI 2013, Nilsson 2004 as reported in FEBI 2013, Nilsson and Green 2009 as reported in FEBI 2013, Nilsson *et al.* 2009 as reported in FEBI 2013) changed with a marked reduction in the number of passerine carcasses recovered and an increase in gull species carcasses. The data indicated that lighting changes in 2002, turning bridge lights off at high pylons during foggy conditions, may have reduced passerine collision numbers, and that scavenging species (e.g. gulls) may have a greater collision risk with traffic due to their behaviour. The studies have also inferred that bird collisions with the bridge mainly occur during adverse weather conditions (Nilsson *et al.* 2009 as report in FEBI 2013). To put this study into context it has been estimated 100 million individuals pass over the Oresund area every autumn (Nilsson and Green 2011), with 10 million migrants passing the Oresund Bridge during autumn migration, and that numbers of collision victims reported in the above studies did not represent more than a minor effect on species considered (Nilsson *et al.* 2009 as report in FEBI 2013).

Migratory passerine species are the most prevalent collision victim (Bing *et al.*, 2012; Longcore *et al.*, 2013), a trend that has also been recorded at the Sabo Bridge over Sabo Estuary in Portugal (Godinho *et al.*, 2017). Bird mortality was estimated at three sections of the railway, over a total distance of 16.3 km. As with the above case studies, 27,000 bird movements (c.83% re water fowl and aquatic birds, with passerine species accounting for most of the remainder of species) were recorded crossing the Sabo Bridge during 400 hours of observation (Godinho *et al.*, 2017), suggesting that bridges over wetlands present a relatively low collision risk to waterbirds and mortality occurred at such low numbers that it did not represent more than a minor effect. Despite the greater proportion of aquatic birds, passerine birds accounted for 15 of the 25 bird species identified in the mortality survey. As with the Oresund Bridge, the Sabo Bridge is also a cable-stay and bowstring structure, which pose a greater collision risk to birds than the proposed clear span bridge structure over the River Corrib.

As part of the Hong Kong-Shenzhen Western Corridor EIA for a 5.5km bridge (Ove Arup & Partners Hong Kong Ltd., 2002) a short study was carried out during the migration period (November 2001 to March 2002) to assess flight behaviour and altitudes over three selected bridges, all approximately 15m in height. The study found that birds tended to flyover the structure in the evening and below the structure during the midday, and that birds actively avoided the structure by changing their altitude on approach. No collisions with the studied bridges were observed. However, it should be noted that nocturnal surveys were not carried out.

A study of the M4 Severn Bridge Crossing, UK, found that many bird species (including Dunlin) changed their flight patterns to fly over the bridge, gaining height within 100m of the bridge, before dropping to their normal flight altitude (The Mersey Gateway Project Environmental Statement, 2008). Mallard and mute swans were recorded flying under the bridge, in a straight line (The Mersey Gateway Project Environmental Statement, 2008). The M4 Severn Bridge Crossing is a cable-stay bridge that is 2.2 km in length, and has a height of 136 m, and a clearance of 47m above water level. This study did not include observation periods during poor visibility conditions or nighttime periods.

A short-term study at the Golden Gate Bridge, California, showed birds actively avoided the bridge structure with most flying over or around the cable-stay structures rather than through them. No collisions were recorded and similarly these surveys were carried out during the diurnal period (Golden Gate Bridge EIA - EDAW and AECOM, 2009).

The findings of these studies support an argument that bridge structures, although they may result in some degree of bird mortality through collision, do not pose a collision risk of a magnitude that would kill large numbers of birds or result in any population level effects as a consequence. These findings also support avoidance of structures by birds in flight.

The risk of birds colliding with a bridge structure is dependent on factors such as the location and attributes of the man-made structures (Lucas *et al.* 2008), visibility and detectability of the structure (bridge strikes are more likely during poor weather conditions or at night), the structure and use of the surrounding habitat (Zuberogoita *et al.*, 2015), their frequency of occurrence within the impact zone (and flight height relative to the bridge structure), and the bird species present and their species-specific characteristics such as morphology and behaviour which influence their relative susceptibility to colliding with structures (Janss, 2000); scavenging behaviour is also associated with higher mortality due to traffic collisions. The effects of collision risk at night can be magnified by disorientation caused by artificial lighting (Kahlert *et al*., 2005; Molenaar *et al.*, 2006). It has also been inferred that a bird's individual experience or inexperience can influence collision risk (Barrios and Rodriguez, 2004).

Wind direction and wind speed can have a significant effect on collision risk. Collision risk with traffic and bridge structures is greater during windy weather (Jacobson, 2005; Otero *et al*., 2023; Owens and James, 1990). Downdrafts can also occur when bridges are perpendicular to wind direction and can increase collision risk with traffic or bridge structures (Jacobson, 2005).

Larger, less agile species such as geese, swans, cranes and Cormorant would be expected to be more susceptible to colliding with a bridge structure; particularly in relation to the risk of colliding with supporting cables. In terms of design criteria, bridges lit at night and with a dense and/or expansive network of supporting cables and towers across the river valley pose the highest risk.

Collision events with suspension cables are generally comparable to the collision risk with power lines (Kahlert *et al*., 2005), but collisions with bridges are less frequent than with overhead power lines. Flight activity studies at three transmission line sites in central Ireland recorded no collision events between birds and overhead lines during 108 hours of observation (217 flocks and 1040 target species crossings), which is line with findings of other similar studies (EirGrid, 2020). In addition to the lack of collisions, some avoidance behaviour by birds was noted, with the majority of birds flying above the power lines; the exception was at the 400 kV site (with the tallest towers), where a third of all birds flew beneath the lines (EirGrid, 2020). Targeted mortality searches indicated the majority of bird remains were of corvids and pigeon species (common, widespread species) with small numbers of gulls, waders, ducks and passerines (EirGrid, 2020).

A study of mute swan mortality in Dublin and Wicklow found that 57% of swan deaths of a known cause were caused by collision events (Collins and Whelan, 1994, cited in Keville and O'Sullivan Associates Ltd., 2006). 10% of these deaths were caused by bridges, and 72% were a result of collisions with overhead wires (Collins and Whelan, 1994, cited in Keville & O'Sullivan Associates Ltd., 2006). It is thought that bridge designs with stays or tendons are more difficult for swans to avoid than those without, although swan collision events with bridges are rare, and are not significant at the population level (Collins and Whelan, 1994, cited in Keville & O'Sullivan Associates Ltd., 2006).

The only structure associated with the Project which is of a scale as to pose a collision risk to birds is the proposed River Corrib bridge. It spans the River Corrib and riparian corridor (c.620m) which is a prominent natural corridor used by birds for foraging and commuting between Lough Corrib and Galway Bay. Along with more local daily bird movements, the River Corrib corridor is also likely to be used during the seasonal movement of birds to and from Galway Bay. With the exception of the proposed Menlough Viaduct, all of the other structures associated with the Project are either tunnels or (relatively) small river/stream culverts and pose no risk to birds at a population level. The Menlough Viaduct spans an area of Limestone pavement and woodland across the top of a low hill but given that it is only slightly elevated above the surrounding land (generally the deck is between 0.75m and 2.5m above ground), is mostly flanked by woodland on both

sides (minimising the collision potential by directing birds over the structure), it poses a minimal collision risk to birds.

The design for the proposed River Corrib Bridge is detailed in Section 2.2.3.1 of this updated NIS and Appendix D is unchanged from that presented in the 2018 NIS. In terms of design, this poses a minimal risk to birds when compared with bridge structures which present a network of supporting cable structures across the river corridor. The structural depth of the main span of the bridge deck that crosses the River Corrib ranges from 3-7m, which is generally thicker (and therefore likely to be more visible to birds) than the existing Quincentenary Bridge c.1.7km downstream. It will also not be lit, which further reduces the risk of bird collision.

In terms of bird species known to use the River Corrib corridor for commuting or foraging, the more recently recorded species include the Black-headed gull, Common gull, Cormorant, Coot, Grey heron, Curlew and Common tern with additional historical species including the Redshank, Hen harrier, Lapwing and Merlin. Reverting to the surveys carried out in 2005/2006 as part of the 2006 Galway City Outer Bypass Scheme (Appendix G), which specifically recorded species flying through the riverine corridor at a location in close proximity to the proposed bridge (52 surveys encompassing 104 hours of observations), the most frequently recorded SCIs were Black-headed gull, Common gull and Cormorant. Black-headed gull were recorded passing the observation point 409 times (with 810 individuals counted in total); Common gull passed the observation point 93 times (130 individuals in total); and, Cormorant passed the observation point 177 times (248 individuals in total). Hen harrier and Coot were only recorded once, Curlew twice and Lapwing on four occasions over the survey period. Grey heron were recorded passing the observation point on 20 occasions. Common tern were observed passing the observation point on only 43 occasions and generally low over the water (<5m). Although dated, the report gives good indication of the proportional use of the River Corrib corridor by relevant SCIs and the recent surveys align with the representative ratio of abundances as indicated above (other than the single sighting of four Common terns and no confirmed sightings of Lapwing).

Waterbirds frequenting the River Corrib, such as indicted above, commuting between Galway Bay and Lough Corrib, successfully navigate four existing road bridges during each one-way flight. The proposed bridge over the River Corrib spans the entire river and riparian corridor (c.620m wide) and depth of the main span ranges from 3-7m, which is generally thicker (and therefore likely to be more visible to birds) than the existing Quincentenary Bridge c.1.7km downstream. The scale of the proposed clear span bridge is insignificant in comparison to the examples in Denmark, Sweden, Portugal, Hong-Kong and San Francisco discussed above and poses minimal risk to birds due to the absence of a network of supporting cable structures.

It is worth noting in terms of collision risk and population level effects locally, that the Quincentenary Bridge (an elevated structure above the River Corrib with supporting piers in the river channel) has been in operation since 1984 and population trends for the SCI bird species of Inner Galway Bay SPA recorded along the River Corrib corridor are currently assessed as stable or increasing (NPWS 2013b) – similar population trends were not available for Lough Corrib SPA at the time of writing.

Given the low risk posed by bridges to bird populations, the design of the proposed River Corrib Bridge, the low number of individual SCI bird species (and individuals) recorded passing along the River Corrib corridor (particularly in the context of the SPA populations for those species), and the low crossing frequencies observed, a bridge such as that proposed over the River Corrib for the Project is not predicted to pose a collision risk of a magnitude that would have any long-term effects on the numbers, distribution, or the existing population trend for any SPA.

Nocturnal Birds

The fact has been considered that visibility and detectability of structures influence a bird's relative susceptibility to colliding with the structure (Janss, 2000). Strikes are more likely to occur during poor weather conditions or at night (Nilsson *et al.* 2009 as report in FEBI 2013). However, increasing the detectability of a bridge at night by artificial lighting can magnify the collision risk by causing disorientation (Molenaar *et al.*, 2006; Nilsson *et al.* 2009 as report in FEBI 2013). To minimise the risk of collision even further, and protect other sensitive ecological features from impacts (i.e. bats), the proposed bridge will not be lit. The depth of the main span (3-7m) of the proposed bridge, which will be a concrete finish, is

considered to be sufficiently visible in varied weather conditions and low light levels that it will be detectable to birds.

In relation to nocturnal movements of birds, no nocturnal SCI species are listed for either the Lough Corrib SPA or Inner Galway Bay SPA, however barn owl are known to occur in the area and have been fully assessed in the updated EIAR. In general night-time migrating birds fly large distances during the night and at high altitudes – i.e. at altitudes greater the 1km (Gauthreaux, 1991; Dokter *et al.* 2010). The proposed bridge at 8m above the River Corrib will not pose a collision risk to migrating birds flying at night at high altitudes. Daily commuting birds moving between Lough Corrib and Galway Bay are expected to fly during daylight hours and often shortly after dawn and shortly before dusk. Night-time flying birds, either nocturnal species or night-time migrating birds, are not considered at risk to collision with the proposed bridge due to the reasons above.

Summary

Considering the information presented above, the low risk posed by bridges to bird populations, and the clear span design and scale of the proposed bridge, the level of data and the scope of the assessment presented in the updated NIS is sufficient to support the conclusion that the proposed River Corrib Bridge will not affect local bird populations as a result of bird collisions with the bridge structure and it is certain that the Project will not adversely affect the integrity of Lough Corrib SPA or Inner Galway Bay SPA.

6.12 Increase in construction-related traffic

As detailed in Section 1 and the start of Section 6, the potential impact pathway due to an increase in construction-related traffic has been considered in this updated NIS as identified by Dr Arnold, included in the Appropriate Assessment appended (as Appendix 6) to ABP's Inspector's Report date 22 June 2021, including the European sites within the zone of influence of this impact pathway.

The Project will require access to construction vehicles, machinery and workforce which will result in an increase in construction-related, large and small vehicular movements to and from the site to surrounding areas, as well as increased movement of vehicles from workers arriving and leaving the discreet construction sites.

Based on the proximity to the road network, the following European sites have an associated risk on QIs/SCIs due to a potential increase in construction-related traffic, specifically along the R458, N67 and M18 (ABP's Inspector's Report, 2021):

- Lough Corrib SAC
- Galway Bay Complex SAC
- Lough Corrib SPA
- Inner Galway Bay SPA
- Ardrahan Grassland SAC
- Castletaylor Complex SAC
- Kiltiernan Turlough SAC
- Lough Fingall Complex SAC
- Rahasane Turlough SPA
- Rahasane Turlough SAC
- Cregganna Marsh SPA

The increased construction-related traffic could give rise to a variety of potential impacts, including the following as discussed under the relevant headings earlier in this updated NIS:

- Increased spills and leaks which could contaminate groundwater (Section 6.3 and Section 7.3) and surface water (Section 6.4 and Section 7.4)
- Increased generation and deposition of dust and emissions (Section 6.5 and Section 7.5)
- The introduction and spread of invasive species (Section 6.7 and Section 7.7)

The increased construction-related traffic will also contribute to additional noise, vehicular vibrations, vehicular lighting and human activity which will be intermittent and very short duration while vehicles travel along roads to and from construction sites/construction depots/place of residence/stores during the construction phase. These activities will not give rise to impacts that will affect any QIs/SCIs, because:

- These activities and effected are not significantly discernible from existing general activity along these existing roadways/areas
- Any relevant QIs/SCIs are already exposed and habituated to such activities' effects

Summary

The Project will generate increased construction-related traffic along the surrounding road network and impacts associated with increase in emissions, dust, spread of invasive species, and leaks or spills from construction-related traffic could impact on nearby European sites.

6.13 Increase in recreational pressure

As detailed in Section 1 and the start of Section 6, the potential impact pathway due to recreational pressure has also been considered in this updated NIS as identified by Dr Arnold included in the Appropriate Assessment appended (as Appendix 6) to ABP's Inspector's Report date 22 June 2021, including the European sites within the zone of influence of this impact pathway. Dr Arnold refers to the impact pathway arising as a result of "*increasing recreational pressure on certain …* [European] *sites due to increased mobility of an expanding human population*" if "*improvements to the road network bring in additional tourists or indirectly increase the resident population.*"

The Project will generate operational traffic along the surrounding road network with a possible associated risk of a potential increase in recreational pressure on QIs and SCIs as a result of increased visitor numbers on the following European sites:

- Lough Corrib SAC
- Galway Bay Complex SAC
- Lough Corrib SPA
- Inner Galway Bay SPA
- Maumturk Mountains SAC
- The Twelve Bens/Garraun Complex SAC
- Connemara Bog Complex SAC
- Connemara Bog Complex SPA
- Ross Lake and Woods SAC
- Ardrahan Grassland SAC
- Castletaylor Complex SAC

Summary

The Project has the potential to contribute to increased recreational pressure in the surrounding supporting road network, and consideration has been given to possible impacts on the conservation objectives of QIs

and SCIs of local European sites due to the potential increase in recreational pressure and associated increase in visitors to local European sites in the wider vicinity of Galway.

6.14 Potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations of typical species and positive indicator species

Upon review of the assessment undertaken by the Inspector appointed by ABP documented in ABP's Inspector's Report dated 22 June 2021, the potential impact pathway identified by Dr Arnold [appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021] related to possible deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations is also considered.

The Project, through a variety of potential impact pathways (as discussed in the sections above), has the potential to affect local flora and fauna populations within the Assessment Boundary. Some of those local populations may be typical or positive indicator species of QI habitats or support the QI/SCI fauna populations of European sites in the vicinity of the Project.

In addition to the four local European sites (Lough Corrib SAC, Galway Bay Complex SAC, Lough Corrib SPA and Inner Galway Bay SPA) which are/were considered in the overall assessment presented in the updated/2018 NIS through assessment of the impact pathways described above, the additional European sites considered in the zone of influence as identified by Dr Arnold [appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021] include:

- Ardrahan Grassland SAC
- Castletaylor Complex SAC
- Kiltiernan Turlough SAC
- Lough Fingall Complex SAC
- Connemara Bog Complex SAC
- Connemara Bog Complex SPA
- Rahasane Turlough SAC
- East Burren Complex SAC
- Moneen Mountain SAC
- Black Head-Poulsallagh Complex SAC
- Gortnandarragh Limestone Pavement SAC
- Ross Lake and Woods SAC

Summary

The Project will contribute to impacts on surrounding habitats and associated fauna and flora populations and consideration has been given to possible impacts on the potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations in the wider vicinity of Galway.

6.15 Summary

Table 6.1 below summarises the potential impacts associated with the Project, and their ZoI.

Table 6.1 Potential Impacts of the Project

Impact
Construction Impacts
Habitat loss Loss/fragmentation of habitat area, within and adjacent to Lough Corrib SAC, and the loss/fragmentation of habitat area from local sites that support wintering bird species listed as SCIs of Lough Corrib SPA and Inner Galway Bay SPA
Habitat degradation as a result of tunnelling/excavations Tunnelling under Lough Corrib SAC and excavating deep cuttings within and immediately adjacent to the Lough Corrib SAC boundary has the potential to result in the loss, or degradation, of QI Annex I habitat area in Lough Corrib SAC
Habitat degradation as a result of hydrogeological impacts Potential to affect the existing hydrogeological regime supporting groundwater dependant habitats within the hydrogeological ZoI
Habitat degradation as a result of hydrological impacts Potential to affect water quality in the receiving environment during construction, including the marine environment associated with Galway Bay
Habitat degradation as a result of air quality impacts Potential to affect vegetation and habitats in Lough Corrib SAC through dust deposition impacts during construction
Habitat degradation as a result of introducing/spreading non-native invasive plant species during construction
Disturbance/displacement Potential to affect habitat usage by SCI bird species during construction and/or operation, both within SPA sites and at important *ex-situ* habitat areas
Mortality risk from construction works Potential to result in the mortality of the QI aquatic species of Lough Corrib SAC during construction of the River Corrib Bridge
Increase in construction-related traffic Increase in construction-related traffic and the associated increase in emissions, dust, noise and vibration, leaks or spills could impact on the QIs and SCIs of nearby European sites
Potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations of typical species and positive indicator species Through the potential impact pathways described above, there is the potential to affect local flora and fauna populations within the Assessment Boundary
Operational Impacts
Habitat degradation as a result of hydrogeological impacts Potential to affect the existing hydrogeological regime supporting groundwater dependant habitats within the hydrogeological ZoI
Habitat degradation as a result of shading impacts Potential to affect habitats in Lough Corrib SAC as a consequence of shading impacts during operation
Habitat degradation as a result of air quality impacts Potential to affect vegetation and habitats in Lough Corrib SAC through air quality impacts during operation
Habitat degradation as a result of introducing/spreading non-native invasive plant species during operation
Barrier effect

Impact
Potential to present a barrier to Otter within the Bearna Stream catchment
Mortality risk from road traffic Potential to result in the mortality of Otter through the increased risk of road traffic collisions which could affect the Otter populations of Lough Corrib SAC and Galway Bay Complex SAC
Increase in recreational pressure The Project will contribute to increased recreational pressure with possible effects on the conservation objectives of local European sites due to the potential increase in visitors to local European sites in the wider vicinity of Galway
Potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations of typical species and positive indicator species Through the potential impact pathways described above, there is the potential to affect local flora and fauna populations within the Assessment Boundary

7. Zone of Influence of the Project

The Zone of Influence (ZoI) is the area within which the Project could affect the receiving environment such that it could potentially have significant effects on the QI habitats or QI/SCI species of a European site (as defined in CIEEM, 2018).

The mechanism to define the ZoI is summarised as follows:

- Consider the nature, size and location of the Project (see Section 2 for a description of the Project)
- Consider the sensitivities of the relevant ecological receptors (see Section 5 for a description of the baseline environment)
- Identify potential impact sources and pathways (see Section 6 for the potential impacts associated with the Project)
- Determine the ZoI based on the potential extent of the impact

In consideration of the European sites considered in this updated NIS (Section 1.2), identified impact sources and pathways (Section 6), the ZoI of each impact pathway is explained and summarised in Table 7.2, with the combined ZoI shown on Figure 21, with a close up of Lough Corrib SAC on Plate 7.1 at the end of this Section.

7.1 Habitat Loss & Fragmentation

As discussed in Section 6.1, habitat loss refers to any habitat areas lost within European sites and also within the Assessment Boundary. Habitat fragmentation refers to any habitat block which is split by the Project.

As outlined in Section 2.2.2 and Section 6.1, the Project traverses Lough Corrib SAC and some potential *ex-situ* sites supporting bird species listed as SCIs of Lough Corrib SPA and/or Inner Galway Bay SPA – in both instances this will result in some level of habitat loss and fragmentation.

Loss of habitat, and any associated habitat fragmentation, at the winter bird sites will not result in a decline in the number and range of habitat areas available locally to bird species listed as SCIs of any of the surrounding SPAs for their wintering populations and will not therefore, affect the ability of these SCI populations to maintain themselves in the long-term.

As detailed under Section 6.1.2 there are three SPAs locally which have bird species listed as SCIs for their breeding populations: Lough Corrib SPA, Inner Galway Bay SPA and Connemara Bog Complex SPA. None of the breeding sites for the SCI species of these SPAs are within or adjacent to the Assessment Boundary. Connemara Bog Complex SPA lies c.9km to the northwest of the Project and is only listed for breeding SCI populations. At this distance the Project poses no risk of affecting breeding sites or success at the nesting sites within the SPA.

To re-iterate from Section 6.1.2 Rahasane Turlough SPA (c.13km) is outside the impact zone of influence. Cregganna Marsh SPA is the only other SPA within proximity (c.4km southeast) with a solitary SCI wintering bird (Greenland White-fronted Goose, *Anser albifrons flavirostris*). There were no records of Greenland white-fronted geese from any of the winter bird sites for the Project during any of the survey periods undertaken between 2018 and 2024 and the Project will not impact the QI populations of this SPA, or Rahasane Turlough SPA, whose Greenland white-fronted goose populations are linked to the Cregganna Marsh SPA SCI populations.

Lough Corrib SPA is designated for breeding populations of Common scoter, Black-headed gull, Common gull, Common tern and Arctic tern (refer to Table 9.22 of this updated NIS) (Hunt and Heffernan, 2007). Inner Galway Bay SPA is designated for breeding populations of Cormorant, Common tern and Sandwich tern (refer to Table 9.29 of this updated NIS).

Common scoter were not found to be present at any of the winter bird sites across the study area. They breed on lakes and the SCI population breeds in Lough Corrib. They forage on sandy seabeds and offshore shallows.

The nearest Black-headed gull breeding site is at Angliham Quarry; c.1.3km to the north of the Project, where 11 of 431 nest sites recorded during the 2007 survey were located. There are many islands in Lough Corrib traditionally used as Common gull breeding sites, and many bays, islands and sections of shoreline in the lake traditionally used as Common tern nest sites. The nearest of these sites was at Walsh's Island, more than 8.5km to the north of the Project.

Black-headed gull and Common gull are commonly found across a wide range of habitats from aquatic to agricultural to the urban environment, as evidenced from the results of the winter bird surveys. Black-headed gull were recorded from 39 of the 60 wintering bird survey sites across Galway City and environs and Common gull from 27 of the same survey sites (2014/2015). Black-headed gull were recorded 35 times within the Assessment Boundary and buffer Survey Area with numbers ranging in size from single individuals to a maximum flock of 65 birds at the playing fields in Ballybrit, near Castle Park (2022-2023). Common gull were recorded less frequently during 2022/2023 with a maximum flock of five birds. Black-headed and Common gulls are opportunistic omnivorous feeders eating seeds and fruits, insects, earthworms, fish and carrion, and scavenging rubbish and scraps. On the basis of their broad habitat usage and the generality of their food preferences, and given the abundance of suitable alternative foraging habitat that will remain available to both species during operation, habitat loss or habitat fragmentation associated with the Project will not affect the foraging ecology or success of these SCI species.

Cormorant, Common tern, Arctic tern and Sandwich tern forage over lakes, rivers and estuarine/marine waters and feed predominantly on fish. This is consistent with the habitat types where these species were recorded in the local area from the survey results and available desktop records. The Project will not result in any loss of river, lake or marine habitat nor associated prey biomass and the design and mitigation measures will ensure that the Project will not have any effect on water quality in the aquatic and marine environments. The Project will also not result in any fragmentation of aquatic habitat along the River Corrib, over which it crosses on an elevated bridge structure. Therefore, there is no potential for habitat loss or habitat fragmentation associated with the Project to affect the foraging ecology or success of these SCI species.

All other SPAs are located more than 10km from the Project. That distance is considered to be beyond the normal commuting range of wintering or breeding SCI species[33]. The exception is birds wintering in Ireland migrating to/from their breeding grounds; for example, Whooper swans returning to winter in Ireland from their Icelandic breeding grounds. Current best scientific knowledge is that roads do not pose any risk of population level effects to wintering birds during these migratory movements (once habitat loss is considered in the context of staging areas; which does not arise in the context of the Project), and breeding sites or supporting home ranges will not be affected beyond a distance of 10km. Accordingly, the Project poses no risk to the conservation objectives of any other SPA sites.

The ZoI of this impact is potentially any habitat area within or traversed by the Project that lies either within Lough Corrib SAC or those potential *ex-situ* sites supporting SCI listed bird species of Lough Corrib SPA and/or Inner Galway Bay SPA.

[33] Rahasane Turlough SPA is a considerable distance (c.13km) from the project, beyond normal core of foraging ranges for the wintering SCIs observed at the wintering sites within the Scheme Study Area (Wigeon flight distance for forage is <3km (Johnson *et al*., 2009 and Legagneux, *et al*., 2014) and Golden Plover core forage range 3km as reported in Scottish Natural Heritage: Assessing Connectivity with Special Protection Areas (SPAs) Guidance Version 3, 2016).

7.2 Habitat Degradation as a result of Tunnelling/Excavations

As discussed in Section 2.2.2, the Project traverses adjacent to and beneath the Lough Corrib SAC for Lackagh Tunnel and its approaches. The Project has the potential to affect the structural integrity[34] of the rock mass, and the structure and function of the habitats supported by it, above and adjacent to the proposed Lackagh Tunnel and associated construction works.

The ZoI of this impact is habitat areas immediately above the Lackagh Tunnel and along the western and eastern approaches to the tunnel within Lough Corrib SAC.

7.3 The Habitat Degradation as a result of Hydrogeological Impacts

The Project will interact with groundwater during construction and operation and there are groundwater dependant habitats locally that could be negatively affected as a consequence of groundwater drawdown or groundwater quality impacts, where they occur within the hydrogeological ZoI.

The extent of drawdown, referred to as drawdown zone of influence (ZoI), is the area within which groundwater levels are lowered and outside of this area groundwater levels will remain at their natural level. The drawdown ZoI is presented as a radius on either side of the Project that takes into account the aquifer properties and the hydraulic gradient and it is calculated using the upper range of properties determined for each aquifer.

The area where groundwater is at risk from accidental pollution or runoff is limited in extent to c.100m around the Assessment Boundary of the Project for the Galway Granite Batholith due to the poor aquifer properties that will prevent groundwater migrating downgradient of the site. If localised zones of permeability are encountered in the Galway Granite Batholith, then these will be managed by sealing them from the proposed road drainage. The area where groundwater is at risk from accidental pollution or runoff for the Visean Undifferentiated Limestone aquifer encompasses the footprint of the Project but is extended where karst is present to accommodate groundwater down gradient.

The hydrogeological ZoI for groundwater drawdown and groundwater quality impacts during construction and operation is shown on Figures 11.3.001 to 11.3.010 and Figures 12.1.001 to 12.1.008.

The unmitigated ZoI of the Project within the Spiddal GWB, the Maam-Clonbur GWB, the Clare-Corrib (Ballindooley West) GWB, and the Clare-Corrib (Ballindooley East) GWB, does not extend to include any European sites (refer to Figures 11.3.001 to 11.3.010 and Figures 12.1.01 to 12.1.008).

Therefore, the Project will not have any impacts on groundwater dependent habitats in any European sites supported by these groundwater bodies, during construction or operation, as a consequence of the Project traversing these groundwater bodies.

A direct pathway is present between the swallow hole at Galway Racecourse and Galway Bay through the shared Clarinbridge GWB and contamination of water draining into the swallow hole has the potential to impact the Galway Bay Complex SAC and Inner Galway Bay SPA during construction and operational phases.

During construction or operation, the Project only has the potential to interact with groundwater dependant habitats that are within the unmitigated hydrogeological ZoI of the Project, and supported by groundwater contributions from Ross Lake GWB, Lough Corrib Fen 1 (Menlough) GWB, Lough Corrib Fen 1 (Lackagh) GWB, Lough Corrib Fen 2 GWB, Clare-Corrib GWB or Clarinbridge GWB. The only European sites within this zone that contain groundwater dependent habitats are Lough Corrib SAC and Galway Bay Complex SAC.

Within these groundwater bodies, the following elements of the Project have the potential to interact with groundwater during construction, based upon the design of the Project and the groundwater monitoring data presented in Appendix A and Appendix F: excavating and installing the N59 Link Road North drainage outfall, excavating and installing the support piers for the River Corrib Bridge, excavating and installing the

[34] Structural Integrity of the rock mass that supports the mosaic of Limestone pavement and Calcareous grassland is the physical and mechanical geotechnical properties that control the behaviour of the geotechnical Limestone pavement environment

support piers for the Menlough Viaduct and runoff from the small scale construction works at the Lackagh Quarry access road and along Bothar Nua and Sean Bothar and the drainage into the swallow hole at Galway Racecourse.

A groundwater assessment (Appendix L) indicated no direct pathway via the perched or regional aquifer between Lackagh Quarry and Coolagh Lakes (groundwater fed lake) and associated GWDTEs (habitats dependent on lake water level and water quality).

Although the potential hydrogeological impacts do not extend to Lough Corrib SPA, and will not result in any habitat loss or habitat degradation within the Lough Corrib SPA, it does have the potential to affect wetland habitats at the Coolagh Lakes, and potentially peatland habitats in the western part of the study area. These habitats support wintering bird species which are listed as SCIs of Lough Corrib SPA and/or Inner Galway Bay SPA. Therefore, impacts upon the existing hydrogeological regime could potentially affect habitat quality and usage of the site by SCI species, which in turn could affect the conservation objective to maintain the distribution of areas used by SCI waterbirds.

The hydrogeological ZoI for groundwater drawdown and groundwater quality impacts during construction and operation is shown on Figures 11.3.001 to 11.3.010 and Figures 12.1.001 to 12.1.008and includes habitat areas within Lough Corrib SAC, Galway Bay Complex SAC, wetland sites supporting SCIs of Lough Corrib SPA and Inner Galway Bay SPA.

7.4 Habitat Degradation as a result of Hydrological Impacts

The Project traverses the catchments of the following streams/rivers: Sruthán na Líbeirtí (Liberty Stream), the Trusky Stream, the Bearna Stream, the Tonabrocky Stream, the Knocknacarragh Stream, the River Corrib (and the Coolagh Lakes), and Ballindooley Lough. There is therefore the potential for the Project to affect water quality in the receiving environment during construction which has the potential to impact on any aquatic, estuarine and marine habitats and/or species downstream of the Project in those watercourses and in Galway Bay.

The ZoI of this impact is any wetland, coastal or marine habitat downstream of any watercourse crossings or drainage outfalls, and any aquatic/marine species therein and includes Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC and Inner Galway Bay SPA, and *ex-situ* marine habitats used by QIs from Kilkieran Bay and Island SAC and Inishmore Island SAC.

7.5 Habitat Degradation as a result of Air Quality Impacts

Construction works will generate dust and road traffic will generate air pollutants during operation. The effects of air pollution on vegetation and habitats may extend for up to 200m from the proposed road carriageway.

The ZoI of this impact is the immediate vicinity of the construction works for dust deposition and within 200m of the carriageway edge of the proposed N6 GCRR and haul roads during construction and during operation, and only includes Lough Corrib SAC.

7.6 Habitat Degradation as a result of Shading Impacts

Habitats beneath, or immediately adjacent to, viaduct structures, embankments or retaining walls where habitat will not be permanently lost are at risk of some level of shading from the Project – i.e. the proposed River Corrib Bridge, the proposed Menlough Viaduct, and sections of embankment and retaining walls between these structures.

The ZoI of this impact is habitat areas within Lough Corrib SAC that lie beneath, or immediately adjacent to, viaduct structures, embankments or retaining walls where habitat will not be permanently lost – i.e. the proposed River Corrib Bridge, the proposed Menlough Viaduct, and sections of embankment and retaining walls between these structures.

7.7 Habitat Degradation as a result of Introducing/Spreading Non-native Invasive Plant Species

There are local populations of non-native invasive plant species present within, or in close proximity to, the Assessment Boundary. The Project has the potential to accidentally cause the introduction/spread of non-native invasive plant species to any habitat areas crossed by, immediately adjacent to, or downstream of the Project during construction and/or operation. During construction, the haul routes also pose a potential source and pathway for soil contaminated by non-native invasive plant species (Figures 3.1 & 3.2).

The ZoI of this impact is potentially any habitats crossed by, immediately adjacent to, or downstream of the Project or along any of the proposed haul routes that are at risk from contaminated soil/material and includes Lough Corrib SAC and Galway Bay Complex SAC. Lough Corrib SPA is excluded from the ZoI being upstream of the Project and Inner Galway Bay SPA will not support terrestrial non-native species in its marine / coastal habitat.

7.8 Disturbance/Displacement of Bird Species from SPAs and/or *Ex-situ* Sites

In relation to defining the disturbance ZoI for wintering bird species there are three components to consider: general construction activity disturbance (e.g. increased human presence, vehicle movements and earthworks), construction impulse noise disturbance (e.g. pile driving and blasting), and operation traffic noise.

7.8.1 General Construction Activity Disturbance

Based on the findings of the study prepared for Humber INCA (Cutts *et al.*, 2009), investigating the effects of disturbance on foraging and roosting waterbirds, in terms of a response to third party disturbance (e.g. human presence), minimal effects would be expected beyond 300m. In terms of construction noise, levels below 50dB would not be expected to result in any response from foraging or roosting birds. Noise levels between 50dB and 70dB would provoke a moderate effect/level of response from birds – i.e. birds becoming alert and some behavioural changes (e.g. reduced feeding activity) – but birds would be expected to habituate to noise levels within this range. Noise levels above 70dB would likely result in birds moving out of the affected zone, or leaving the site altogether. This is supported by the findings of Wright *et al.* (2010) which found that noise levels above 60dB resulted in behavioural responses, with birds abandoning the site in response to noise levels above 70dB.

Noise levels associated with typical construction activity have been calculated in accordance with the methodology set out in BS 5228:2009 +A1 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise. This standard sets out sound power levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels. A variety of items of plant will be in use during the construction works. These will include breakers, excavators, dump trucks, and generators in addition to general road surfacing and levelling equipment. The key phases of works will involve ground breaking, excavation works, fill works, piling of structures, and general road works.

The following tables present calculations of indicative noise levels for typical noise sources associated with road construction works, at set distances from the construction activity, using the source data from BS 5228:2009 +A1 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise.

Calculations of indicative noise levels for typical noise sources associated with road construction works at set distances from the construction activity were calculated using the source data from BS 5228:2009 +A1 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise. The calculations assume that plant items are operating for 66% of the time to obtain an LAeq, 1 hour value. Noise levels are presented in Table 7.1 for the individual items of plant at specific distances in addition to a cumulative level assuming all plant items associated with the individual phases are operating simultaneously, and at the same distance, for any one scenario. The calculations do not take account of any screening afforded by intervening structures, construction site hoarding etc. and therefore represent a “worst case” scenario.

Table 7.1 Indicative Construction Noise Calculations at Varying Distances

Construction Activities	Combined L_{Aeq} at 10m	Calculated Noise Level at Increasing Distances					
		20m	50m	80m	100m	150m	250m
Rock Breaking / Drilling / Rock Crushing / Impact Piling	93	85	77	73	71	68	63
Site Clearance Utilities Excavation & fill Structures Road Works	85	77	69	65	63	60	55
General site work	78	70	62	58	56	52	48

None of the construction activities listed above would be expected to result in any more than a moderate level of disturbance effect on waterbirds at distances beyond 150m. At 300m, noise levels are below 60dB or, in most cases, are approaching the 50dB threshold. Low, or no, effects would be expected for those noise levels. Any landscape features, vegetation cover or buildings between the construction site and winter bird sites would contribute to further reducing the ambient noise at any given distance. Therefore, 300m is considered to be a precautionary buffer in defining the ZoI of disturbance effects associated with general construction activities.

The disturbance distances at which third party human disturbance would result in behavioural changes or displacement would be expected to be less than that associated with noise sources (Cutts *et al.*, 2009). For the purposes of the assessment, a precautionary approach is taken and the greater buffer distance of 300m is used to define the potential disturbance zone. This 300m buffer is referred hereafter as the "general construction disturbance ZoI".

7.8.2 Impulse Noise Disturbance

In terms of noise levels associated with blasting, behavioural response thresholds would be expected to be similar to those described above for general construction related disturbance. However, calculating a distance whereby blasting would attenuate to below a level of disturbance is less certain given the large number of variables that would influence that calculation (e.g. size of charge used, air pressure, depth of blasting and relationship to the surrounding topography).

Rees *et al.* (2005) found that impulsive noise disturbance (e.g. airport bird scaring) alerted Whooper swans at distances of up to c.800m. However, it is worth noting that in that study, airport scaring only alerted the birds on eight occasions over three years, the proportion of birds alerted was low (approximately a third, on average), disturbance events were temporary (with birds resuming undisturbed behaviour within minutes), and few of the small percentage of disturbance events that resulted in bird flight were attributed to airport scaring[35]. Nonetheless, as a precautionary approach, 800m is used as the zone within which some level of disturbance may occur from rock blasting.

The magnitude of any disturbance effects is likely to be greatest where blasting is occurring regularly, over a prolonged period, and any disturbance effects will probably only be apparent at distances less than 800m. The majority of locations where blasting might be required during construction will be short-term (days to a few weeks) and with relatively few, small magnitude blast events. In that scenario, any temporary displacement of birds from the immediate vicinity of the blast site will not affect survival rates or have any long-term effects on local bird populations. There are only five locations along the Project where, to facilitate excavating out deep cuttings, blasting will be frequent and prolonged: Ballagh (Ch. 3+100 to Ch.

[35] Disturbance-related flights accounted for c.30% of all recorded disturbance events; with less than 5% of those attributed to airport scaring.

3+900 of the proposed N6 GCRR), the N59 Letteragh Junction (Ch. 7+500 to Ch. 8+300 of the proposed N6 GCRR), Lackagh Tunnel (both the western and eastern approaches from Ch. 10+900 to Ch. 11+150 and from Ch. 11+800 to Ch. 12+100 of the proposed N6 GCRR), Castlegar (Ch. 12+550 to Ch. 13+650 of the proposed N6 GCRR), and at the Galway Racecourse Tunnel (Ch. 14+200 to Ch. 15+400 of the proposed N6 GCRR).

Ballindooley Lough is the only winter bird site within 800m of these locations that frequently hosts high numbers of SCI listed wintering bird species: the main lake is c.450m from the eastern approach to Lackagh Quarry (Ch. 11+800 to Ch. 12+100 of the proposed N6 GCRR) and c.350m from the cutting at Castlegar. Therefore, Ballindooley Lough is the only winter bird site where long-term blasting may have a significant effect on wintering bird species. As acknowledged above, any landscape features, vegetation cover or buildings between the noise source and the receptor would serve to further reduce the ambient noise at a given distance.

7.8.3 Operational Noise Disturbance

The parameter most commonly used to describe noise levels is the LAeq which is defined as the A-weighted equivalent continuous steady sound level over a set time period and is effectively an average value. A typical noise level associated with a light goods vehicle (car or small van) at a road edge is 70dB LAeq and up to 85dB LAeq for heavy goods vehicles (HGV's).

The noise level associated with a stream of traffic is not constant but varies with the traffic volumes, vehicle type, traffic speed and road type. Moving away from the road edge, the road alignment (i.e. cuttings, embankments etc.) and distance will influence the level of noise at a particular location.

For the Project, noise levels along the length of the proposed N6 GCRR will vary depending on the factors noted above. It is possible to determine typical road traffic noise associated with the proposed N6 GCRR using the Noise Footprint Graphs included in Appendix A of the TII Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (National Roads Authority, 2014). The graphs enable the user to determine the distance from the road centreline whereby road traffic noise levels will fall below 60dB Lden depending on the roads vertical alignment, the traffic volumes, the percentage of HGV's and the road surface. This information has been used to identify the typical noise footprint associated with key sections of the route of the proposed N6 GCRR.

At Briarhill Junction, at distances of 120m and greater from the road centreline, noise levels will typically be below 60dB Lden. It should be noted, due to the alignment of the existing N6 at Coolagh and Doughiska, road traffic noise levels are already elevated at this location and this is factored into the noise modelling and assessment.

Highest noise levels will be experienced between the proposed N83 Tuam Road Junction and the proposed N59 Moycullen Road where road traffic noise levels will be at or above 60dB Lden between 140 and 150m from the proposed road centreline. This applies to the sections of the Project which are on embankment and at the new junctions.

Moving west, beyond the N59 Letteragh Junction towards Bearna, at distances of 50 to 70m from the proposed road centreline, noise levels will typically be below 60dB Lden due to the reduction in traffic volumes, traffic speed and the alignment profile.

Typically noise levels above 70dB do not extend beyond the immediate vicinity of the road carriageway and as such, the permanent displacement of birds from habitat areas beyond this would not be expected during operation. As discussed above under General Construction Activity Disturbance, some level of disturbance would be expected initially within the 60dB to 70dB zone (between the proposed road carriageway and 120m at Briarhill, the road carriageway and 150m from the N83 Tuam Road Junction to the N59 Moycullen Road, and between the road carriageway and 50 to 70m west of the N59 Moycullen Road) with birds habituating to the increased noise baseline. Below 60dB, behavioural changes or displacement would not be predicted to occur.

The ZoI for disturbance associated with general construction activities is *c.*300m, increasing to *c.*800m where frequent and long-term blasting is proposed and includes areas of bird habitat within Lough Corrib SPA and areas of bird habitat used by SCI bird species of Lough Corrib SPA and Inner Galway Bay SPA outside of the European sites.

7.9 Barrier Effect

The Project will require the construction of new watercourse crossings of streams within the Bearna Stream catchment and these structures haves the potential to present a barrier to Otter movement within the Bearna Stream catchment.

The ZoI of this impact is the Bearna Stream catchment which includes part of Galway Bay Complex SAC.

7.10 Mortality Risk from Construction works and Road Traffic

The Project has the potential to result in the mortality of aquatic species in the River Corrib during construction of the River Corrib Bridge. It also has the potential to result in the mortality of Otter through the increased risk of road traffic collisions which could affect the Otter populations that use the River Corrib and Coolagh Lakes and those that use watercourses within the Bearna Stream catchment.

The ZoI of this impact is the River Corrib corridor and in the vicinity of the Coolagh Lakes, and within the Bearna Stream catchment, and includes Lough Corrib SAC and Galway Bay Complex SAC.

7.11 Increase in construction-related traffic

The potential impact pathway related to increased construction-related traffic and the additional European sites in its zone of influence as identified by Dr Arnold in the Appropriate Assessment [appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021 is also considered].

The construction-related traffic associated with the Project will result in an increase in large vehicular movements to and from the site to surrounding areas, as well as increased movement of vehicles from workers arriving and leaving site and will generate construction-related traffic on the surrounding road network which has the potential to result in significant effects to air such as dust and emissions, leaks or spills from construction plant and equipment, and construction waste.

The increased construction-related traffic is an impact pathway for many impacts already incorporated within this updated NIS, including:

- Increased spills and leaks which could contaminate groundwater (Section 6.3 and Section 7.3) and surface water (Section 6.4 and Section 7.4)
- Increased generation and deposition of dust and emissions (Section 6.5 and Section 7.5)
- The introduction and spread of invasive species (Section 6.7 and Section 7.7)

Hydrogeology: The ZoI includes habitat areas within Lough Corrib SAC, and wetland sites supporting SCIs of Lough Corrib SPA and Inner Galway Bay SPA.

Hydrology: The ZoI is any wetland, coastal or marine habitat downstream of any watercourse crossings or drainage outfalls, and any aquatic/marine species therein and includes Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC and Inner Galway Bay SPA.

Air quality: The ZoI is the immediate vicinity of the construction works for dust deposition and within 200m of the and haul roads during construction and footprint of the Project during operation, and includes Lough Corrib SAC.

Invasive Species: The ZoI is potentially any habitats crossed by, immediately adjacent to, or downstream of the Project or along any of the proposed haul routes that are at risk from contaminated soil/material and includes Lough Corrib SAC and Galway Bay Complex SAC.

On the basis of ABP's Inspector's Report dated 22 June 2021, there is the potential for construction-related traffic to affect European sites associated with the wider existing road network, which, on a precautionary basis, could extend the ZoI of the Project to include the following additional European sites: Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SPA, Rahasane Turlough SAC, Cregganna Marsh SPA.

7.12 Increase in recreational pressure

The potential impact pathway related to increased recreational pressure has been included since the 2018 NIS as per the Appropriate Assessment undertaken by ABP. The transport modelling for the proposed N6 GCRR was used to assess the potential increase in regional traffic and its associated potential recreational pressures on European sites.

The Project will contribute to increased recreational pressure in the surrounding supporting road network and potentially contribute to additional visitors to the local European sites within and around Galway, with a possible associated risk of a potential increase in recreational pressure on QIs and SCIs of these European sites.

The European sites considered along with the additional potential European sites identified by Dr Arnold in the Appropriate Assessment [appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021], include Lough Corrib SAC, Galway Bay Complex SAC, Lough Corrib SPA, Inner Galway Bay SPA, Maumturk Mountains SAC, The Twelve Bens / Garraun Complex SAC, Connemara Bog Complex SAC, Connemara Bog Complex SPA, Ross Lake and Woods SAC, Ardrahan Grassland SAC and Castletaylor Complex SAC.

7.13 Potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations of typical species and positive indicator species

The potential impact pathway related to possible deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations as identified by Dr Arnold in the Appropriate Assessment [appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021], is also considered.

The Project, through a variety of potential impact pathways (as discussed in the sections above), has the potential to affect local flora and fauna populations within the Assessment Boundary. Some of those local populations may be typical or positive indicator species of QI habitats or support the QI/SCI fauna populations of European sites in the vicinity of the Project.

In addition to the four local European sites (Lough Corrib SAC, Galway Bay Complex SAC, Lough Corrib SPA and Inner Galway Bay SPA), the additional potential European sites considered within the zone of influence as identified by Dr Arnold in the Appropriate Assessment [appended (as Appendix 6) to the ABP's Inspector's Report dated 22 June 2021], include the Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Connemara Bog Complex SAC, Connemara Bog Complex SPA, Rahasane Turlough SAC, East Burren Complex SAC, Moneen Mountain SAC, Black Head-Poulsallagh Complex SAC. Gortnandarragh Limestone Pavement SAC and Ross Lake and Woods SAC.

7.14 Summary

Table 7.2 below summarises the potential impacts associated with the Project, and their ZoI.

Table 7.2 Identified Impacts and Potential Zone of Influence (ZoI)

Impact	Zone of Influence (ZoI)
Construction Impacts	
Habitat loss	Generally, within the footprint of the proposed N6 GCRR but can also result from extreme cases of habitat degradation (see below)
Habitat fragmentation	Habitat areas or species ranges/territories through which the Project traverses
Habitat degradation as a result of tunnelling/excavations	Area immediately above the Lackagh Tunnel and along the western and eastern approaches to the tunnel
Habitat degradation as a result of hydrogeological impacts	Groundwater dependant habitats within the hydrogeological ZoI. For hydrogeology ZoI refer to Figures 11.3.001 to 11.3.010 and Figures 12.1.001 to 12.1.008
Habitat degradation as a result of hydrological impacts	Any wetland, coastal or marine habitat downstream of any watercourse crossings or drainage outfalls, and any aquatic/marine species therein
Habitat degradation as a result of air quality impacts related to dust	Dust generated during construction is only likely to be deposited in measurable quantities in the immediate vicinity of the construction works
Habitat degradation as a result of introducing/spreading non-native invasive plant species	Potentially any habitats crossed by, immediately adjacent to, or downstream of the Project or along any of the haul routes are at risk from contaminated soil/material both sourced from within the Assessment Boundary or that imported from offsite sources
Disturbance/displacement	Habitat areas used by wintering birds within 300m of general construction activities or those within 800m of areas requiring blasting over a prolonged period
Mortality risk from construction works	Aquatic species foraging or commuting along the River Corrib corridor
Increase in construction-related traffic	The increase in construction related traffic will contribute to potential habitat degradation as a result of hydrogeological and hydrological impacts, air quality impacts and possible introduction and spread non-native invasive plant species
Potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations of typical species and positive indicator species	The four principle European sites associated with Galway Bay and Lough Corrib, but possibly other European sites with similar / dependent QIs/SCIs
Operational Impacts	
Habitat degradation as a result of hydrogeological impacts	Groundwater dependant habitats within the hydrogeological ZoI. For hydrogeology ZoI refer to Figures 11.3.001 to 11.3.010 and Figures 12.1.001 to 12.1.008
Habitat degradation as a result of shading impacts	Habitats beneath, or immediately adjacent to, viaduct structures, embankments or retaining walls where habitat will not be permanently lost – i.e. the proposed River Corrib Bridge, the proposed Menlough Viaduct, and sections of embankment and retaining walls between these structures.
Habitat degradation as a result of air quality impacts related to emissions	Generally local to the road edge and not greater than a distance of 200m

Impact	Zone of Influence (ZoI)
Habitat degradation as a result of introducing/spreading non-native invasive plant species	Potentially any habitats crossed by, or immediately adjacent to, the Project are at risk from contaminated soil/material both sourced from within the Assessment Boundary or that imported from offsite sources
Barrier effect	The Bearna Stream catchment
Mortality risk from road traffic	Relevant to aquatic species along the River Corrib corridor and in the vicinity of the Coolagh Lakes, and within the Bearna Stream catchment
Increase in recreational pressure	Various European sites accessible to visitors within the vicinity of Galway
Potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations of typical species and positive indicator species	The four principle European sites associated with Galway Bay and Lough Corrib, but possibly other European sites with similar / dependent QIs/SCIs

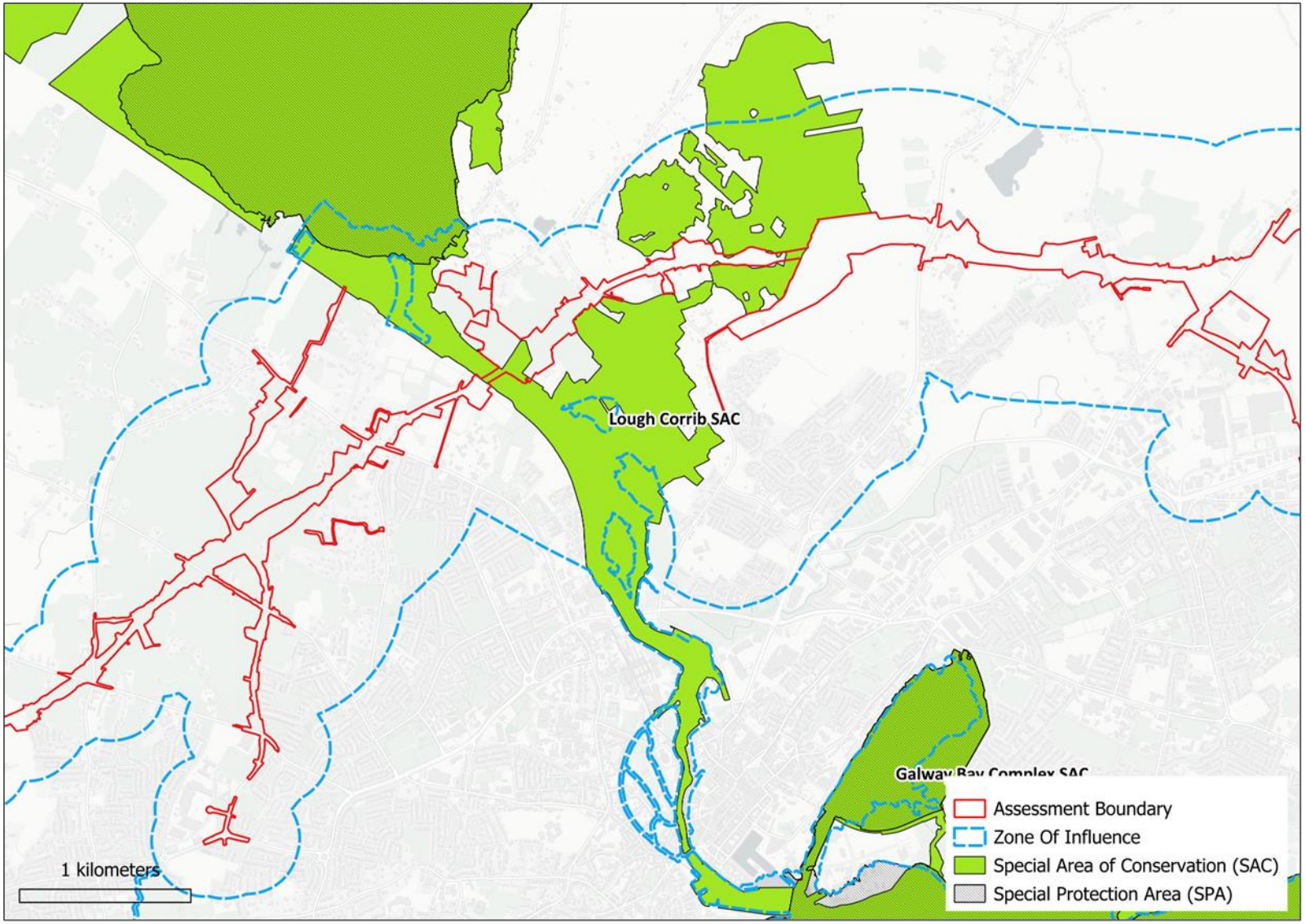


Plate 7.1 Close up of the Lough Corrib SAC and ZoI of the Project ZoI of the Project

8. European sites within the Zone of Influence of the Project

8.1 Identifying European sites within the ZoI of the Project

The nature and scale of the Project, the identified potential impacts and their relationship to European sites were considered in order to determine which European sites were within the ZoI of the Project, and therefore potentially at risk of the Project affecting their conservation objectives.

The ZoI is a defined area within which there is potential for the Project to affect the conservation objectives supporting the conservation condition of the QIs/SCIs of a European site.

In the case of QI habitats, if a European site lies beyond the ZoI, then the Project cannot affect habitats within that site.

Consideration was also given as to whether the Project had the potential to have *ex-situ* impacts on species listed as QIs/SCIs of any European sites beyond the ZoI of the Project, taking into consideration the species' foraging range, home range and connections between maternity, breeding and hibernation sites. This is discussed further below.

Table 8.1 below lists the potential impacts associated with the Project, their ZoI, and which European sites could be affected by each and has been updated to take account of the additional potential impact pathways identified above.

Table 8.1 Identified European sites within the Zone of Influence (ZoI)

Potential Impact	Zone of Influence (ZoI)	European Sites within the ZoI
Potential Construction Impacts		
Habitat loss	Generally, within the footprint of the proposed N6 GCRR but can also result from extreme cases of habitat degradation (see below)	Lough Corrib SAC and potentially *ex-situ* sites associated with Lough Corrib SPA and Inner Galway Bay SPA
Habitat fragmentation	Habitat areas or species ranges/territories through which the Project traverses	Lough Corrib SAC and potential *ex-situ* sites associated with Lough Corrib SPA and Inner Galway Bay SPA
Habitat degradation – tunnelling/excavation	Area immediately above the Lackagh Tunnel and along the western and eastern approaches to the tunnel	Lough Corrib SAC
Habitat degradation – hydrogeology	Groundwater dependant habitats within the hydrogeological ZoI. For hydrogeology ZoI refer to Figures 11.003.1 to 11.3.010 and Figures 12.1.001 to 12.1.008	Lough Corrib SAC Galway Bay Complex SAC Inner Galway Bay SPA and potential *ex-situ* sites associated with Lough Corrib SPA and Inner Galway Bay SPA
Habitat degradation – hydrology	Any wetland, coastal or marine habitat downstream of any watercourse crossings or drainage outfalls, and any aquatic/marine species therein	Lough Corrib SAC Galway Bay Complex SAC Inner Galway Bay SPA and potential *ex-situ* sites Lough Corrib SPA and potential *ex-situ* sites

Potential Impact	Zone of Influence (ZoI)	European Sites within the ZoI
		Kilkieran Bay and Island SAC marine QI species Inishmore Island SAC marine QI species
Habitat degradation – air quality	Dust generated during construction is only likely to be deposited in measurable quantities in the immediate vicinity of the construction works	Lough Corrib SAC
Habitat degradation – non-native invasive species	Potentially any habitats crossed by, or immediately adjacent to, the Project or along any of the haul routes are at risk from contaminated soil/material both sourced from within the Assessment Boundary or that imported from offsite sources	Lough Corrib SAC Galway Bay Complex SAC Inner Galway Bay SPA
Disturbance/displacement	Habitat areas used by SCI wintering birds within 300m of general construction activities or those within 800m of areas requiring blasting over a prolonged period	Potential *ex-situ* sites associated with Lough Corrib SPA and Inner Galway Bay SPA
Mortality risk – construction materials	Aquatic species foraging or commuting along the River Corrib corridor	Lough Corrib SAC
Increase in construction-related traffic	The increase in construction related traffic will contribute to potential habitat degradation as a result of hydrogeological and hydrological impacts, air quality impacts and possible introduction and spread non-native invasive plant species	Lough Corrib SAC Galway Bay Complex SAC Inner Galway Bay SPA and potential *ex-situ* sites Lough Corrib SPA and potential *ex-situ* sites Ardrahan Grassland SAC Castletaylor Complex SAC Kiltiernan Turlough SAC Lough Fingall Complex SAC Rahasane Turlough SPA Rahasane Turlough SAC Cregganna Marsh SPA
Potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations of typical species and positive indicator species	The four principle European sites associated with Galway Bay and Lough Corrib, but possibly other European sites with similar / dependent QIs/SCIs	Lough Corrib SAC Galway Bay Complex SAC Inner Galway Bay SPA Lough Corrib SPA Ardrahan Grassland SAC Castletaylor Complex SAC Kiltiernan Turlough SAC Lough Fingall Complex SAC Connemara Bog Complex SAC Connemara Bog Complex SPA Rahasane Turlough SAC East Burren Complex SAC Moneen Mountain SAC Black Head-Poulsallagh Complex SAC Gortnandarragh Limestone Pavement SAC

Potential Impact	Zone of Influence (ZoI)	European Sites within the ZoI
		Ross Lake and Woods SAC.
Potential Operational Impacts		
Habitat degradation – hydrogeology	Groundwater dependant habitats within the hydrogeological ZoI. For hydrogeology ZoI refer to Figures 11.3.001 to 11.3.010 and Figures 12.1.001 to 12.1.008	Lough Corrib SAC Galway Bay Complex SAC Inner Galway Bay SPA and potential ex-situ sites associated with Lough Corrib SPA and Inner Galway Bay SPA
Habitat degradation – shading	Habitats beneath, or immediately adjacent to, viaduct structures, embankments or retaining walls where habitat will not be permanently lost – i.e. the proposed River Corrib Bridge, the proposed Menlough Viaduct, and sections of embankment and retaining walls between these structures	Lough Corrib SAC
Habitat degradation – air quality	Nitrogen-based compounds dispersed and deposited to surrounds from emissions, generally local to the road edge and not greater than a distance of 200m.	Lough Corrib SAC
Habitat degradation – non-native invasive species	Potentially any habitats crossed by, or immediately adjacent to, the Project or along any of the haul routes are at risk from contaminated soil/material both sourced from within the Assessment Boundary or that imported from offsite sources	Lough Corrib SAC Galway Bay Complex SAC Inner Galway Bay SPA
Barrier effect	The Bearna Stream catchment	Galway Bay Complex SAC
Mortality risk	Relevant to aquatic species along the River Corrib corridor and in the vicinity of the Coolagh Lakes, and within the Bearna Stream catchment	Lough Corrib SAC Galway Bay Complex SAC
Increase in recreational pressure	Various European sites accessible to visitors within the vicinity of Galway	Lough Corrib SAC Galway Bay Complex SAC Lough Corrib SPA Inner Galway Bay SPA Maumturk Mountains SAC The Twelve Bens/Garraun Complex SAC Connemara Bog Complex SAC Connemara Bog Complex SPA Ross Lake and Woods SAC Ardrahan Grassland SAC Castletaylor Complex SAC
Potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations of typical species and positive indicator species	The four principle European sites associated with Galway Bay and Lough Corrib, but possibly other European sites with similar/dependent QIs/SCIs.	Lough Corrib SAC Galway Bay Complex SAC Inner Galway Bay SPA Lough Corrib SPA Ardrahan Grassland SAC

Potential Impact	Zone of Influence (ZoI)	European Sites within the ZoI
		Castletaylor Complex SAC Kiltiernan Turlough SAC Lough Fingall Complex SAC Connemara Bog Complex SAC Connemara Bog Complex SPA Rahasane Turlough SAC East Burren Complex SAC Moneen Mountain SAC Black Head-Poulsallagh Complex SAC Gortnandarragh Limestone Pavement SAC Ross Lake and Woods SAC.

8.2 Summary

Considering the ZoI of the Project, which has been updated for this updated NIS, it has been assessed as having the potential to affect (directly or indirectly) the following European sites:

- Lough Corrib SAC
- Lough Corrib SPA
- Galway Bay Complex SAC
- Inner Galway Bay SPA
- Ardrahan Grassland SAC
- Castletaylor Complex SAC
- Kiltiernan Turlough SAC
- Lough Fingall Complex SAC
- Rahasane Turlough SPA
- Rahasane Turlough SAC
- Cregganna Marsh SPA
- Maumturk Mountains SAC
- The Twelve Bens/Garraun Complex SAC
- Connemara Bog Complex SAC
- Connemara Bog Complex SPA
- Ross Lake and Woods SAC
- East Burren Complex SAC
- Moneen Mountain SAC
- Black Head-Poulsallagh Complex SAC
- Gortnandarragh Limestone Pavement SAC
- Inishmore Island SAC

- Kilkieran Bay and Island SAC

The locations of these European sites relative to the Project, and the predicted ZoI, are shown on Figure 21.

All other European sites are located beyond the ZoI and therefore, cannot be impacted by the Project.

9. Examination and Analysis of Potential Direct and Indirect Impacts on European Sites

The following sections assesses the direct and indirect impacts of the Project with respect to the 22 relevant European sites within the ZoI of the Project: Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC, Inner Galway Bay SPA, Inishmore Island SAC, Kilkieran Bay and Islands SAC, Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SPA, Rahasane Turlough SAC, Cregganna Marsh SPA, Maumturk Mountains SAC, The Twelve Bens/Garraun Complex SAC, Connemara Bog Complex SAC, Connemara Bog Complex SPA, Ross Lake and Woods SAC, East Burren Complex SAC, Moneen Mountain SAC, Black Head-Poulsallagh Complex SAC and Gortnandarragh Limestone Pavement SAC.

The findings of the 2018 NIS have been reviewed and updated in light of the updated ecological baseline from the additional surveys undertaken between 2022 and 2024, updated SSCO data and/or updated scientific literature where relevant, and the assessment undertaken by the Inspector appointed by ABP.

The main changes to the assessment include the reclassification of the aquatic vegetation in the River Corrib as Vegetation of flowing waters (Annex I habitat [3260]; the update in air quality impact pathway due to updated ammonia desktop data; the reassessment required in terms of shading impacts of the proposed River Corrib bridge; and the additional potential impact pathways/European sites identified by the Inspector appointed by ABP as detailed in Section 1 and Section 5.8 of this updated NIS. There has been no deviation in the findings given the updated information, as reported in this updated NIS.

In terms of the assessment undertaken by Inspector appointed by ABP, they concurred with the assessment included in the 2018 NIS but also included additional potential impact pathways and European sites in their assessment as document in their report appended to ABP's Inspector's Report dated 22 June 2021 and, on a precautionary basis, these are included over and above those considered and assessed in the 2018 NIS. These additional impact pathways, and European sites are:

- Their proximity to the wider road network, having the potential to be affected by an increase in construction-related traffic: Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SPA, Rahasane Turlough SAC and Cregganna Marsh SPA
- Potential increase in recreational pressure associated with the operation of the Project: Maumturk Mountains SAC, The Twelve Bens/Garraun Complex SAC, Connemara Bog Complex SAC, Connemara Bog Complex SPA and Ross Lake and Woods SAC
- Potential deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations of typical species and positive indicator species: Connemara Bog Complex SAC, Connemara Bog Complex SPA, Ross Lake and Woods SAC, Ardrahan Grassland SAC, Castletaylor Complex SAC, East Burren Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SAC, Moneen Mountain SAC, Black Head-Poulsallagh Complex SAC, Gortnandarragh Limestone Pavement SAC

In respect of each of these European sites, the assessment below sets out the analysis of the potential impacts, the QIs/SCIs at risk of these potential impacts in view of the sites' conservation objectives (including their specific attributes and targets) and the QIs'/SCIs' conservation condition. The avoidance and design measures set out in Section 2.5 are considered in assessing the potential impacts. The mitigation measures which will be implemented are presented in Section 10 of this updated NIS and any residual impacts from the Project with respect to European sites are assessed in Section 11. Based on the examination and analysis set out, it is the professional opinion of the authors of this updated NIS that with the implementation of the proposed mitigation measures the Project will not adversely affect the integrity of any European sites and there is no reasonable scientific doubt to this conclusion. The assessment of the Project in combination with any other plans or projects on European sites is presented in Section 12.

9.1 Lough Corrib SAC

9.1.1 Qualifying Interest and Conservation Objectives of Lough Corrib SAC

The QI Annex I habitats and species present in Lough Corrib SAC, and the overall conservation objective for each, are listed below in Table 9.1 (NPWS, 2017a). Those highlighted (in green) are the QI's which were recorded within the ZoI of the Project. The Freshwater pearl mussel is also highlighted because, whilst the QI population is not directly present within the ZoI, there is a potential for indirect impacts through the potential for impacts on salmonid fish species in the River Corrib to affect a critical stage of the Freshwater pearl mussel's lifecycle within the catchment (see Section 9.1.4.9). Based on the potential impact sources and pathways identified in Section 6, none of the other QIs are at risk of impacts from the Project.

Refer also to Table 9.13 for how these impact pathways relate to the specific conservation objectives of each QI potentially affected by the Project.

Table 9.1 Qualifying Interests and Conservation Objectives of Lough Corrib SAC (those highlighted (in green) are the QI's which were recorded within the ZoI of the Project)

Qualifying Interests	Conservation Objectives
Annex I Habitats	
[3110] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	To restore the favourable conservation condition
[3130] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*	To restore the favourable conservation condition
[3140] Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp	To restore the favourable conservation condition
[3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (or Vegetation of flowing waters)	To maintain the favourable conservation condition
[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites)	To maintain the favourable conservation condition
[6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	To maintain the favourable conservation condition
[7110] Active raised bogs *	To restore the favourable conservation condition
[7120] Degraded raised bogs still capable of natural regeneration	To restore the favourable conservation condition
[7150] Depressions on peat substrates of the *Rhynchosporion*	To restore the favourable conservation condition
[7210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* *	To maintain the favourable conservation condition
[7220] Petrifying springs with tufa formation (*Cratoneurion*) *	To maintain the favourable conservation condition
[7230] Alkaline fens	To maintain the favourable conservation condition
[8240] Limestone pavements *	To maintain the favourable conservation condition
[91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	To maintain the favourable conservation condition
[91D0] Bog woodland *	To maintain the favourable conservation condition
Annex II Species	

Qualifying Interests	Conservation Objectives
[1029] Freshwater Pearl Mussel - *Margaritifera margaritifera*	To restore the favourable conservation condition
[1092] White-clawed Crayfish - *Austropotamobius pallipes*	To maintain the favourable conservation condition
[1095] Sea Lamprey - *Petromyzon marinus*	To restore the favourable conservation condition
[1096] Brook Lamprey - *Lampetra planeri*	To maintain the favourable conservation condition
[1106] Atlantic Salmon - *Salmo salar* (only in fresh water)	To maintain the favourable conservation condition
[1303] Lesser Horseshoe Bat - *Rhinolophus hipposideros*	To restore the favourable conservation condition
[1355] Otter - *Lutra lutra*	To maintain the favourable conservation condition
[1393] Slender green feather-moss (Varnished hook-moss) - Drepanocladus *(Hamatocaulis) vernicosus*	To maintain the favourable conservation condition
[1833] Slender Naiad - *Najas flexilis*	To restore the favourable conservation condition

The site specific conservation objectives document for Lough Corrib SAC (NPWS, 2017a) informed this assessment. This document sets out the attributes, measures and targets that define the favourable conservation condition of QI habitats and species within the European site. Affecting the conservation condition of QI habitats or species is deemed to constitute an adverse effect on the integrity of Lough Corrib SAC.

The specific attributes and targets used to define the conservation objectives of the QI habitats and species within the ZoI of the Project are presented in Table 9.13 in Section 9.1.4.10. Those highlighted (in green) in that table correspond to the specific attributes and targets that could potentially be affected for each QI, by the identified impacts.

Although the Lesser horseshoe bat is present within the Scheme Study Area, the roost that forms the QI population for this European site (Eborhall House) is more than 30km away from the Project, on the northern shore of Lough Corrib. This distance would be regarded to be beyond the normal core foraging range of the Eborhall House population and beyond the normal commuting range of this species except on exceptional occasions or over long periods of time – for example, bats dispersing and moving between areas in the wider landscape over a period of many years/generations. Furthermore, radio-tracking surveys of the Menlough population of bats (which were identified within the Scheme Study Area) undertaken to inform the assessment of the proposed N6 GCRR in 2014 and 2015 did not suggest any evidence of movement between that population and the Eborhall House roost. The absence of a supporting population link between the Menlough population and Ross Lake and Woods SAC population is upheld by the lack of ringed bats (28 bats captured and ringed from Menlough Castle and Coopers Cave in May 2023 and August 2023) recorded during the four Summer inspections and two daytime Winter inspections at Eborhall House (Summer roost), Ballymaglancy cave (Summer/Winter roost), Kelly's Cave (Winter roost), Bunnadober Mill (Summer, Maternity roost), Ross Castle (Summer roost), and Cloonnabinnia Cave (Summer/Winter) by Scott Cawley during the 2023 season to inform this Project.

Given the lack of any linkage between the Scheme Study Area and the roosts that are the reason for designation of this European site, likely significant effects on the Lough Corrib SAC's Lesser horseshoe bat population have been ruled out. The local Lesser horseshoe bat population does not form part of the QI population for Lough Corrib SAC at Eborhall House and does not support the conservation objectives or conservation condition of the roost at Eborhall House. Although it is predicted in the updated EIAR that there will be local level residual impacts on the Menlough Lesser horseshoe bat population, as a result of the Project, these impacts will not affect the conservation objectives of Lough Corrib SACs nor will they affect the QI Lesser horseshoe bat populations of any other European sites because this population does not form part of the QI population for Lough Corrib SAC.

9.1.2 Ecological Baseline

Section 5 above presents the ecological baseline within the relevant survey areas related to the Project. This section presents the ecological baseline within the Lough Corrib SAC. The baseline presented in the 2018 NIS has been reviewed and updated where necessary to reflect the findings of the 2022 to 2024 surveys. Where changes have been made these are noted in the following sections.

9.1.2.1 Habitats

As noted in Section 2.2.2 and Section 6.1, the Project and its boundary overlaps with, i.e. traverses through or adjacent to the Lough Corrib SAC at four locations[36]: at the termination of the proposed drainage outfall from the N59 Link Road North at Kentfield; at the site of the proposed River Corrib Bridge between Dangan and Menlough; to the west of the Coolagh Lakes; and, to the west and north of Lackagh Quarry where the Project will consist of a tunnel (Lackagh Tunnel) and approach road infrastructure (Ch. 10+620 to Ch. 11+800).

Habitat mapping of each of these areas is provided showing both the Fossitt (2000) habitat classifications (refer to Figures 15.1 to 15.5 and Figures 16.1 to Figures 16.5) and, where applicable, the priority Annex I or Annex I habitat types (refer to Figures 17.1 to 17.5 and Figures 18.1 to Figures 18.5), as referenced in each of the sections below (Sections 9.1.2.1.1 to 9.1.2.1.4). An overview of the area is shown on Plate 9.1 below. Approximately 3.8ha of the Project lies within the Lough Corrib SAC.

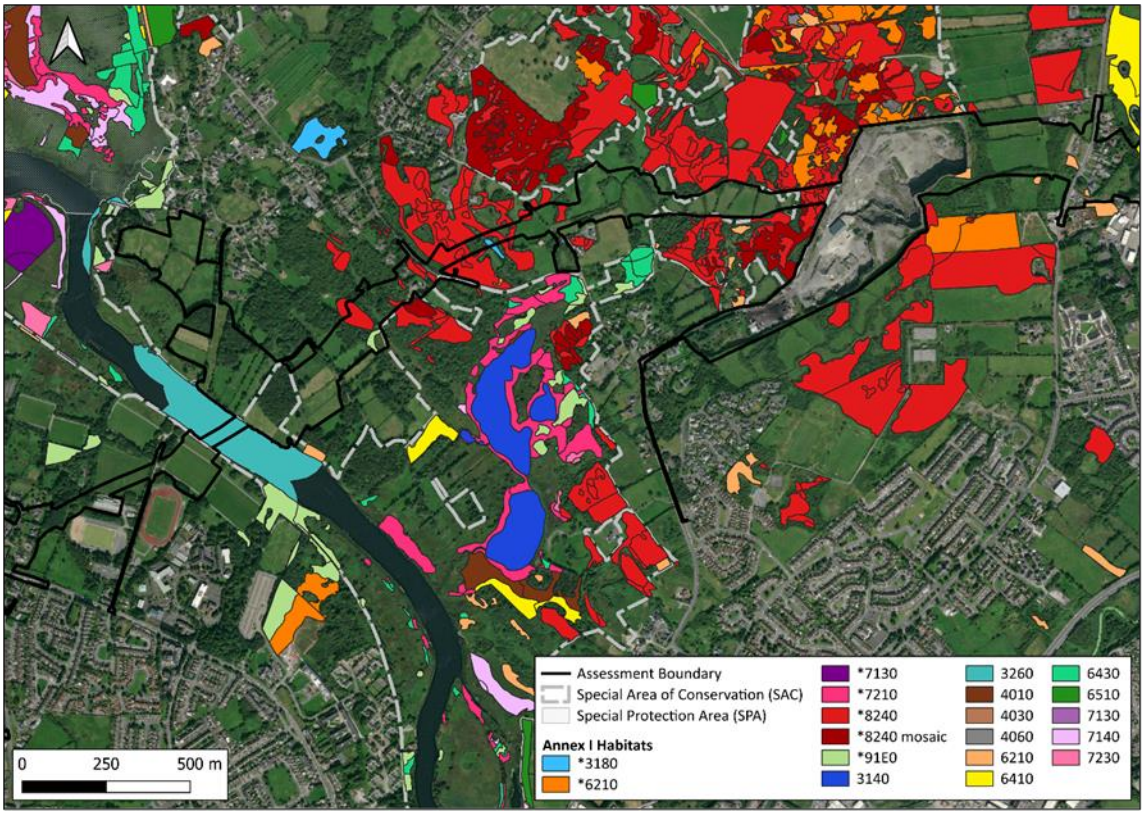


Plate 9.1 The Project and an Overview of Annex I habitats in the Vicinity of Lough Corrib SAC

The full results of the habitat surveys carried out in Lough Corrib SAC are presented in *N6 Galway City Transport Project – Habitat mapping and assessment of a section of Lough Corrib SAC and surrounding*

[36] The current versions of the digital designated area boundaries that can be downloaded from the NPWS website do not always accurately relate to features on the ground such as field boundaries, road margins etc. This is on account of the scale difference between the 6-inch maps used to originally define the European site boundaries and current larger scale vector mapping/orthophotography. The descriptions of habitat locations in this report, with respect to whether they are inside/outside of the Lough Corrib SAC boundary, are an interpretation of their intended locations with respect to the field boundaries and legal designated area boundary as shown on the official Department of Culture, Heritage and the Gaeltacht boundary hardcopy maps. This approach was discussed and agreed with the NPWS.

areas (Barron *et al.*, 2017), which is included in Appendix H (Part 1). The results of additional detailed and verification surveys are also incorporated into Appendix H.

Appendix H presents the habitat information and includes three parts:

- Part 1 describes the results of habitat surveys carried out by BEC consultants in 2013-2014 within and adjacent to Lough Corrib SAC.
- Part 2 describes the methodology and results of additional habitat surveys that were undertaken between 2014 and 2019 (including the surveys undertaken as part of the response to the Request for Further Information received from ABP in 2019. Part 2 contains 3 Annexes:
  - Annex 1 contains habitat species lists and relevé references from the 2019 and 2023 habitat surveys
  - Annex 2 contains drawings
  - Annex 3 contains Digital Datasets relating to the habitat surveys, containing the full results of the all the relevés taken between 2013 and 2019 (inclusive of explanatory notes to the various worksheets)
- Part 3 provides the soil depth measurements of various transects in the woodland polygon of Area 1.e (described below that were undertaken in March 2020 as part of the response to questions raised during the oral hearing in 2020).
- Part 4 Replicates the information presented in the 2019 RFI Response (included in Part 2 above) to illustrate the location of where relevés were taken and the figures have been updated to reflect the Project assessed with in this updated NIS including the modifications detailed in Section 2 of this updated NIS.

In summary, a total of **18 Annex I** habitats (2 additional habitats included since the 2018 NIS), now covering c.148.1 ha (decrease from the 155.2 ha measured in the 2018 NIS) due to changes in the SAC boundary within Lough Corrib SAC and extending outside of the Assessment Boundary, were recorded during the survey:

- Dystrophic lakes [3160]
- Wet heaths [4010]
- Dry heaths [4030]
- Alpine and Boreal heaths [4060]
- Calcareous grasslands [6210]
- Orchid-rich calcareous grasslands [*6210]
- *Molinia* meadows [6410]
- Hydrophilous tall-herb communities [6430]
- *Cladium* fens [*7210]
- Blanket bog (inactive) [7130]
- Blanket bog (active) [*7130]
- Transition mires and quaking bogs [7140]
- Alkaline fens [7230]
- Limestone pavement (exposed) [*8240]
- Limestone pavement (wooded) [*8240]
- Alluvial forests [*91E0]
- Hard water lakes [3140] (new since the 2018 NIS)

- Vegetation of flowing waters [3260] (not incorporated into the overall area of Annex I habitat indicated above as it is patchily distributed in parts of the River Corrib) (newly classified since the 2018 NIS)

The majority of these habitat types form part of, and are supported by, the wetland complex along the River Corrib corridor and associated with the Coolagh Lakes. The drier heath, grassland and exposed limestone rock habitats are predominantly located on the slopes of an elevated hill to the north of the Coolagh Lakes (which also support smaller areas of these habitat types beyond the wetland margins).

The River Corrib itself was classified as a Depositing/lowland river (FW2) as part of aquatic habitat surveys carried out in 2014 (Appendix N). Depositing lowland rivers can correspond with two Annex I habitat types, in an Irish context: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (or Vegetation of flowing waters) [3260]; and, Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation [3270]. The River Corrib channel in the vicinity of the Project lacks the muddy bank habitat and the vegetation/plant species associated with the [3270] Annex I habitat type. In parts of Europe the Vegetation of flowing waters [3260] is interpreted as covering only rivers where Water Crowfoots *Ranunculus* species are a significant component of the vegetation. In the vicinity of the Project and further downstream, the River Corrib does support *Ranunculus* communities, but they are scarce with a patchy occurrences.

As reported in the 2019 RFI Response submitted by GCC to ABP as part of the Section 51 Application, the definition for the Annex I Vegetation of flowing waters [3260] is broad in the EU habitats interpretation manual (European Commission, 2013) and the NPWS Article 17 report (at that stage the 2013 report) and the position adopted that the habitat did not correspond to Annex I habitat was correct based on the information available at that time. Since then, there is updated literary and additional survey information available. The habitat in Ireland is more clearly defined in Article 17 (NPWS, 2019b), as the "*highest riverine conservation interest ... associated with lowland depositing and tidal rivers and unmodified, fast-flowing, low-nutrient rivers*", with the Site Specific Conservation Objectives (SSCO) (NPWS, 2017a) placing the Lough Corrib SAC squarely into the latter natural fast-flowing rivers with variable flows. The extents of the River Corrib within the Assessment Boundary acts like a lake and does not support the high conservation habitat type. Furthermore, although the habitat is represented as a continuous linear feature by the 2023 aquatic habitat specialists (Appendix N, 2016 and 2023 aquatic habitat survey results), they state in the findings that the habitat units are patchily distributed and the indicator species was very scarce. The aquatic habitat in the River Corrib, is assessed in this updated NIS, on a precautionary basis, as being Annex I habitat, Vegetation of flowing waters [3260], which is a QI of Lough Corrib SAC. It has been mapped along the entire length of the river between Lough Corrib and into Galway City up to Bridge Street where the survey area terminated (refer to Appendix N).

Little is known about the characteristics, vegetation sub-types or distribution of this QI Annex I habitat Vegetation of flowing waters [3260], in Lough Corrib SAC. The SSCO for Lough Corrib SAC states that any high conservation value sub-types in the SAC will be associated with areas of natural, fast and highly variable flows, and that a natural flow regime is required for both plant communities and channel geomorphology to be in favourable condition. For many of the sub-types of this habitat, high flows are required to maintain the substratum necessary for the characteristic species. Flow variation can be particularly important, with high and flood flows being critical to the hydromorphology (NPWS, 2017). The section of River Corrib at the site of the proposed River Corrib Bridge is more characteristic of lake conditions, with water being controlled by the Salmon Weir, and is lacking in the fast, highly variable, natural flow regime typically required to sustain the favourable conditions required for the high conservation value sub-types of this habitat. Nonetheless vegetation within this stretch of the river is, on a precautionary basis, considered to meet the criteria to be part of the 3260 QI Annex I habitat for Lough Corrib SAC.

Downstream of the proposed River Corrib Bridge, and beyond the Assessment Boundary, the habitat present within Lough Corrib SAC along the river banks consists of a mosaic of Wet grassland (GS4) and Reed swamp (FS1). Scrub (WS1), Dry calcareous and neutral grassland (GS1) and woodland (WD1, WN2 and WN6) are also present between the proposed crossing point of the River Corrib Bridge and the Coolagh Lakes. Many of these habitat types correspond with the Annex I habitat types[37] Calcareous grassland [6210], Residual alluvial forests [*91E0], Cladium fen [*7210], Hydrophilous tall herb [6430] and Transition mires

[37] Where abbreviated Annex I habitat names are used throughout this report, nomenclature follows that of NPWS (2019a)

[7140]. Although only Calcareous grassland and Cladium fen are QI habitats for Lough Corrib SAC, many of the other wetland habitats are likely to provide a supporting role to these habitats within this mosaic.

The proposed drainage outfall from the N59 Link Road North will discharge to a drainage ditch in Lough Corrib SAC at Kentfield. Habitats in this area included Treeline (WL2), Scrub (WS1) and Dry meadows and grassy verges (GS2), Wet grassland and Reed and large sedge swamp/Tall-herb swamp/Wet grassland (FS1/FS2/GS4). A patch of *Phragmites australis* Reed swamp (FS1) and an area of Rich fen and flush (PF1) are immediately to the east of the Assessment Boundary. The fen area corresponds with the PF1_RFLU1a[38] vegetation community (Carex viridula oedocarpa - Pinguicula vulgaris - Juncus bulbosus flush; brown moss sub-community) of the Annex I habitat type Alkaline fens [7230].

The drainage ditch, to which the drainage outfall discharges, drains to the northwest for c.380m before turning northeast where it connects with the River Corrib after a further c.130m. Along or close to the drainage ditch, within the boundary of Lough Corrib SAC, are Wet grassland (GS4), Wet heath (HH3), Transition mire (PF3) and Wet willow-alder-ash woodland (WN6) habitats. Some of these correspond with Annex I habitat types: *Molinia* meadow [6410], Wet heath [4010], Transition mire [7140] and Residual alluvial forests [*91E0], respectively.

The Coolagh Lakes correspond with the Annex I Hard water lakes [3140] habitat type and support a wetland complex of Wet grassland (GS4), Wet heath (HH3), Fen (PF1 and PF2), Reed swamp (FS1), and Tall-herb swamps (FS2). Many of these habitat types correspond with the Annex I habitat types[39] (Perrin *et al.*, 2014), Residual alluvial forests [*91E0], *Cladium* fen [*7210], Alkaline fen [7230], Hydrophilous tall herb [6430], *Molinia* meadow [6410], Wet heath [4010] and Transition mires [7140]. Although only Calcareous grassland and Cladium fen are QI habitats for Lough Corrib SAC, many of the other wetland habitats are likely to provide a supporting role to these habitats within this mosaic.

The area to the west of the Coolagh Lakes and to the north and east towards Lackagh Tunnel consisted of a mosaic of Exposed calcareous rock (ER2), Dry calcareous and neutral grassland (GS1), Oak-Ash-Hazel Woodland (WN2) and Scrub (WS1). Some of these areas corresponded with the Annex I habitats Calcareous grassland [*6210/6210] and Limestone pavement [*8240]. For the Annex I habitat types recorded, the majority are well defined by recent national studies co-ordinated by NPWS (refer to publications referenced in Table 4.2 of this updated NIS) and for the purposes of this assessment, were identified and classified in accordance with those publications, where available

However, in the case of *8240 Limestone pavement, some further definition of the habitat type was required. Though the Interpretation Manual of EU Habitats (CEC, 2013) does not specifically mention woodland being a component of the Annex I definition for *8240 Limestone pavement, its inclusion appears widely accepted (JNCC, 2009, 2014; Wilson & Fernández, 2013). The EU Interpretation Manual does include "scrub... (*e.g. Corylo-Fraxinetum*)", and the two corresponding categories from the UK National Vegetation Classification which relate to *8240 Limestone pavement are both woodland types. It is, however, stated by Rodwell *et al.* (2000) that Limestone pavement habitats do not fit well in the NVC system, with there being nothing encountered that cannot be described in terms of fragments, or complexes of a variety of vegetation types, already represented elsewhere within the classification.

The National Survey of Limestone Pavement (NSLP) (Wilson & Fernández, 2013) describes two pavement types based on their morphology:

- Blocky, characterised by a well-defined structure of clints and grikes
- Shattered areas of loose rubble which generally lack a well-defined structure of clints and grikes

Wooded limestone pavement is described in the National Survey of Limestone Pavement (NSLP) as a habitat which "*includes low woodland formations dominated by Hazel and/or Ash with typical blocky pavement under the canopy*". No justification is provided as to why hazel/ash woodland which has developed over shattered pavement is not included within the Annex I type. The EU Interpretation Manual does include 'shattered pavements' within its definition of the Annex I habitat. Recognising areas of blocky pavement as

[38] Alkaline fen vegetation community classification (Perrin *et al.*, 2014)

[39] Where abbreviated Annex I habitat names are used throughout this report, nomenclature follows that of NPWS (2019a)

opposed to shattered pavement under woodland, when the ground is carpeted in a cover of bryophytes, can be difficult. Indeed, both blocky and shattered pavement types frequently occur together, which further complicates the distinction. The species occurring in woodland over blocky pavement and shattered pavement would be similar and can indeed be found in calcareous woodland on deeper soils, so the species do not assist in defining the habitat. As such, it was decided for the purposes of this assessment that areas of *8240 wooded Limestone pavement include those having a closed canopy of trees at least 3m tall with at least 50% of the surface comprising bedrock at the surface (the bedrock was normally covered by mosses) and retaining some evidence of Limestone pavement structure. In the *8240 wooded limestone pavement habitats encountered, soil was generally present but was thin (< 2cm), though could be deeper in places – for example, in old grikes – due to a build-up of humus.

In the case of the Annex I habitat types Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (* important orchid sites) [6210/*6210], these were identified and classified in accordance with both the EU Interpretation Manual definition as well as O'Neill *et al.* (2013). Within Lough Corrib SAC, calcareous grassland was recorded at three locations within the ZoI of the proposed Project: on the east bank of the proposed River Corrib Bridge crossing (Ch. 9+400 – Ch. 9+475), along the spring/valley leading to the Coolagh Lakes (Ch. 9+950), and to the north and west of Lackagh Quarry (Ch. 11+000 – Ch. 11+800) (Figures 17.1 and 17.4 and Figures 18.1 and 18.4).

9.1.2.1.1 Proposed River Corrib Bridge

Habitat types recorded within Lough Corrib SAC in the vicinity of the proposed River Corrib Bridge and the proposed drainage outfalls are shown on Figure 15.1 and Figure 16.1 (Fossitt habitat classifications) and Figure 17.1 and Figure 18.1 (Annex I habitat classifications) and are described in Appendix H (Part 2). The detailed description below relates to each habitat area within Lough Corrib SAC that lies within the Assessment Boundary, and that will be directly affected by the Project (c.2.9ha will be directly impacted within Lough Corrib SAC). None of these areas correspond with Annex I habitat types or support the conservation objectives of Lough Corrib SAC. The reference codes used below (e.g. Area 1.a) correspond with the annotation on Figure 19.1 and Figure 20.1. Due to the changes in the Lough Corrib SAC boundary since the 2018 NIS (Section 1) Area 1.a, Area 1.g, 4.b, 4.c, 4.d, 2.a, 2.c, 2.d and 2.j. are no longer in the Lough Corrib SAC and omitted from this updated NIS.

The River Corrib itself was classified as a Depositing/lowland river (FW2) corresponding with QI Annex I habitat, Vegetation of flowing waters [3260]. None of the terrestrial habitat areas that lie within the Assessment Boundary and within Lough Corrib SAC corresponds with Annex I habitat types, are QI habitat of Lough Corrib SAC, or support QI habitats of Lough Corrib SAC.

Vegetation of flowing waters [3260] in the River Corrib

As confirmed in Appendix N, aquatic vegetation recorded during the surveys in 2023 within the River Corrib between Lough Corrib and Bridge Street, Galway City is limited to the margins and the vicinity of islands due to a steep drop off into deeper water and/or trees overhanging the edge of the river. There are some areas where the fringing aquatic vegetation is intermittent or absent, including particularly on the west bank, upstream and downstream of the proposed N6 GCRR river crossing point, as well as north of the crossing point on both banks near Menlo Castle.

Along most of the river, on both sides, communities of submerged plants forming a band along the deep-water edge of fringing vegetation were recorded during the 2023 surveys. Depending on the steepness of the drop-off into deep water this band of vegetation varies from intermittent patches of plants to a fairly dense community around 5 metres wide.

The composition is somewhat variable with no clear pattern or zonation. The 2023 survey results indicate a presence of low density, patchy coverage of aquatic vegetation, comprised of commonly recorded submerged aquatic species consistently present locally in the River Corrib between Lough Corrib and Bridge Street, Galway City. Appendix N gives the percentage frequency of each species in 130 sample points along the river between Lough Corrib and Bridge Street, Galway City, and shows that the most frequent and consistently recorded species were *Elodea canadensis*, *Lemna trisulca*, *Myriophyllum spicatum*, *Chara virgata*, *Ceratophyllum demersum*, *Utricularia vulgaris* agg. and *Potamogeton perfoliatus*.

Area 1.b

This habitat area consists of a gravel pathway along the west bank of the River Corrib, which was classified as Buildings and artificial surfaces (BL3), and a strip of Wet grassland (GS4) and Scrub (WS1) between the path and the river, with the addition of areas of amenity grassland (GA2) and dry calcareous and neutral grassland (GS1) in the habitat mosaic. The grassland strip appears to be periodically managed. The species associated with the grassland/scrub are *Agrostis stolonifera, Arrhenatherum elatius, Holcus lanatus, Lythrum salicaria, Filipendula ulmaria and Rubus fruticosus* agg., with fringing *Phragmites australis* and *Schoenoplectus lacustris* along the water's edge. Species associated with the scrub areas include *Salix cinerea* subsp. *oleifolia, Crataegus monogyna* and *Rubus fruticosus* agg. Approximately 0.03ha (was 0.07ha in the 2018 NIS) of this habitat area lies within the Assessment Boundary and within Lough Corrib SAC.

The pathway and scrub areas do not correspond to any Annex I habitat types. The grassland areas lack a sufficient number of indicator species to correspond with any Annex I grassland habitat types. There are no indicator species of Calcareous grassland [*6210/6210] and only a single species listed for this Annex I habitat in CEC (2013) is present (*Arrhenatherum elatius*).

The following relevés were recorded in Area 1.b in 2019: 5880_R1, 5880_R2, 5880_R3, 5880_R4 and 5506_R1.

Area 1.c

This habitat area is a linear section of scrub/treeline (WS1/WL2), comprised mostly of Fraxinus excelsior with occasional Crataegus monogyna, Alnus glutinosa, Prunus spinosa and Ilex aquifolium. Structurally, it is very sparse with large gaps between individual trees in places, particularly in the vicinity of the proposed crossing point for the River Corrib Bridge. This habitat area does not correspond with any Annex I habitat types. In particular, it does not correspond with any woodland habitat types; lacking any woodland structure as it is a narrow, linear feature made up of a gappy, single line of trees/bushes. Approximately 0.06ha (was 0.05ha in the 2018 NIS) of this habitat area will be directly affected, 0.04ha of which is within Lough Corrib SAC.

The following relevés were recorded in Area 1.c in 2019: 4619_R1 and 4619_R2.

Area 1.d

This habitat area is classified as Dry calcareous and neutral grassland (GS1) and corresponds with the Cynosurus cristatus – Trifolium repens grassland vegetation community (GS1_3b) 40. This field covers an area of approximately 0.56ha (unchanged from 2018 NIS) and lies entirely within the Assessment Boundary and Lough Corrib SAC.

This habitat type does not correspond to either the priority or non-priority variant of the Annex I habitat type Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (* important orchid sites) [6210/*6210] on the basis that it does not support the required species composition for this habitat type. None of the High Quality Positive Indicator Species nor any of the Positive Indicator Species for this habitat in an Irish context (after O'Neill *et al.,* 2013) are present. No species listed for this Annex I habitat in CEC (2013) are present.

Considering Lowland hay meadows [6510], it does not support the required species composition for this habitat type for this habitat in an Irish context, having only four indicator species present, as listed in O'Neill *et al.* (2013): *Centaurea nigra, Trifolium pratense, Plantago lanceolata* and *Ranunculus acris*. No species listed for this Annex I habitat in CEC (2013) are present.

The following relevés were recorded in Area 1.d in 2014: BEC 175.

The following relevés were recorded in Area 1.c in 2019: 4400_R1, 4400_R2, 4400_R3, 4400_R4 and 4400_R5.

Area 1.e

This habitat area is classified as Dry calcareous and neutral grassland (GS1) and corresponds with the Cynosurus cristatus – Trifolium pratense grassland vegetation community (GS1_3d). This field covers an area of approximately 0.69ha (unchanged since 2018 NIS) and lies entirely within the Assessment Boundary. Of this, c.0.24ha also lies within the boundary of Lough Corrib SAC.

This habitat type does not correspond to either the priority or non-priority variant of the Annex I habitat type Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (* important orchid sites) [6210/*6210] on the basis that it does not support the required species composition for this habitat type. None of the High Quality Positive Indicator Species are present and only one of the seven Positive Indicator Species for this habitat type (after either O'Neill *et al.,* 2013) is present.

Considering Lowland hay meadows [6510], it is currently not managed as a meadow and it does not support the required species composition for this habitat type, supporting none of the indicator species for this habitat in an Irish context, as listed in O'Neill *et al.* (2013), nor species listed for this Annex I habitat in CEC (2013).

The following relevés were recorded in Area 1.e in 2016: RC-LQ R1.

The following relevés were recorded in Area 1.e in 2019: 4401_R1, 4401_R2, 4401_R3, 4401_R4 and 4401_R5.

Area 1.f

This habitat area is classified as Mixed broadleaved woodland (WD1) and corresponds with the *Fagus sylvatica – Prunus laurocerasus* woodland vegetation community (WD1_2f[41]). This woodland covers an area of approximately 1.58ha, of which c.1.54ha lies within the Assessment Boundary. The majority of the woodland (c.1.45ha) also lies with the boundary of Lough Corrib SAC. These areas remain the same as those reported in the 2018 NIS.

[40] Grassland vegetation community classifications are as per the classification system described in O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) *The Irish semi-natural grasslands survey 2007-2012.*

[41] Perrin, P., Martin, J., Barron, S., O'Neill, F., McNutt, K. & Delaney, A. (2008) National Survey of Native Woodlands 2003-2008. Volume II: Woodland classification.

The following relevés were recorded in Area 1.f in 2019: 3734_R1, 3734_R2, 3734_R3, 3734_R4 and 3734_R5.

9.1.2.1.2 Proposed Drainage Outfall – N59 Link Road North

The termination of the proposed drainage outfall from the N59 Link Road North at Kentfield will discharge to a drainage ditch which ultimately outfalls to the Lough Corrib SAC; and will require construction of the drainage outfall within the SAC boundary.

Habitat types recorded within Lough Corrib SAC in the vicinity of the proposed drainage outfall are shown on Figure 15.2 and Figure 16.2 (Fossitt habitat classifications) and Figure 17.2 and Figure 18.2 (Annex I habitat classifications). The detailed descriptions below relate to each habitat area within Lough Corrib SAC that lies within, or adjacent to, the Assessment Boundary. Area 4a is the only part of Lough Corrib SAC that will be directly impacted (c.0.02ha) and this area does not correspond with any Annex I habitat types. The reference codes used below (e.g. Area 4.a) correspond with the annotation on Figure 19.2 and Figure 20.2.

Area 4.a

The habitats associated with this railway embankment are a mosaic of Treeline (WL2), Scrub (WS1) and Dry meadows and grassy verges (GS2).

As a result of the resurvey in 2023, this area has been reclassified as scrub and scrub tree-line (WL2/WS1) due to the dominance of *Salix cinerea*, the high percentage of tree canopy cover and expansion of tree/shrub vegetation around the former railway embankment. Other plant species recorded were *Hedera helix, Athyrium filix-femina, Phalaris arundinacea, Crataegus monogyna, Fraxinus excelsior* and *Filipendula ulmaria*.

Relevé data from 2019 (relevé 3815_R1) confirms that this habitat area does not correspond with any of the qualifying interest woodland habitats of Lough Corrib SAC: Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0], as oak are absent; and, Bog woodland [*91D0], as it not established on bog habitat. The relevé data also confirms that the riparian woodland does not correspond to the priority Annex I habitat Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae, Salicion albae*) [*91E0].

The boundary of this area has also been extended due to expansion of the tree and shrub cover and, as a result, this habitat area now encompasses all of the overlap area between the Assessment Boundary and Lough Corrib SAC at this location.

Approximately 0.27ha of this habitat area lies within Lough Corrib SAC, with approximately 0.02ha (c.150m^2) within the Assessment Boundary, which remains unchanged from the 2018 NIS.

9.1.2.1.3 Menlough

The Assessment Boundary overlaps with the Lough Corrib SAC boundary at two points in the vicinity of Coolagh Lakes: between Ch. 9+850 and Ch. 10+050, and again between Ch. 10+075 and Ch. 10+100 of the proposed N6 GCRR.

The Coolagh Lakes correspond with the Annex I Hard water lakes [3140] habitat type and support a wetland complex of Wet grassland (GS4), Wet heath (HH3), Fen (PF1 and PF2) and Reed swamp (FS1) and Tall-herb swamps (FS2). Many of these habitat types correspond with the Annex I habitat types[42] Residual alluvial forests [*91E0], Cladium fen [*7210], Alkaline fen [7230], Hydrophilous tall herb [6430], Molinia meadow [6410], Wet heath [4010] and Transition mires [7140]. Although only Calcareous grassland and Cladium fen are QI habitats for Lough Corrib SAC, many of the other wetland habitats are likely to provide a supporting role to these habitats within this mosaic. There was no significant change in the extent of these habitats between 2018 and 2023.

Habitat types recorded within Lough Corrib SAC and adjacent to the Project between Ch. 9+850 and Ch. 10+100 of the proposed N6GCRR are shown on Figure 15.3 and Figure 16.3 (Fossitt habitat classifications) and Figure 17.3 and Figure 18.3 (Annex I habitat classifications) and are described in Appendix H. The detailed descriptions below relate to each habitat area within Lough Corrib SAC that lies within, or adjacent

[42] Where abbreviated Annex I habitat names are used throughout this report, nomenclature follows that of NPWS (2019a)

to, the Assessment Boundary and that will be directly affected by the Project (c.0.11ha will be directly impacted within Lough Corrib SAC). None of these areas correspond with Annex I habitat types. The reference codes used below (e.g. Area 2.a) correspond with the annotation on Figure 19.3 and Figure 20.3.

Area 2.b

This habitat area (c.0.83ha) is classified as Wet grassland (GS4) and corresponds with the Juncus effusus – Holcus lanatus grassland vegetation community (GS4_2b). The species recorded here were *Agrostis stolonifera, Arrhenatherum elatius, Cirsium palustre, Filipendula ulmaria, Holcus lanatus, Juncus effusus, Lychnis flos-cuculi, Lythrum salicaria, Molinia caerulea, Plantago lanceolata, Potentilla anserina, Ranunculus acris, Ranunculus repens* and *Trifolium repens*. Approximately 0.16ha (was 0.25ha in the 2018 NIS) of this habitat area lies within the Assessment Boundary; of which c.0.01ha also lies within Lough Corrib SAC. This habitat does not have the requisite indicator species to correspond with any Annex I habitat types.

The use of more accurate field mapping technology in 2019 allowed the boundaries between the wet grassland (Area 2.a – which has since been removed as it is no longer in the Lough Corrib SAC boundary) and the adjacent area of dry calcareous and neutral grassland to be delineated more accurately.

The following relevés were recorded in Area 2.a in 2017: RC-LQ R3.

The following relevés were recorded in Area 2.a in 2019: 4275_R1, 4275_R2, 4275_R3, 4275_R4, 4275_R5, 3962_R1, 3962_R2, 3962_R3 and 3962_R4.

Area 2e and Area 2.g

These habitat areas are classified as Oak-Ash-Hazel Woodland (WN2) and correspond with the *Fraxinus excelsior – Hedera helix* woodland group and the *Corylus avellana – Oxalis acetosella* woodland vegetation community (WN2_2e). Typical species include *Corylus avellana, Fraxinus excelsior, Hedera helix, Prunus spinosa, Quercus robur, Ilex aquifolium, Acer pseudoplatanus* and *Lonicera periclymenum*. These woodlands cover an area of approximately 0.97ha (was 7.78ha in the 2018 NIS, but also included areas 2.a and 2.d which are no longer in the Lough Corrib SAC boundary); of which c.0.71ha (was 3.3ha in the 2018 NIS) lies within Lough Corrib SAC. Of the c.0.71ha that lies within Lough Corrib SAC, only c.0.04ha (was 0.08ha in the 2018 NIS) also lies within the Assessment Boundary. These woodland blocks form a mosaic with patches of exposed and wooded Limestone pavement habitat across the local area from Menlough to the north of Lackagh Quarry. The Project passes between areas of woodland blocks, some of which lie closer to the Coolagh Lakes.

These woodlands lack the thin soil cover (on average less than 2cm deep) and cover of exposed limestone rock beneath the woodland canopy (i.e. at least 50% of the surface comprising exposed rock) to qualify as the wooded variant of the priority Annex I habitat type Limestone pavements [*8240].

The following relevés were recorded in Area 2.e in 2019: 3790_R1 and 3790_R2.

The following relevés were recorded in Area 2.g in 2019: 3936_R1 and 3936_R2.

Retained Habitat Area at Ch.10+000

The relevés recorded in 2019 confirmed that this area of habitat, which is to be retained and will not be directly affected by the Project, includes oak-ash-hazel woodland (WN2), scrub (WS1) and exposed calcareous rock (ER2); all of which correspond with the Annex I habitat Limestone pavement [*8240].

The following relevés were recorded in this area in 2019: 3155_R1, 5507_R1 and 3156_R1.

Area 2.f

This habitat area (c.0.38ha – unchanged since the 2018 NIS) was classified as Dry calcareous and neutral grassland (GS1) in 2014 in a mosaic with Scrub (WS1) and bracken (HD1). The grassland corresponded with the *Cynosurus cristatus – Trifolium pratense* grassland vegetation community (GS1_3d). The majority of this habitat area lies outside of Lough Corrib SAC, save for a portion (c.0.01ha – unchanged since the 2018 NIS) of the access track which lies within the European site. Typical species included *Cynosurus cristatus, Trifolium pratense, Plantago lanceolata, Centaurea nigra* and *Filipendula ulmaria*.

In 2015, the habitat had been improved and was reclassified as Improved agricultural grassland (GA1) with the typical species of *Lolium perenne*, *Rumex acetosa*, *Plantago lanceolata*, *Trifolium repens*, *Holcus lanatus*, *Cirsium arvense*, *Odontites vernus*, *Ranunculus repens*, *Cynosurus cristatus* and *Trifolium pratense*.

The relevés recorded in 2019 confirmed that Area 2.c, within the overlap area between the Assessment Boundary and Lough Corrib SAC, is dry calcareous and neutral grassland (GS1) but also that the grassland occurs in a mosaic with spoil and bare ground habitat (ED2). As the grassland habitat was more established along the access track as far as the edge of the local road, the boundary of Area 2.c was increased to the north and now extends as far as Bóthar Nua.

This habitat type does not correspond to the (priority) Annex I habitat type *Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (* important orchid sites)* [6210/*6210] on the basis that it does not support the required species composition for this habitat type. None of the requisite High Quality Positive Indicator Species or Positive Indicator Species were present. Considering *Lowland hay meadows* [6510], only two indicator species were recorded (*Plantago lanceolata* and *Trifolium pratense*) and on that basis it does not support the required species composition for this habitat type.

The following relevés were recorded in Area 2.f in 2019: 4266_R1, 4266_R2, 4266_R3, 4266_R4 and 4266_R5.

Area 2.h

This habitat area is classified as Scrub (WS1) and is dominated by *Prunus spinosa*. Other typical species include *Rubus fruticosus* agg., *Hedera helix* and *Pteridium aquilinum.* The scrub covers approximately 0.16ha (unchanged since the 2018 NIS); all of which lies within Lough Corrib SAC. Approximately 0.01ha (unchanged since the 2018 NIS) also lies within the Assessment Boundary. This habitat does not have the requisite indicator species to correspond with any Annex I habitat types.

The following relevés were recorded in Area 2.h in 2019: 3938_R1, 3938_R2 and 3938_R3.

Area 2.i

This is a local road and gravelled access track which is classified as Buildings and artificial surfaces (BL3). This habitat area runs along the boundary of Lough Corrib SAC and, being a man-made feature, does not correspond with any Annex I habitat types.

The boundary of Area 2.i was amended slightly in 2019 to account for the establishment of grassland habitat across all of the access track into the field to the south of Bóthar Nua (part of Area 2.i was merged with Area 2.f, see discussion on Area 2.f above).

9.1.2.1.4 Coolough and Proposed Lackagh Tunnel

The Project and its boundary overlaps with i.e. traverses through or adjacent to the Lough Corrib SAC at the following locations between Ch. 10+620 and Ch. 11+800 of the proposed N6 GCRR, including a tunnel beneath the SAC and the full extent of Lackagh Quarry:

- North of the road carriageway from Ch. 10+620 to Ch. 10+660 (Areas 3.a and 3.b)
- North and south of the western approach to the Lackagh Tunnel from Ch. 10+800 to Ch. 11+150 (Areas 3.g to 3.l)
- Above the Lackagh Tunnel from Ch. 11+150 to Ch. 11+420 (Areas 3.m and 3.n)
- Adjacent to the western boundary of Lackagh Quarry, south of the Lackagh Tunnel portal within the quarry
- Adjacent to the western and northern boundary of Lackagh Quarry, north of the Lackagh Tunnel portal within the quarry

Habitat types recorded within Lough Corrib SAC in the vicinity of the proposed Lackagh Tunnel (and western approach to same) and Lackagh Quarry are shown on Figures 15.4 and 15.5 and Figures 16.4 and 16.5 (Fossitt habitat classifications) and Figures 17.4 and 17.5 and Figures 18.4 and 18.5 (Annex I habitat classifications) and are described in Appendix H. The detailed descriptions below, and the reference codes used, relate to each habitat area within Lough Corrib SAC shown on Figures 19.4 and 19.5 and Figures 20.4

and 20.5. The descriptions relate to habitat areas that will be directly affected by the Project (c.0.2ha will be directly impacted within Lough Corrib SAC). None of these areas correspond with Annex I habitat types.

Retained Area of QI Annex I Habitat above Lackagh Tunnel Ch. 11+270 - 11+380

The habitat areas being retained above the Lackagh Tunnel comprise a mosaic of exposed limestone rock (ER2), calcareous grassland (GS1), scrub (WS1) and oak- ash-hazel woodland (WN2). With the exception of one area of scrub, all habitat areas above the Lackagh Tunnel that lie within the overlap area between the Assessment Boundary and Lough Corrib SAC correspond with priority Annex I Limestone pavement habitat [*8240]; one of the qualifying interest habitats of Lough Corrib SAC.

Additional relevés were taken in this area in 2019 in support of the Annex I habitat classifications: 3087_R1, 3087_R2, 3087_R3, 3087_R4, 3087_R5, 3088_R1, 3088_R2, 3088_R3, 3088_R4, 3089_R1, 3130_R1, 3130_R2, 3322_R1, 3322_R2, 3322_R3, 3322_R4, 3322_R5, 3494_R1, 3494_R2, 3494_R3, 3494_R4, 3494_R5, 3513_R1, 3513_R2, 3705_R1 and 3705_R2.

Relevés 4155_R1, 4155_R2 and 4155_R3 were taken in 2019 in support of the non- Annex scrub (WS1) habitat being retained above the Lackagh Tunnel within the overlap area between the Assessment Boundary and Lough Corrib SAC.

Area 3.a

This habitat area lies adjacent to Lough Corrib SAC and is classified as a mosaic of Oak-Ash-Hazel Woodland (WN2) and Scrub (WS1) and corresponds with the *Fraxinus excelsior – Hedera helix* woodland group and the *Geum urbanum – Veronica montana* vegetation community (WN2_2a). Typical species include *Fraxinus excelsior*, *Corylus avellana*, and *Rubus fruticosus* agg. These woodlands lack the thin soil cover (on average less than 2cm deep) and cover of exposed limestone rock beneath the woodland canopy (i.e. at least 50% of the surface comprising exposed rock) to qualify as the wooded variant of the priority Annex I habitat type Limestone pavements [*8240].

Area 3a lies outside of the overlap between the Assessment Boundary and Lough Corrib SAC and, therefore, was not surveyed in 2019.

Area 3.b

This habitat area (c.0.28ha – unchanged since the 2018 NIS) is classified as a mosaic of Oak-Ash-Hazel Woodland (WN2) and Scrub (WS1) and corresponds with the *Fraxinus excelsior – Hedera helix* woodland group and the *Corylus avellana – Oxalis acetosella* woodland vegetation community (WN2_2e). Typical species include *Corylus avellana, Hedera helix* and *Crataegus monogyna.* This area lies within Lough Corrib SAC with c.0.03ha (unchanged since the 2018 NIS) also within the Assessment Boundary. These woodlands lack the thin soil cover (on average less than 2cm deep) and cover of exposed limestone rock beneath the woodland canopy (i.e. at least 50% of the surface comprising exposed rock) to qualify as the wooded variant of the priority Annex I habitat type Limestone pavements [*8240].

The following relevés were recorded in Area 3.b in 2019: 3768_R1 and 3768_R2.

Area 3.c, Area 3.d, Area 3.e, Area 3.g, Area 3.h, Area 3.i and Area 3.j

These habitat areas are classified as a mosaic of Oak-Ash-Hazel Woodland (WN2) and Scrub (WS1) and correspond with the *Corylus avellana – Oxalis acetosella* woodland vegetation community (WN2_2e). Typical species include *Corylus avellana, Crataegus monogyna, Hedera helix* and *Rubus fruticosus* agg. These woodlands lack the thin soil cover (on average less than 2cm deep) and cover of exposed limestone rock beneath the woodland canopy (i.e. at least 50% of the surface comprising exposed rock) to qualify as the wooded variant of the priority Annex I habitat type Limestone pavements [*8240]. The soils in these woodland blocks were generally between 5cm and 10cm depth, on average. Bare rock cover was <10% in most cases but where rock cover was greater it consisted of large limestone blocks rather than the clint and grike rock structure associated with the Annex I habitat type.

These woodlands cover an area of approximately 2ha; of which c.1.82ha also lies within Lough Corrib SAC. Of the c.1.82ha that lies with Lough Corrib SAC, only c.0.11ha also lies within the Assessment Boundary. These areas are unchanged since the 2018 NIS. These woodland blocks form a mosaic with patches of exposed and wooded Limestone pavement habitat across the local area from Lackagh Quarry to Menlough.

Area 3.d, a mosaic of oak-ash-hazel woodland (WN2) and scrub (WS1), lies adjacent to but outside of the overlap between the Assessment Boundary and Lough Corrib SAC and, therefore, was not surveyed in 2019.

The following relevés were recorded in Area 3.c in 2019: 4541_R1, 4541_R2, 4541_R3, 4541_R4 and 4541_R5.

The following relevés were recorded in Area 3.e in 2019: 4473_R1 and 4473_R2.

The following relevés were recorded in Area 3.g in 2019: 3754_R1, 3754_R2, 3754_R3 and 3754_R4.

The following relevés were recorded in Area 3.h in 2019: 4538_R1 and 4538_R2.

The following relevés were recorded in Area 3.i in 019: 4517_R1, 4517_R2, 4517_R3 and 4517_R4.

The following relevés were recorded in Area 3.j in 2019: 4156_R1, 4156_R2, 4156_R3 and 4156_R4.

Habitat Area between 3.e and 3.i - Ch. 11+050 to Ch. 11+100

A relevé was recorded in this habitat area in 2019 (3340_R1) as it lies within Lough Corrib SAC and overlaps slightly (c.3m^2) with the Assessment Boundary. The relevé recorded in 2019 confirmed that, within the overlap area between the Assessment Boundary and Lough Corrib SAC, this habitat area is oak-ash-hazel woodland (WN2) and does not correspond with the priority Annex I habitat Limestone pavement [*8240].

Consequently, as it does not correspond with Limestone pavement [*8240] this habitat area no longer needs to be retained as part of the mitigation strategy for the Project.

The following relevé was recorded in this habitat area in 2019: 3340_R1.

Area 3.f

This habitat area is classified as a mosaic of Treelines (WL2) and Scrub (WS1) with some associated Dry meadows and grassy verges (GS2), and Spoil and Bare Ground (ED2) habitat. Approximately 0.07ha (was 0.08ha in the 2018 NIS)of this habitat area lies within the Assessment Boundary and Lough Corrib SAC. Typical species of the treeline/scrub are *Fraxinus excelsior*, *Prunus spinosa* and *Rubus fruticosus* agg.. Typical grassland species include *Agrostis stolonifera*, *Centaurea nigra*, *Holcus lanatus*, *Leontodon autumnalis*, *Plantago lanceolata*, *Plantago major*, *Potentilla anserina*, *Ranunculus repens*, *Senecio jacobaea* and *Trifolium repens*. These habitats do not correspond with any Annex I habitat types.

The following relevés were recorded in Area 3.f in 2019: 4149_R1, 4149_R2 and 4149_R3.

9.1.2.2 Otter

Evidence of Otter activity was abundant and widespread within Lough Corrib SAC along the River Corrib corridor during all the surveys conducted during 2023 by Triturus Environmental Ltd. and Scott Cawley Ltd, supporting findings of preceding surveys (2014 and 206-2017) which extended to the southeastern shore of Lough Corrib. However, there are no Otter holts or couches (resting places) present along the River Corrib in the vicinity of the proposed River Corrib Bridge (see Table 9.2 for summary of results). One Otter couch site was recorded at the Coolagh Lakes but more than 600m from the Project, in 2014.

Only indicators of transient otters moving through the River Corrib within the Assessment Boundary were noted and included an otter print along the southern bank of the River Corrib, close to the UoG pitches, with feeding signs (fish bones) present on the opposite northern bank, in the Menlo area. Otter spraints were recorded in numerous areas, on both sides of the River Corrib, between the areas of Menlo Castle and Menlo Pier.

Table 9.2 Otter Holts/Couches Recorded

Ref. No.	Feature	Status and Description
H1	Couch site	Active couch site along river bank >1km from the Project
H2	Couch site	Active couch site along river bank

Ref. No.	Feature	Status and Description
		>1km from the Project
H3	Couch site	Active couch site along river bank c.450m from the Project
H4	Potential natal holt	Dense scrub patch with abundant Otter signs surrounding and in the vicinity, well-worn and used trails leading into scrub – evidence suggestive of juvenile Otter being present. >1km from the Project
H5	Couch site	Active couch site along river bank >1km from the Project
H6	Couch site	Active couch site along river bank >1km from the Project
H7	Couch site	Active couch site along river bank >1km from the Project
H8	Couch site	Active couch site along river bank >1km from the Project
H9	Couch site	Active couch site along river bank c.600m from the Project

The full results of the Otter surveys are shown on Figure 6.

9.1.2.3 White-clawed crayfish

There were no White-clawed crayfish recorded at any of the aquatic survey sites during the 2023 or 2014 surveys for the Project, including the River Corrib. No other evidence of the presence of the species within the River Corrib within the Assessment Boundary was observed (i.e. Otter spraints will commonly contain crayfish remains if they form part of their diet). Therefore, White-clawed crayfish are not present in Lough Corrib SAC within the ZoI of the Project, in the area between Lough Corrib and Galway Bay.

9.1.2.4 Fish

The River Corrib is an important salmonid watercourse, supporting both Atlantic salmon and Brown trout. The River Corrib system is also designated under the Habitats Directive as part of a SAC (Lough Corrib SAC) for its Atlantic salmon *Salmo salar*, Sea lamprey *Petromyzon marinus* and Brook lamprey *Lampetra planeri* populations. Water quality in the lower reaches of the River Corrib, where the Project would cross the river, is classified as unpolluted (Q4)[43] by the EPA (sampled at the Salmon Weir - http://gis.epa.ie/Envision) and from the 2015 surveys. The Q3 value assigned to the River Corrib is considered as tentative due to the absence of riffle areas in the aquatic survey area within the Assessment Boundary. There are no records (2023 and 2015 surveys) of Atlantic salmon spawning in the vicinity, or downstream, of the proposed River Corrib Bridge. The holding habitat for adult salmonids where the River Corrib overlaps the Assessment Boundary is considered moderate and the river is characteristic of a migratory passageway for spawning tributaries of Lough Corrib (e.g. Owenriff River) rather than an important transitory resting habitat (Appendix K – Part 2).

There are records of Sea lamprey spawning below the Salmon Weir in Galway City (O'Connor, 2007) and the species has also been recorded by IFI spawning in the upper catchment in Cong, Co. Mayo. Brook

[43] EPAs biological water quality rating system, after Toner *et al*., 2005: Q5, Q4-5 and Q4 = Unpolluted, Class A; Q3-4 = Slightly polluted, Class B; Q3 or Q2/3 = Moderately polluted Class C; and, Q2, Q1/2 or Q1 = Seriously polluted Class D.

lamprey have been recorded widely throughout the River Corrib catchment (O'Connor, 2007). No suitable lamprey ammocoete nursery habitat was recorded in the vicinity of the proposed River Corrib Bridge, or the associated drainage outfalls to the river during the 2023 surveys which aligned with the findings of the 2015 surveys (Appendix K – Part 2).

Whilst there are no records of Atlantic salmon or Sea lamprey at the proposed River Corrib Bridge crossing, the River Corrib provides important habitat for Atlantic salmon, and both lamprey species, particularly in the context of its function as a migration corridor from the sea to the spawning areas for Atlantic salmon and Sea lamprey.

9.1.2.5 Lesser Horseshoe Bat

There is a Lesser horseshoe bat population within the Scheme Study Area, centred around the maternity site at Menlo Castle. This building is a known maternity roost for Lesser horseshoe bat and appears to be the largest and most important roost in the study area, with a peak count of 46 no. bats observed emerging from the structure during an emergence survey in mid-August 2023.

The 15 roosts identified during the various surveys conducted at various times from 2014 to 2023 are mainly concentrated in the area between Castlegar Village demarcated by the N83 Tuam Road in the east, the River Corrib in the west, and the N6 to the south. Two outliers are located west of the River Corrib, in Aughnacurra housing estate and further west in Ballard West in the vicinity of Bearna Woods. Lesser horseshoe bats ringed at Menlo Castle during 2014 were also recaptured at Coopers Cave (two over August/September 2014 and one in January 2018), Aughnacurra residential estate (two in August 2018) and Menlo Castle (one in August 2023).

Walked transects (May to September 2023) and static detector assessments (February to October 2023) indicated highest levels of activity were recorded at Menlo/River Corrib and Castlegar (transects), at Castlegar, Lackagh Quarry and Ballinfoyle area (static detectors), and wintering hibernation static detectors confirmed activity at Menlo Castle, Cooper's Cave and Cloonnabinnia Cave.

The foraging area used by this Lesser horseshoe bat population extends from Dangan/Kentfield on the west bank of the River Corrib, to a mating and hibernation site in Castlegar c.3.5km to the east.

The Lesser horseshoe bat roost (and associated Lesser horseshoe bat population) that forms the QI population for this European site (Eborhall House) is more than 30km away from the Project, on the northern shore of Lough Corrib. This distance would be regarded to be beyond the normal core foraging range of the Eborhall House population and beyond the normal commuting range of this species except on exceptional occasions or over long periods of time – for example, bats dispersing and moving between areas in the wider landscape over a period of many years/generations. Furthermore, radio-tracking surveys of the Menlough population of bats (which were identified within the Scheme Study Area) undertaken for this Project in 2014 and 2015 did not suggest any evidence of movement between that population and the Eborhall House roost. The absence of a supporting population link between the Menlough population and Ross Lake and Woods SAC population is upheld by the lack of ringed bats (28 bats captured and ringed from Menlough Castle and Coopers Cave in May 2023 and August 2023) recorded during the four Summer inspections and two daytime Winter inspections at Eborhall House (Summer roost), Ballymaglancy cave (Summer/Winter roost), Kelly's Cave (Winter roost), Bunnadober Mill (Summer, Maternity roost), Ross Castle (Summer roost), and Cloonnabinnia Cave (Summer/Winter) by Scott Cawley during the 2023 season. Given the lack of any linkage between the roosts in the Scheme Study Area and the roosts that are the reason for designation of this European site, the Menlo Castle Lesser horseshoe bat population does not form part of the QI population for Lough Corrib SAC. Although it is predicted in the updated EIAR that there will be local level residual impacts on the Menlough Lesser horseshoe bat population, as a result of the Project, these impacts will not affect the conservation objectives of Lough Corrib SAC, nor will they affect the QI Lesser horseshoe bat population of any other European site, because this population does not form part of the QI population for either Lough Corrib SAC or any other European site designated for this species.

9.1.2.6 Freshwater pearl mussel

There are no Freshwater pearl mussel populations within that portion of Lough Corrib SAC crossed by, or downstream of, where the Project interacts with this European site (see also Section 9.1.4.9); the QI population in Lough Corrib SAC is associated with the Owenriff River, c.23km to the north.

9.1.2.7 Varnished hook-moss and Slender naiad

The nearest known site for Varnished hook-moss, at Gortachalla Lough, is north of Moycullen and more then 10km from the Project. The species was not historically recorded in the area and the area does not support populations due to lack of suitable and appropriate habitat.

Slender naiad is not known from any of the waterbodies within Lough Corrib SAC that lie within the Scheme Study Area and was not recorded in any of the aquatic habitat surveys.

9.1.3 Potential Direct and Indirect Impacts[44]

The Project and its boundary overlaps with, i.e. traverses through or adjacent to one European site, namely Lough Corrib SAC at four locations: at the termination of the proposed drainage outfall from the N59 Link Road North at Kentfield; at the site of the proposed River Corrib Bridge between Dangan and Menlough; to the west of the Coolagh Lakes (Ch. 9+850 to Ch. 10+100 of the proposed N6 GCRR); and, to the west and north of Lackagh Quarry where the Project will consist of a tunnel (Lackagh Tunnel) and approach road infrastructure (Ch. 10+620 to Ch. 11+800 of the proposed N6 GCRR).

The following, are the impacts by which the Project could (in the absence of mitigation measures) potentially affect the QIs of Lough Corrib SAC:

- Habitat loss and habitat fragmentation
- Habitat degradation through structural effects to the overlying/adjacent limestone bedrock associated with the proposed Lackagh Tunnel and approaches
- Habitat degradation as a result of the Project affecting the functioning and quality of the existing hydrogeological regime
- Habitat degradation as a result of the Project affecting water quality in receiving watercourses during construction
- Habitat degradation as a result of air quality impacts
- Habitat degradation as a result of shading effects from elevated structures or high embankment
- Habitat degradation as a result of introducing/spreading non-native invasive plant species to habitat areas within Lough Corrib SAC
- Mortality risk to aquatic species in the River Corrib during construction of the proposed River Corrib Bridge
- Mortality risk to Otter during operation through collisions with road traffic

9.1.4 Examination and Analysis of Potential Direct and Indirect Impacts

9.1.4.1 Habitat loss/fragmentation

Habitats

As detailed in the 2018 NIS, through the evolution of the proposed N6 GCRR, elements were included in the design, which avoided direct impacts on habitat areas within Lough Corrib SAC. These include, the siting and design of the proposed River Corrib Bridge which avoids any direct impacts on QI Annex I habitat within Lough Corrib SAC and the clear span design, with no in-stream piers, which avoids any loss of in-stream habitat. A retaining wall on the southern side of the proposed N6 GCRR at approximately Ch. 9+880 to Ch. 10+050 and on both sides of the proposed N6 GCRR at approximately Ch. 10+850 to Ch. 11+150 forms part of the design to avoid the encroachment of the proposed N6 GCRR on Annex I habitat within Lough Corrib SAC. The proposed Lackagh Tunnel is beneath an area of QI Annex I habitats in Lough Corrib SAC (Limestone pavement and Calcareous grassland) avoiding any direct habitat loss. It remains however,

[44] In combination effects are considered in Section 12 separately from the direct and indirect impacts discussed in this section.

that the Assessment Boundary includes habitat areas within Lough Corrib SAC at the four locations as detailed in this Section 9.1.2.1.

At some of these locations, QI Annex I habitats are present within the Assessment Boundary however, not all lands within both the Assessment Boundary and Lough Corrib SAC are required to facilitate construction works. Unchanged since the 2018 NIS, the design of the proposed N6 GCRR does not permit construction compounds or materials stockpiles to be located within Lough Corrib SAC. Nor does it allow permanent fencing to be erected on areas of Annex I habitat within Lough Corrib SAC.

As per the 2018 NIS, mitigation measures are required to ensure that no construction works will take place within any Annex I habitat areas in Lough Corrib SAC that lie within the Assessment Boundary (Section 10.2 and Figures 17.1 to 17.5, Figures 18.1 to 18.5). This is reflected in the assessment presented in this section of the updated NIS related to habitat loss, i.e. the assessment below does not discuss habitat loss in the restricted area of construction works.

In a worst-case scenario, habitat degradation could result in habitat loss over time. These are discussed separately below and include: potential structural impacts associated with tunnelling, potential hydrogeological impacts, potential hydrological impacts, potential air quality impacts, and impacts potentially arising from the spread/introduction of non-native invasive plant species.
The loss of any habitat areas outside of Lough Corrib SAC will not have any indirect impacts on QI habitats, or habitats supporting QI species, due to the absence of any impact pathways – i.e. the habitats lost outside of this European site do not provide a supporting role to any QI habitats within Lough Corrib SAC, nor to QI species. Similarly, loss of non-QI habitats within the Lough Corrib SAC boundary will not have any indirect impacts on QI habitats due to the absence of any impact pathways – i.e. the non-QI habitats lost within the European site do not provide a supporting role to any QI habitats, nor to QI species. The loss of supporting habitats, as summarised here, was further detailed in Section 4.9 of the RFI Response Volume I Report (30 August 2019) submitted in response to the Request for Further Information received from ABP on 04 April 2019 in respect of the 2018 application, which concluded that habitat areas outside the Lough Corrib SAC and non-Annex I habitats in Lough Corrib SAC do provide a supporting role to habitats within Lough Corrib SAC. However, the role these habitats areas play in supporting the biological and environmental processes that, in turn, support the extent, distribution and quality/condition of habitat in Lough Corrib SAC, will not be affected by the proposed N6 GCRR, and as such the Project, due to its design and the effective implementation of the mitigation measures proposed.

The overlap of the Assessment Boundary with Lough Corrib SAC covers an area of approximately 3.8ha. Approximately 2.7ha of this habitat area will be retained with approximately 1.1ha of this habitat area being lost within Lough Corrib SAC.

At the proposed River Corrib Bridge crossing, the Project does not impact directly upon Vegetation of flowing water [3260] within the River Corrib, nor any other QI habitats within Lough Corrib SAC (Figure 18.1). On the west bank, the area of habitat loss within Lough Corrib SAC is c.0.03ha; comprising a narrow band of rank grassland. On the east bank the area of habitat loss within Lough Corrib SAC is c.2.3ha; comprising a block of woodland and two agricultural fields with a treeline along the river bank. The area of woodland that will be lost is *c.*1.45ha, with the grassland and treeline habitat comprising a further c.0.85ha. The total area of habitat loss within Lough Corrib SAC at the proposed River Corrib Bridge crossing is c.2.33ha.

As per the 2018 NIS, none of these terrestrial habitats corresponds with any Annex I habitat types. None of these terrestrial habitat types are QIs of Lough Corrib SAC, and they do not provide a supporting role to any QI habitats within Lough Corrib SAC, nor to QI species (see species discussions below). Therefore, their loss from Lough Corrib SAC will not affect the conservation objective attributes and targets supporting the conservation condition of any of the QI habitats or species of Lough Corrib SAC (Table 9.13).

Proposed Drainage Outfall - N59 Link Road North

The proposed drainage outfall for the N59 Link Road North at Kentfield will result in the loss of a treeline and scrub along the raised former railway embankment, along with some associated rank grassland habitat. The total area of habitat loss for the proposed Drainage Outfall for N59 Link Road North within Lough Corrib SAC is c.0.03ha (c.250m^2).

As per the 2018 NIS, none of these habitats corresponds with any Annex I habitat types (Figure 17.2 and Figure 18.2). None of these habitat types are QIs of Lough Corrib SAC, and they do not provide a supporting role to any QI habitats within Lough Corrib SAC, nor to QI species (see species discussions below). Therefore, their loss from Lough Corrib SAC will not affect the conservation objective attributes and targets supporting the conservation condition of any of the QI habitats or species of Lough Corrib SAC (see Table 9.13).

Menlough

No construction works will be undertaken, and there will be no habitat loss, within those areas of QI Annex I habitat located inside the boundary of Lough Corrib SAC (Figure 17.3 and Figure 18.3).

Between Ch. 9+850 and Ch. 10+050, the proposed N6 GCRR will result in the loss of c.0.02ha Oak-ash-hazel woodland, calcareous grassland and wet grassland habitat. The second area, (between Ch. 10+075 and Ch. 10+100) consists of predominantly Oak-ash-hazel woodland (two separate patches) along with a patch of *Prunus spinosa* dominated Scrub and a field access track, covering an area of c.0.11ha. A small portion of the Coolagh Road that lies within Lough Corrib SAC will also be affected (c.50m^2). The total area of habitat loss within Lough Corrib SAC in the Menlough area is c.0.13ha.

As per the 2018 NIS, none of the directly affected habitat areas within Lough Corrib SAC correspond with any Annex I habitat types. None of these habitat types are QIs of Lough Corrib SAC, and they do not provide a supporting role to any QI habitats within Lough Corrib SAC, nor to QI species (see species discussions below). Therefore, their loss from Lough Corrib SAC will not affect the conservation objective attributes and targets supporting the conservation condition of any of the QI habitats or species of Lough Corrib SAC (see Table 9.13).

Coolough and Proposed Lackagh Tunnel

No construction works will be undertaken, and there will be no habitat loss, within those areas of QI Annex I habitat located inside the boundary of Lough Corrib SAC (refer to Figure 17.4 and Figure 17.5 and Figure 18.4 and Figure 18.5). This includes those habitats above the proposed Lackagh Tunnel and those within Lough Corrib SAC adjacent to the western and northern boundaries of Lackagh Quarry.

Between Ch. 10+620 to Ch. 10+660, the proposed N6 GCRR will result in the loss of c.0.03ha of Oak-ash-hazel woodland and scrub inside Lough Corrib SAC, to the north of the proposed road carriageway.

Between Ch. 10+750 to Ch. 10+810, the proposed N6 GCRR will result in the loss of c.0.11ha of *Prunus spinosa* dominated scrub/treeline, and two patches of calcareous/neutral grassland, totalling c.0.11ha inside Lough Corrib SAC to the north of the proposed road carriageway. North of the western approach to the Lackagh Tunnel, from Ch. 10+800 to Ch. 11+150, the proposed N6 GCRR will result in the loss of c.0.07ha of Oak-ash-hazel woodland and scrub that lies within Lough Corrib SAC and within the Assessment Boundary. This habitat area does not correspond to any Annex I habitat type. South of the western approach to the Lackagh Tunnel, from Ch. 10+800 to Ch. 11+150, the proposed N6 GCRR will result in the loss of c.0.02ha of scrub, c.0.02ha of Oak-ash-hazel woodland, and c.0.07ha of a mosaic of treeline, scrub, rank grassland and disturbed ground within Lough Corrib SAC. This habitat area does not correspond to any Annex I habitat type.

The total area of habitat loss within Lough Corrib SAC in the vicinity of the proposed Lackagh Tunnel area is c.0.2ha.

As per the 2018 NIS, none of the affected habitat areas within Lough Corrib SAC correspond with any Annex I habitat types. None of these habitat types are QIs of Lough Corrib SAC, and they do not provide a supporting role to any QI habitats within Lough Corrib SAC, nor to QI species (see species discussions below). Therefore, their loss from Lough Corrib SAC will not affect the conservation objective attributes and targets supporting the conservation condition of any of the QI habitats or species of Lough Corrib SAC (see Table 9.13).

Otter

As there were no Otter breeding or resting places, holt or couch sites, present within the ZoI of the proposed N6 GCRR, habitat loss will not result in any decline in the number of available holt or couch sites within Lough Corrib SAC.

In the context of river systems, the *Threat Response Plan Otter* Lutra lutra *2009-2011* document (NPWS, 2011) defines terrestrial Otter habitat as a 10m zone of riparian habitat along the river banks. On the River Corrib, the construction of the proposed bridge structure will not result in the loss of any in-stream habitat. Construction of the bridge structure (a supporting pier) will result in the permanent loss of c.20m^2 of Otter habitat on the west bank of the river. On the east bank, the supporting pier will result in the loss of c.24m^2 of Otter habitat. On both river banks, some vegetation cutting/removal will likely be required to facilitate the construction works and potentially on an ongoing basis during operation (potentially c.40m of linear length on the east bank). Some effects to any remaining vegetation underneath the bridge structure would also be expected as a result of shading effects. The construction of the proposed drainage outfalls to the River Corrib will, also, result in the combined permanent loss of approximately 23m^2 of riparian habitat (S15, S18A and S18B). Overall, c.67m^2 of Otter habitat will be permanently lost from within Lough Corrib SAC as a result of the proposed N6 GCRR and as such the Project.

Habitat loss of such a comparatively small scale, in the context of the in-stream and riparian habitat resource along the River Corrib between the lake and Galway City (in itself a small proportion of Otter habitat available in the wider Lough Corrib SAC – i.e. less than 0.0007% of the total of c.1,054ha quoted in the conservation objectives document for Lough Corrib SAC) does not constitute a significant decline. This assessment is made on the basis that the habitat loss and changes associated with the proposed N6 GCRR will not reduce the number of available breeding or resting places, will not affect prey availability or abundance, and will therefore, not affect the local Otter population's ability to maintain itself even over the short-term. This is evidenced at many bridge and culvert sites across the country, even in cases where habitats are converted to hard surfaces (such as where a precast concrete culvert is installed), where Otter routinely use highly modified habitat within culverts and beneath bridges.

As per the 2018 NIS, there will be no in-stream works associated with the construction of the proposed River Corrib Bridge and the bridge structure is elevated above the river and much of the floodplain. As a result, there will not be any fragmentation of Otter habitat along the River Corrib.

As per the 2018 NIS, bankside and riparian habitat loss, or modification, associated with construction of the proposed N6 GCRR, will not affect the conservation objective attributes and targets supporting the conservation condition of Otter in Lough Corrib SAC (see Table 9.13).

Sea lamprey, Brook lamprey and Atlantic salmon

The function of the River Corrib, for Sea lamprey, Brook lamprey and Atlantic salmon, in the vicinity of the proposed River Corrib Bridge is primarily as a migration corridor between Galway Bay and spawning areas upstream in the catchment. Habitat loss relating to the river is restricted to two c.3m sections of riverbank that will be lost to construct the proposed drainage outfalls (one on each bank – refer to Section 2 for description of the proposed drainage design). Habitats in the vicinity are neither suitable spawning habitat for these species nor nursery habitat for lamprey ammocoetes, and therefore any habitat loss associated with such works will have no effect on the species ability to maintain their population within the catchment – even in the short-term.

As per the 2018 NIS, there will be no in-stream works associated with the construction of the proposed River Corrib Bridge and therefore, no fragmentation of Sea lamprey, Brook lamprey or Atlantic salmon habitat.

As per the 2018 NIS, none bankside and riparian habitat loss, or modification, associated with construction of the proposed N6 GCRR, will not affect the conservation objective attributes and targets supporting the conservation condition of Sea lamprey, Brook lamprey or Atlantic salmon in Lough Corrib SAC (see Table 9.13).

Summary

The proposed N6 GCRR, and as such the Project, will not result in north-south division of the Lough Corrib SAC; areas of SAC traversed are avoided through the Lackagh Tunnel and clear-span bridge across River Corrib. The proposed N6 GCRR will result in the loss/fragmentation of habitat areas, with some of this habitat loss/fragmentation occurring within and adjacent to Lough Corrib SAC.

A summary of the potential habitat loss/fragmentation impacts are presented in Table 9.3 below.

Table 9.3 Summary of Habitat Loss/Fragmentation Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction		
Loss of QI habitat or loss of non-QI habitat types that have a supporting role in maintaining the conservation status of QI habitats	Yes There are no areas of QI Annex I habitats within Lough Corrib SAC that lie beneath the footprint of the proposed N6 GCRR. Neither will the Project result in the loss of any habitats that support the QI habitats that are present in Lough Corrib SAC. However, within Lough Corrib SAC there are areas of the QI habitats Limestone pavement [*8240] and Calcareous grassland [6210] that lie within the Assessment Boundary yet outside of the footprint of the proposed N6 GCRR which could be directly impacted if not protected from construction works	Yes To ensure that no QI Annex I habitats in Lough Corrib SAC are directly impacted by the Project (as outlined in Section 10.2)
Fragmentation of habitat	No The Project will not result in the fragmentation of any QI habitats nor will it fragment the River Corrib corridor	No
Loss of habitat that may have a role in supporting the conservation status of: Otter Sea lamprey Brook lamprey Atlantic salmon	No Habitat loss within, or along the banks of, the River Corrib is minimal and will not affect any breeding or resting sites or the species' ability to maintain their populations	No
Operation		
Not applicable	No	No

9.1.4.2 Habitat degradation – tunnelling / excavation

As detailed in the 2018 NIS, there are three specific locations associated with the proposed Lackagh Tunnel discussed below, where construction will involve tunnelling beneath, or deep excavations immediately adjacent to, QI habitats within Lough Corrib SAC (see Figures 1.8 for design and Figures 17.5 and 18.5 for Annex I habitats). For the description of this assessment Lackagh Tunnel and its approaches is discussed in three sections but the overall impact of the Lackagh Tunnel and its approaches has been assessed as one.

Section 1: Stabilisation of Lackagh Quarry Face

Lackagh Quarry lies immediately adjacent to the boundary of Lough Corrib SAC and construction works associated with, or in close proximity to, the quarry walls could affect the structural integrity[45] of the limestone supporting the QI habitats above. These habitats comprise a mosaic of wooded Limestone pavement [*8240], scrub covered Limestone pavement [*8240], exposed Limestone pavement [*8240], and Calcareous grassland [6210]. The worst-case scenario would be large scale rockfall and the resulting loss of habitat that would be associated with such an impact.

[45] Structural Integrity of the rockmass that supports the mosaic of Limestone pavement and Calcareous grassland is the physical and mechanical geotechnical properties that control the behaviour of the geotechnical Limestone pavement environment

Section 2: Lackagh Tunnel

Lackagh Tunnel will comprise of a twin bored mined (drill and blast) tunnel through limestone beneath Lough Corrib SAC. There is the risk that such works could impact upon the structural integrity of the overlying QI Limestone pavement above or affect the existing hydrogeological regime. This in turn could affect the supported QI habitats.

Section 3: Western Approach to Lackagh Tunnel

The Western Approach to Lackagh Tunnel is set within thick subsoils that are bound to the north and south by Lough Corrib SAC and the mosaic of Limestone pavement associated QI habitats. There is the risk that such works could impact upon the structural integrity of the adjacent QI Limestone pavement or Calcareous grassland habitats or affect the existing hydrogeological regime.

Overall

As detailed in the 2018 NIS, a design and detailed construction methodology have been developed for construction works for the three sections of Lackagh Tunnel to ensure that the structural integrity of the limestone supporting the QI habitat at the surface is not affected (for a summary refer to Section 2.5.7 with the full description provided in Appendix F). However, mitigation measures in the form of ensuring the monitoring of rock slopes during tunnel construction and monitoring of blasting locally are required to ensure there is no risk to the structural integrity of the rock mass supporting any habitats above.

Summary

A summary of the potential direct or indirect impacts associated with the proposed Lackagh Tunnel tunnelling/excavations are presented in Table 9.4 below.

Table 9.4 Summary of Impacts Associated with constructing the Lackagh Tunnel

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction		
Tunnelling and excavations at the proposed Lackagh Tunnel affecting the structural integrity of surface-level habitats: [*8240] [6210]	Yes If construction works resulted in impact to the structural integrity of the rock mass above the tunnel resulting in the damage to or loss of QI Limestone pavement/Calcareous grassland habitat area within the SAC above	Yes To ensure there is no risk to the structural integrity of the rock mass supporting the QI habitats in Lough Corrib SAC (Section 10.3)
Operation		
During operation, the proposed Lackagh Tunnel poses no risk to the structural of the rock mass above the tunnel	No	No

9.1.4.3 Habitat degradation – hydrogeology

As discussed above in Section 6.3, the following groundwater bodies are within the hydrogeological ZoI and are potentially affected by the proposed N6 GCRR, and as such the Project. The hydrogeological ZoI also includes habitat areas within Lough Corrib SAC (for locations relative to the proposed N6 GCRR and Lough Corrib SAC, refer to Figures 11.3.001 to 11.3.010 and Figures 12.1.001 to 12.1.008):

- Ross Lake GWB
- Lough Corrib Fen 1 (Menlough) GWB
- Lough Corrib Fen 1 (Lackagh) GWB
- Lough Corrib Fen 2 GWB
- Clare-Corrib GWB

There are no groundwater dependant habitats listed as QIs of Lough Corrib SAC (or supporting QI habitats in the SAC) present within the hydrogeological ZoI of the Project in GWDTE Lough Corrib Fen 2 (refer to Figures 11.3.005 and 11.3.006 and Figures 12.1.005 and 12.1.006, and also Figures 17.1 to 17.5 and Figures 18.1 to 18.5 for Annex I habitat mapping).

The hydrogeological ZoI for groundwater quality within the Ross Lake GWB includes a marginal area of QI Annex I habitat (Alkaline Fen) at the proposed drainage outfall for the N59 Link Road North as part of the Project. Excavating and installing the drainage outfall is the only activity in this area. Despite the small-scale activities and the short duration of construction there may be small risk of groundwater quality impact from those works.

In the Lough Corrib Fen 1 (Menlough) GWB and the Lough Corrib Fen 1 (Lackagh) GWB, the hydrogeological ZoI includes both springs that contribute to the Coolagh Lakes and support the associated wetland complex of QI habitats. As described in Section 1.1, the main contributor to the Coolagh Lakes is the Western Coolagh Spring which is supplied by groundwater from the Lough Corrib Fen 1 (Menlough) GWB. There is a potential for a very low flow rate of seepage from the Lough Corrib Fen 1 (Lackagh) GWB, through the clayey subsoil, to the Eastern Coolagh Spring but this spring only contributes a very small fraction of the groundwater contribution to the Coolagh Lakes.

The Coolagh Lakes themselves are Hard water lakes [3140] and support the wetland habitats Alkaline fen [7230] and Cladium fen [*7210]. All of these habitat types are QI habitats of Lough Corrib SAC. The fringing habitats associated with the Coolagh Lakes, which also include non-QI Annex I habitats [*91E0, 6430, 4010 and 7140] are also considered as part of the conservation objectives of the Hard water lakes habitat for their supporting role.

As detailed in the 2018 NIS, a groundwater assessment was conducted (Appendix L) specifically with regard to the impact the Lackagh Tunnel may have on Coolagh Lake (groundwater fed lake) and associated GWDTEs (habitats dependent on lake water level and water quality), which support QI habitats [3140, *7210 and 7230] of Lough Corrib SAC and non-QI Annex I habitats [*91E0, 6430, 4010 and 7140]. No direct impact pathway was identified, and no impact expected. This is unchanged from the 2018 NIS.

Within the Lough Corrib Fen 1 (Menlough) GWB and the Lough Corrib Fen 1 (Lackagh) GWB, only the following elements of the Project have the potential to interact with groundwater during construction, based upon the design of the proposed N6 GCRR and the groundwater monitoring data presented in Appendix A, Appendix F and Appendix L of this updated NIS:

- Excavating and installing the support piers for the Menlough Viaduct and the potential of intercepting groundwater conduits in the Lough Corrib Fen 1 (Menlough) GWB
- As detailed in the 2018 NIS, the potential of an accidental pollution event affecting groundwater quality in the Lough Corrib Fen 1 (Menlough) GWB, Lough Corrib Fen 1 (Lackagh) GWB and the Clare-Corrib GWB

With the exception of the potential for intercepting groundwater conduits when constructing the supporting piers for the Menlough Viaduct, the construction of the proposed N6 GCRR will not affect the existing hydrogeological regime in terms of the quantity of water supply to the Coolagh Lakes or the frequency of flooding as groundwater dewatering during construction is not permitted within the design (see Appendix A). Mitigation measures are required to ensure that any groundwater conduits that may be intercepted during construction of the Menlough Viaduct will be maintained.

The Clare-Corrib (Terryland) GWB overlaps with groundwater dependant habitats along the eastern edge of the Coolagh Lakes (Figures 11.3.007 and 11.3.008 and Figures 12.1.007 and 12.1.008). Construction works

at the Lackagh Quarry access road and along Bothar Nua and Sean Bothar have the potential to interact with groundwater. These works are small scale and do not include dewatering or require significant excavations. This is unchanged from the 2018 NIS.

As per the 2018 NIS, the Limestone pavement adjacent to the Western Approach to Lackagh Tunnel and Lackagh Quarry, as well as that above the Lackagh Tunnel, will have no groundwater impacts from the proposed N6 GCRR during construction or operation; the pavement will remain drained and recharge will continue to follow exiting pathways through the unsaturated zone to the water table. There is however a risk that the accidental spillage of pollutants during construction could affect groundwater quality in the GWB which in turn could affect the conservation objectives of the Coolagh Lakes and the supported fringing wetland habitats (see Table 9.5 below).

Where the construction works drain to any of the infiltration basins, this risk is removed. The infiltration basins are designed to be used during both construction phase for site runoff and operational phase for road runoff and will be part of the initial works undertaken for the Project. The design of each infiltration basin is specific to the local hydrogeology, taking into account the unsaturated zone available and including placement of engineered appropriate subsoil to provide the required infiltration capacity. All infiltration basins include pre-treatment by hydrocarbon interceptor and containment area to provide an appropriate holding time to contain accidental spillages. All infiltration basins will be excavated into bedrock, with an over excavation to accommodate the thickness of appropriate subsoil. The sides of the excavation will be lined to control groundwater infiltration so that all discharges drain through a constructed subsoil appropriately placed for the thickness of the unsaturated zone. The design of the infiltration basins, coupled with the inclusion of hydrocarbon interceptor and containment area, will provide an appropriate level of protection to prevent contamination of groundwater from the infiltration basins during construction and operation.

There is however a risk, in those sections of the Project underlain by limestone, of accidental spills during construction in areas where the bedrock outcrops, such as those areas where the groundwater has extreme or high vulnerability (Figure 3.01 and 3.02 of Appendix A) or where the karst limestone outcrops due to cuttings and excavations. Mitigation measures are required to ensure that groundwater quality is not affected during construction.

During operation, impacts to groundwater quantity could occur as a result of dewatering or sealing of cuttings or tunnels changing flow paths, as per the 2018 NIS. Impacts to groundwater quality could be caused by discharging contaminated road runoff to ground or where leachate/runoff from limestone fill could affect the pH of acidic groundwater along the western section of the proposed N6 GCRR.

As a consequence of the sealed design of the tunnels and approaches, none of the cuttings in the Lough Corrib Fen 1 (Menlough) GWB or the Lough Corrib Fen 1 (Lackagh) GWB require operational dewatering and, therefore, there will not be any operational impacts on groundwater supply or flow paths within the GWBs in that regard as per the 2018 NIS.

Although the drainage design (as described in Section 2, and Appendices A, B, C, and F) will ensure that groundwater quality will be maintained during operation, it is important that they are inspected to ensure that karst features do not affect the functioning of the infiltration basins during operation. If this is identified during routine inspections of the infiltration basins then mitigation is required to ensure any issues are addressed so that they continue to function as designed for the operational lifespan of the Project (see Section 10.4.1.2).

Summary

A summary of the potential hydrogeological impacts associated with the Project are presented in Table 9.5 below.

Table 9.5 Summary of Hydrogeological Impacts

Potential Direct and Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction		
Construction works affecting groundwater quantity that supports QI wetland habitats: e.g. Coolagh Lakes	Yes The installation of the supporting piers of the proposed Menlough Viaduct has the potential to interact with groundwater conduits and potentially affect groundwater flow locally with the Lough Corrib Fen 1 (Menlough) GWB – which in turn could affect groundwater supply to the Western Coolagh Spring that contributes to the Coolagh Lakes, supporting QI wetland habitats in the SAC	Yes To ensure that construction works will not affect the existing groundwater regime (as outlined in Section 10.4)
Construction works affecting groundwater quality	Yes Affecting the quality of groundwater supporting groundwater dependant habitats in Lough Corrib SAC could affect the distribution, extent, diversity and area of QI wetland habitats	Yes To ensure that construction works will not affect groundwater quality in the underlying aquifer (as outlined in 10.4)
Operation		
Groundwater quantity being affected during operation	Yes Although the design of the Project will not restrict or inhibit existing groundwater flow paths supporting groundwater dependant habitats in Lough Corrib SAC, it is important that they are inspected to ensure that karst features do not affect the functioning of the infiltration basins during operation	Yes To ensure that the infiltration basins continue to function as designed for the operational lifespan of the Project (as outlined in Section 10.4)
Groundwater quality being affected during operation	Yes The drainage design (as described in Section 2, and Appendices A, B, C and F) will ensure that groundwater quality will be maintained during operation However, it is important that they are inspected to ensure that karst features do not affect the functioning of the infiltration basins during operation	Yes To ensure that the infiltration basins continue to function as designed for the operational lifespan of the Project (as outlined in Section 10.4)

9.1.4.4 Habitat degradation – hydrology

Potential Hydrological Impacts on Surface Water Quality during Construction

Water Quality

As detailed in the 2018 NIS, it is extremely unlikely that a pollution event of a magnitude that would affect the conservation objectives of the QI aquatic species would occur during construction. The proposed N6 GCRR crosses the River Corrib close to the downstream end of the catchment, which limits the ZoI of water quality impacts to that portion of Lough Corrib SAC downstream of the proposed N6 GCRR. Any pollution events that may occur would be expected to be relatively minor in comparison to the dilution factor and assimilative capacity of the River Corrib, or to be any more than temporary in nature. Therefore, any pollution event during construction would not have any perceptible or far-reaching effects within the catchment.

Nevertheless, a precautionary approach is being taken (as per the 2018 NIS) in assuming a level of risk of water quality impacts and construction mitigation is required to mitigate potential damage through various avoidance, reduction, mitigation and monitoring measures designed to prevent any untreated construction runoff water entering directly the River Corrib.

Summary

As per the 2018 NIS, there is the potential for water quality to be affected during construction of the Project as there is the potential for accidental spillages of pollutants to affect water quality in receiving watercourses/waterbodies and mitigation measures are required.

The Project has the potential to affect the range, area, or structure/function of QI habitats within Lough Corrib SAC, the range of QI species, or the ability of these QI habitats or species populations to maintain themselves in the long-term due to effects on water quality. The Project therefore also has the potential to inhibit any efforts to restore favourable conservation status, where this forms part of the conservation objectives (or might in the future).

Therefore, the Project has the potential to affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats and species of Lough Corrib (see Table 9.13) through impacts on water quality during construction.

A summary of the potential direct or indirect impacts associated with the hydrological regime are presented in Table 9.6 below.

Table 9.6 Summary of Hydrological Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required
Construction		
Construction works affecting surface water quality	Yes Affecting the quality of surface water supporting aquatic/wetland habitats and species could affect the quality and extent of those habitats and the aquatic species they support	Yes To ensure that water quality in the receiving environment is not affected during construction (as outlined in Section 10.5)

9.1.4.5 Habitat degradation – air quality

As explained in Section 6.5 above, TII published *Air Quality Assessment of Specified Infrastructure Projects* in 2022. As a resulted this section has been reviewed and updated since the 2018 NIS to take account of these new guidelines but also the updated information on habitat and vegetation tolerances to nitrogen-based emissions (Aherne *et al*., 2020; Aherne *et al*., 2021). The updated assessment provided below has not resulted in material changes to the overall findings as presented in the 2018 NIS.

In this section, unless indicated otherwise, the air quality parameter values discussed are the modelled contributions and the estimated background levels based on measured values from roads in proximity to the proposed N6 GCRR.

Emissions from car exhausts, and the deposition of particulate matter produced by engine, brake and tyre wear, can contribute to increased deposition of pollutants, such as oxides of nitrogen (NO_x, NO_s), ammonia (NH_3) and acid deposition (TII, 2022), which can impact receiving habitats in the vicinity of a road carriageway, and the associated nitrogen deposition (Ndep) into the neighbouring landscape. This can affect the ecosystems and vegetation present, influencing plant growth rates and species composition, diversity, and abundance.

The current understanding of air quality impacts from roads and their interaction/effects on ecology are set out in the TII's *Air Quality Assessment of Specified Infrastructure Projects* (TII, 2022)) and two UK reports: *The Ecological Effects of Diffuse Air Pollution from Road Transport* (Bignal *et al.*, 2004) and *The Ecological Effects of Air Pollution from Road Transport: An Updated Review* (Natural England, 2016).

National assessments indicate that there is no risk of carbon monoxide, 1-3 butadiene, benzene, lead and sulphur dioxide concentrations exceeding relevant air quality standard limits due to emissions from traffic anywhere in Ireland (Bignal *et al*., 2004; Natural England, 2016; EPA, 2021[46]). Nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) are considered important in terms of human receptors (TII, 2022) and are not specifically addressed in recent reports on air quality impacts on designated nature conservation (IAQM, 2020; Aherne *et al*., 2020; Aherne *et al*., 2020), other than the inclusion of NO_2 into the overall Ndep contributions modelled for the proposed N6 GCRR.

Air quality modelling for the nitrogen-based parameters was undertaken and values calculated for Lough Corrib SAC at distances up to, at least, 200m from the proposed edge of the proposed N6 GCRR, in 10m intervals (refer to Appendix O for the results). The section of the proposed N6 GCRR of relevance to this updated NIS is referred to as Link 53 in Appendix O and the more detailed measurements for specific receptor sites were undertaken along 10 transects (Transect 1 to 9 and Transect 23) across Link 53.

NO_x

The critical level[47] for NO_x is 30µg/m^3 for the protection of vegetation. At no point within Link 53, where the proposed N6 GCRR passes through or close to Lough Corrib SAC, is the critical level of 30µg/m^3 exceeded, either during the opening year (2031: ranges from 10.8µg/m^3 to 16.4µg/m^3) or design year (2046: ranges from 12.1µg/m^3 to 19.2µg/m^3).

Therefore, NO_x concentrations associated with the operation of the proposed N6 GCRR, and as such the Project, pose no risk to the conservation objectives of any QI habitats in Lough Corrib SAC.

Acid Deposition

Alkaline habitats, such as Limestone pavements [*8240] and Calcareous grassland [6210] have substrates that inherently neutralise potential acidification and will not be affected by any increases in acid deposition associated with the operation of the proposed N6 GCRR.

The Air Pollution Information System (APIS) has published critical loads[48] (0.1keq/ha/yr to 1.0keq/ha/yr) for bog habitats only: specifically Raised bogs and Blanket bogs[49]. Raised bogs [7110] is a QI for Lough Corrib SAC, but not recorded during the habitat surveys and outside the ZoI. Blanket Bogs [*7130] is not a QI for Lough Corrib SAC. Nonetheless, Blanket bog [*7130] habitat in the vicinity of Link 53 and within Lough Corrib SAC lies c.740m northwest of the proposed River Corrib bridge. This is outside the 200m ZoI for traffic emission impacts, at which distance the modelled acid deposition contribution of the proposed N6 GCRR is <0.1µg/m^3 along Link 53 for the opening (2031) and design (2046) years.

Therefore, acid deposition associated with the operation of the proposed N6 GCRR, and as such the Project, poses no risk to the conservation objectives of any QI habitats in Lough Corrib SAC.

NH_3

The critical levels for NH_3 are >3µg/m^3 for vascular plants and >1µg/m^3 for bryophytes and lichens (IAQM, 2020).

At no point within Link 53, or within Lough Corrib SAC, is the critical level of 3µg/m^3 exceeded, either during the opening year (2031: ranges from 1.03µg/m^3 to 2.18µg/m^3) or design year (2046: ranges from 1.25µg/m^3 to 2.72µg/m^3). Therefore, no harmful effects on vascular plants will occur from NH_3 contributions from the proposed N6 GCRR and as such the Project.

The predicted NH_3 concentrations fall below the 1µg/m^3 critical level along Link 53 at 30m for the operational year (2031) and 40m for the design year (2046). Limestone pavement [*8240] is the only QI

[46] Environmental Protection Agency (2021) Air Quality in Ireland 2020.

[47]The concentration of an air pollutant above which adverse effects on ecosystems may occur based to present knowledge (IAQM, 2020).

[48] Deposition flux of an air pollutant below which significant harmful effects on sensitive ecosystems do not occur, according to present knowledge (IAQM, 2020).

[49] https://www.apis.ac.uk/search-pollutant-impacts

Annex I habitat that has conservation objective attributes and targets associated with bryophytes that intersects the 30m and 40m NH_3 ZoI across Link 53 (depicted in Plate 9.2, Plate 9.3 and Plate 9.4).

Limestone pavement [*8240] habitat in Lough Corrib SAC has three bryophyte related conservation objectives. The first is 'Vegetation composition: typical species', where the target is to have at least seven positive indicator species (Wilson and Fernández, 2013) present at a representative number of monitoring stops. The second is 'Vegetation composition: bryophyte layer', where the target is to have at least 50% bryophyte cover on wooded pavement at a representative number of monitoring stops. Neither conservation objective defines, interprets or quantifies what is meant by 'a representative number of monitoring stops'. The third is 'Indicators of local distinctiveness' where the target is to ensure 'indicators of local distinctiveness are maintained' in terms of occurrence, which is not spatially defined or explained.

Limestone pavement habitat within Lough Corrib SAC falls within the 30m and 40m NH_3 ZoI at the following locations:

- At two locations west of the Lackagh Tunnel, north and south of the proposed N6 GCRR (Plate 9.3)
- At one location at the western portal to Lackagh Tunnel, south of the proposed N6 GCRR (Plate 9.3)
- At one location at the eastern portal to Lackagh Tunnel within Lackagh Quarry, north of the proposed N6 GCRR (Plate 9.3)
- At one location near Coolagh Lakes south of the proposed N6 GCRR (Plate 9.2)

As per the TII (2022) air quality guidelines the five intersections were investigated by way of more detailed air quality modelling along transects extending away from the road edge and taking into consideration the road elevations at these transect locations.

Considering the elevation of the proposed road, and the results of the air quality modelling eco-transects, there is only one location where the NH^3 ZoI (20m to 30m for the operational (2031) and design (2046) year respectively) includes a very limited area[50] of c.181m^2 (or 0.025% for the 30m ZoI) of Wooded limestone pavement habitat within the survey area locally and within Lough Corrib SAC.

The potential deterioration of the habitat quality through loss of positive indicator species will not occur because only vascular plants are listed as positive indicator species for wooded limestone (Wilson and Fernández, 2013).

Due to the very limited area of Wooded limestone pavement habitat in Lough Corrib SAC potentially affected by NH_3 contributions greater than the 1µg/m^3 critical level (i.e. 0.025% of the local habitat resource in Lough Corrib SAC), compared with the overall cover of Wooded limestone pavement habitat locally, the proposed N6 GCRR will not undermine the bryophyte cover conservation objective of Limestone pavement in the Lough Corrib SAC.

Bryophytes, along with orchids and ferns, are listed as indicators of local distinctiveness for Wooded limestone pavements (Wilson and Fernández, 2013). The potential deterioration of the habitat quality through loss of indicators of local distinctiveness, associated with NH_3 contributions greater than the 1µg/m^3 critical level, will be limited to bryophytes within 30m of the proposed road edge.

The Limestone pavement habitat in this zone comprises a mosaic of wooded and scrub covered limestone habitat (Figure 17.4 and Figure 18.4 - 'QI Habitat within Lough Corrib SAC'). The bryophyte species assemblage recorded in this Wooded limestone pavement habitat is captured in relevés 3156_R1, 3155_R1 and 5507_R1 (within the ZoI) and BEC8 and BEC9 (outside the ZoI) (Appendix H Part 2) and includes the following bryophyte indicator species of local distinctiveness (Wilson and Fernández, 2013): *Ctenidium molluscum*, *Eurhynchium* spp. (*E. hians* and *E. striatum*), *Fissidens* spp. (*F. bryoides and F. dubius*), *Isothecium* spp. *(I. alopecuroides*), *Kindbergia praelonga*, *Neckera* spp. (*N. complanata* and *N. crispa*), *Plagiomnium undulatum*, *Scapania aspera*, *Thamnobryum alopecurum*, *Thuidium tamariscinum*, *Tortella tortuosa*. The relevé results are representative of the overall species assemblage of wooded and scrub

[50] *c.*181m^2 area of Limestone pavement [*8240] extends into the 30m ZoI for NH_3>1µg/m^3 for the design year (2046) representing 0.025% of the total area of [*8240] habitat recorded within the survey area in Lough Corrib SAC (c.736,281m^2 or 73.63ha)

covered Limestone pavement in the immediate vicinity in Lough Corrib SAC, where individual relevé results represent a greater coverage and extent in terms of area and distribution. All bryophyte species of local distinctiveness recorded in the NH_3 ZoI in this location were also recorded and occur in other locations (outside the NH_3 ZoI) in the relevé dataset covering other wooded and scrub covered Limestone pavement habitat locally in Lough Corrib SAC – a total of 58 relevés[51], covering a total of 22.95ha of wooded or scrub covered Limestone pavement (the full species results for relevés recorded in Limestone pavement habitat in Lough Corrib SAC are provided in the digital dataset provided with Appendix H, Part 2). Considering the limited area of Limestone pavement habitat in Lough Corrib SAC potentially affected by NH_3, and that the bryophyte indicator species of local distinctiveness recorded in this zone are present and widespread in Limestone pavement elsewhere within the survey area locally in Lough Corrib SAC, the proposed N6 GCRR and as such the Project will not undermine the indicator species of local distinctiveness conservation objective for Limestone pavement in Lough Corrib SAC.

Overall, NH_3 contributions associated with the operation of the proposed N6 GCRR and as such the Project pose no risk to the conservation objectives of any QI habitats in Lough Corrib SAC.

N Deposition (Ndep)

The critical loads for Ndep vary for different Annex I habitats and were obtained from the EPA Research Report (Aherne *et al.*, 2021) and supported by the habitat-specific critical loads on the APIS website[52]. The assessment investigated the various Ndep categories (2kg N/ha/yr, 5kg N/ha/yr, 7.5kg N/ha/yr, 10kg N/ha/yr and 15kg N/ha/yr) for the various Annex I habitats ([*8240] Limestone pavements, [7230] Alkaline fens, [6210] Calcareous grassland, [*91E0] Alluvial woodland, [6430] Hydrophilous tall herb swamp and [*7210] Cladium fens).

Ndep concentrations greater than or equal to 7.5 kg N/ha/yr is the only Ndep critical load that has a ZoI [30m for the operational (2031) and 40m for the design (2046) year] that intersects a corresponding habitat for that critical load, namely Limestone pavement [8240]:

- At two locations west of the Lackagh Tunnel, north and south of the proposed N6 GCRR (Plate 9.3)
- At one location at the western portal to Lackagh Tunnel, south of the proposed N6 GCRR (Plate 9.3)
- At one location at the eastern portal to Lackagh Tunnel within Lackagh Quarry, north of the proposed N6 GCRR (Plate 9.3)
- At one location near Coolagh Lakes south of the proposed N6 GCRR (Plate 9.2)

As per the TII (2022) guidelines the five intersections were investigated by way of more detailed modelled air quality data along transects from the road edge and taking into consideration the road elevations at these transects.

Considering the depth / elevation of the road against ground-level, the ZoI at the first three sites disappeared entirely and was restricted to the road carriageway for the operational (2031) and the design (2046) year, The ZoI at the fourth site also disappeared entirely for the operational year (2031) and was reduced from 40m ZoI to 20m ZoI for the design year (2046), which exclude the Limesone pavement. There is only Coolagh Lake location where the Ndep >=7.5kg/ha/yr ZoI (30m) includes a very limited area of c.181m^2 (or 0.025%[53]) of Limestone pavement habitat within Lough Corrib SAC, south of the proposed N6 GCRR near Coolagh Lakes for the Design year (2046) only.

[51] 3088_R1, 3088_R2, 3088_R3, 3088_R4, 3155_R1, 3156_R1, 3322_R2, 3322_R4, 3494_R1, 3494_R2, 3513_R1, 3513_R2, 3705_R1, 3705_R2, 5507_R1, BEC 1, BEC 120, BEC 121, BEC 129, BEC 131, BEC 132, BEC 133, BEC 134, BEC 137, BEC 138, BEC 14, BEC 140, BEC 144, BEC 145, BEC 146, BEC 147, BEC 148, BEC 161, BEC 164, BEC 165, BEC 168, BEC 169, BEC 18, BEC 242, BEC 243, BEC 244, BEC 245, BEC 246, BEC 248, BEC 31, BEC 32, BEC 326, BEC 327, BEC 328, BEC 329, BEC 330, BEC 331, BEC 337, BEC 34, BEC 35, BEC 5, BEC 8, BEC 9

[52] https://www.apis.ac.uk/search-pollutant-impacts

[53] *c.*181m^2 area of Limestone Pavement [*8240] extends into the 30m ZoI for NH_3>1µg/m^3 for the design year (2046) representing 0.025% of the total area of [*8240] habitat recorded within the survey area in Lough Corrib SAC (c.736,281m^2 or 73.63ha).

Nitrogen enrichment will not alter the habitat which is characterised by the Limestone pavement and targets related to habitat extent and habitat distribution will not be compromised by Ndep contributions from the proposed N6 GCRR and as such the Project.

Nitrogen enrichment may alter habitat quality by way of vegetation composition, but the targets for vegetation composition of Limestone pavements in Lough Corrib SAC will not be compromised as the limited area within the ZoI will not affect the species counts, percentage cover and percentage area affected of the associated Limestone pavement woodland. The potential deterioration as a result of elevated Ndep from the proposed N6 GCRR will therefore not compromise the species composition attributes and targets to an extent that will compromise the overall conservation objectives of the Lough Corrib SAC.

Therefore, Ndep contributions associated with the operation of the proposed N6 GCRR, and as such the Project, pose no risk to the conservation objectives of any QI habitats in Lough Corrib SAC.

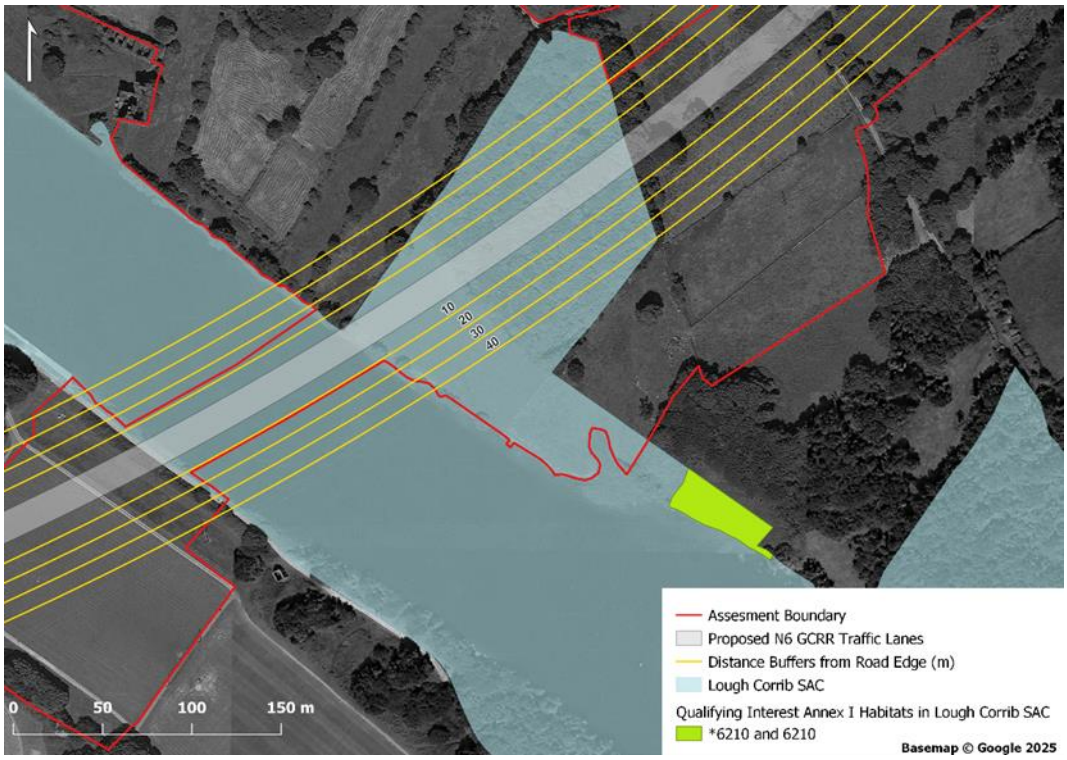


Plate 9.2 Distances from the road edge to the QI Annex 1 habitat receptor site at the River Corrib

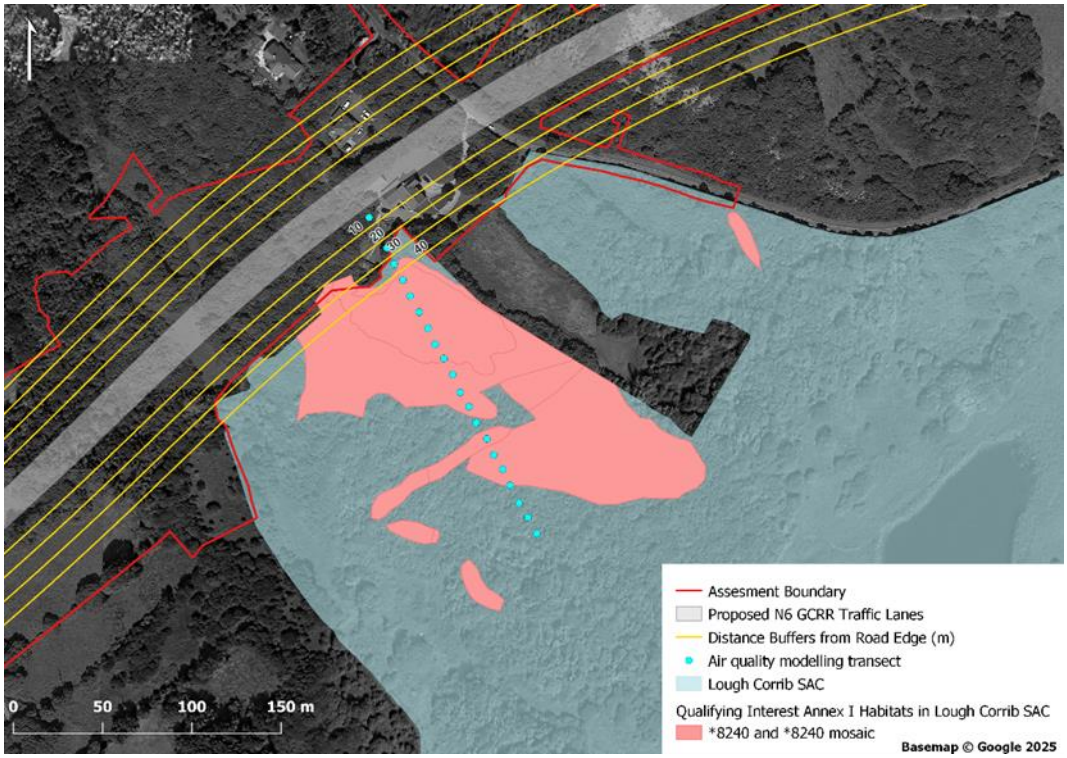


Plate 9.3 Distances from the Road Edge to the QI Annex 1 habitat Receptor Site near the Coolagh Lakes

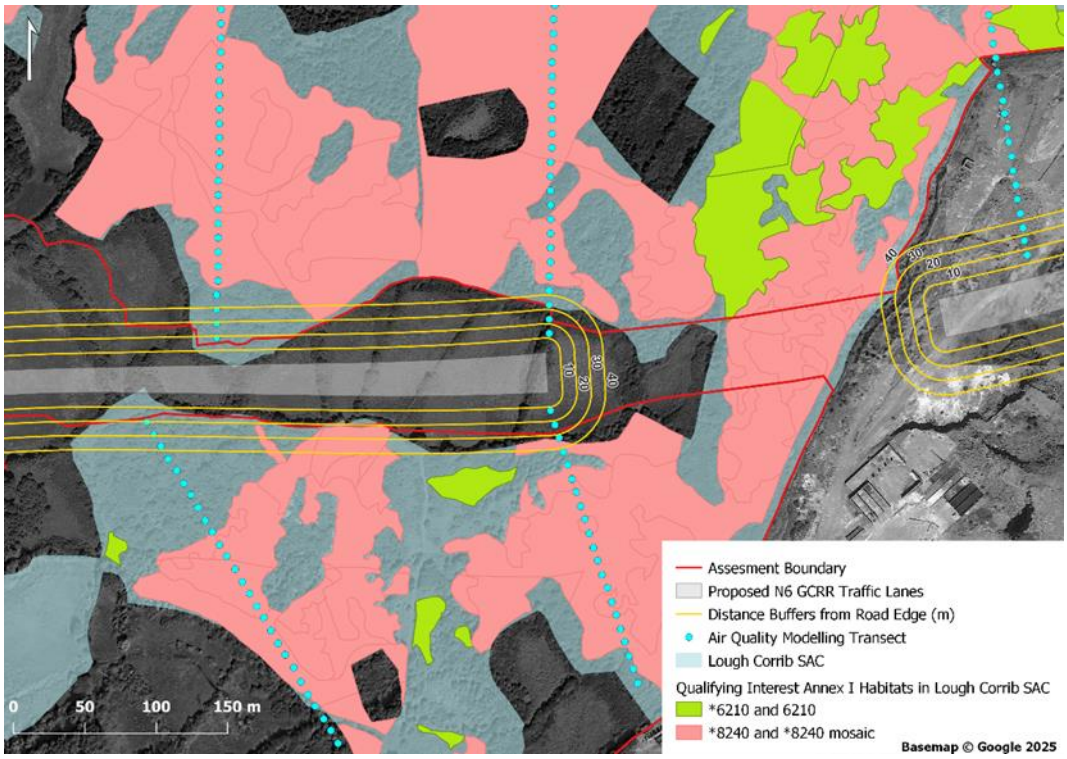


Plate 9.4 Distances from the Road Edge to the QI Annex 1 habitat Receptor Site at the Lackagh Tunnel and Lackagh Quarry

Dust

Dust emissions associated with construction works could, in extreme circumstances, affect adjoining habitats (potentially burying sensitive habitats or plant species). Best practice construction methodologies (e.g. watering of the construction site/access roads and road cleaning) and mitigation measures (dust screens during construction – see Section 10.6) are required to minimise construction generated dust and to contain it within the Assessment Boundary.

Overall

As the Project crosses Lough Corrib SAC at the River Corrib, the elevation of the bridge structure and embankment will result in good dispersion of traffic generated pollution. The design of bridge structure itself includes barriers (c.2m in height) which will serve to contain the majority of pollutants. Considering the above, and the low levels of pollutants predicted during operation of the Project, the Project will not have an effect on any QI Annex I habitats – the closest of which is located c.150m from the Project, beyond the ZoI of any air quality impacts.

Where the Project overlaps with, or lies immediately adjacent to, Lough Corrib SAC between Ch. 9+850 and Ch. 10+900, there are QI Annex I habitats in closer proximity – for example, an area of Limestone pavement and Calcareous grassland c.15m from the road carriageway at Menlough (outside the Lough Corrib SAC boundary). As with the River Corrib crossing, the Project is elevated in this area (dispersing pollutants), low levels of pollutants are predicted during operation, and the ZoI of those pollutants does not extend to include habitats within Lough Corrib SAC, except over a marginal area of wooded Limestone pavement [*8240] habitat near Coolagh Lakes. As clarified above, there will not be any adverse effects that will compromise the conservation objectives of any QI Annex I habitats in Lough Corrib SAC.

From Ch. 10+900 to the western portal of the Lackagh Tunnel the Project is in cutting; the sides of which will act as a barrier to contain traffic generated pollutants. The same applies in Lackagh Quarry, where the road carriageway is surrounded by the quarry walls up to 40m in height. Where the Project tunnels beneath Lough Corrib SAC, emissions generated here will not be physically able to interact with habitat areas above.

However, during construction, mitigation is required to contain dust emissions and avoid any impacts to QI habitats or species within Lough Corrib SAC (see Section 10.6).

Summary

During construction, the Project will generate dust which could affect vegetation within Lough Corrib SAC where the Project lies within or in close proximity to this European site. Mitigation measures are required to contain dust emissions during construction (see Section 10.6).

During operation, impacts on vegetation within Lough Corrib SAC as a consequence of the design of the Project (either on embankment, in cutting, or underground) are not predicted due to the low levels of pollutants predicted, and their restricted ZoI. On the single occasion where overlap with the ZoI has been noted it is marginal and will not adversely impact the habitat so as to affect the conservation objectives of the Annex I habitats.

A summary of the potential air quality impacts associated with the Project are presented in Table 9.7 below.

Table 9.7 Summary of Air Quality Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction		
Dust generated during construction works within, or in close proximity to, Lough Corrib SAC affecting the extent, diversity or structure of habitats within Lough Corrib SAC in the vicinity of the Project	Yes As dust deposition could affect the extent, diversity or structure of habitats within Lough Corrib SAC	Yes To ensure that dust generated during construction does not impact upon the QI habitats or species of Lough Corrib SAC (as outlined in Section 10.6)
Operation		
A reduction in air quality during operation affecting the extent, diversity or structure of habitats within Lough Corrib SAC in the vicinity of the Project	No As potential air quality effects associated with the Project are not predicted to affect the extent, diversity or structure of any QI Annex I habitats within Lough Corrib SAC	No

9.1.4.6 Habitat degradation – shading

As per the 2018 NIS, there are two locations where the Project has the potential to cause some level of shading to habitats within Lough Corrib SAC (refer to Figures 15.1 to 15.5 and Figures 16.1 to 16.5 and 17.1 to 17.5 and Figures 18.1 to 18.5 and for design and habitat information at these locations):

- At the site of the proposed River Corrib Bridge where the elevated structure passes over habitats within the SAC (Ch. 9+400 – Ch. 9+500 of the proposed N6 GCRR), including Annex I habitat, Vegetation of flowing waters [3260]
- A section of raised embankment (Ch. 9+500 – Ch. 9+600 of the proposed N6 GCRR) on its eastern approach, where a section of raised embankment/retaining wall and viaduct run adjacent to the SAC boundary between Ch. 9+850 and Ch. 10+150 of the proposed N6 GCRR)

Bunce *et al.* (1999), presents Ellenberg indicator values[54] for British and Irish vascular plant species – these are values which indicate the environmental conditions that would be expected if a given plant species is present (e.g. light or shade loving species, indicator of dry/wet conditions). The majority of the plant species found in open grassland habitats have values of seven or eight on the light indicator scale. Values of eight indicate "a light loving plant rarely found where relative illumination in summer is less than 40%" and values of 7 indicate "plant generally in well-lit places, but also occurring in partial shade". Therefore, it is reasonable to conclude that any significant reduction in light levels as a result of shading from a bridge/viaduct deck could affect a habitat which is made up of species with Ellenberg indicator values of 7 or higher in an adverse way.

Broome *et al.* (2005) carried out research as to the effects of shading from bridge structures on estuarine marsh vegetation in North Carolina, U.S.A[55]. The results of this study found a significant correlation between light levels under bridges and the height to width ratio (HW ratio) of the structure, and concluded that those bridges with a HW ratio of <0.5 significantly affected plant growth and productivity underneath. HW ratios of between 0.5 and 0.68 resulted in measurable effects but with a reduced significance. Complete loss of vegetation was noted at a single bridge with a HW ratio of 0.28.

The River Corrib bridge will have a HW ratio of between 0.52 and 0.69 where it crosses Lough Corrib SAC at the River Corrib (height of between 13 and 15m and deck width of between approximately 21m to 25m).

Placing an elevated bridge structure over grassland habitat would also result in drying out of the area due to a reduction in direct precipitation; this would also be expected to affect vegetation growth and influence species composition.

As per the 2018 NIS, a shading analysis study has been carried out to model how the proposed N6 GCRR will affect ambient light levels in the vicinity of Lough Corrib SAC – this report is presented in Appendix P. This analysis was reviewed to ensure consistency with current literature for this updated NIS. A series of computer simulations have been carried out in order to calculate the effect of the proposed N6 GCRR on solar exposure for adjacent lands within Lough Corrib SAC.

The computer simulations are based on a 3d design of the proposed N6 GCRR. The sunlight exposure is calculated by ray tracing simulations and the software used is Radiance. Points on the ground can either receive, or not, direct sunlight. The cumulative number of hours that a point can see direct sunlight is used as the measure of solar exposure. Solar exposure has been calculated for equinoxes and solstices. The latitude and longitude used to determine the solar geometry are: 53.3°N and 9°W. The information is presented on a sample series of diagrams in Appendix P that show the distribution of solar exposure on the ground. The colour scale indicates the number of hours that sunlight is received at a given point, throughout the day

[54] Ellenberg values are derived from data on a restricted range of habitats (and may not hold true over a species' full range) and are only intended to give an indication of the environmental conditions present, on what is an arbitrary scale

[55] There are a number of factors and limitations to consider in interpreting the findings of the North Carolina (NC) study with regard to the impacts of a bridge over the Lough Corrib SAC: the NC study assessed the impacts on estuarine wetlands, a very different habitat type to the habitats in question at the River Corrib; due to the significant difference in latitude between both locations (in the region of 18°) the effects of shading would be expected to be different; and, the small sample size of the NC study. However, based on the evidence put forward in that study, and adopting the precautionary principle, it is considered that the conclusions reached in this report in relation to the potential shading impacts of the proposed River Corrib Bridge are reasonable.

considered. It is also possible to trace the effect of shadowing throughout the year from this sequence of sketches.

The results of the shading study carried out found that the effect on daylight is localised with the projected shadow of the proposed N6 GCRR reducing the ambient light levels beneath and near the structure (see Figures 10, 11, 12 and 14 in Appendix P). Background light levels are reached within 20m of the River Corrib Bridge (Figure 12 and 7 of Appendix P) in summer and within 120m in winter (Figure 18 in Appendix P). The area beyond 20m from the edge of the proposed River Corrib Bridge in summer is unaffected by the proposed N6 GCRR. During winter months the zone of effects extends to 120m due to low sun angles, but only on the northern/upstream side of the proposed River Corrib Bridge (maximum extent of shadow upstream is almost aligned with Menlo Castle).

No shading effects are predicted to be associated with the adjoining embankment section and the western end of the Menlough Viaduct from Ch. 9+500 to Ch. 10+150 of the proposed N6 GCRR.

Aquatic vegetation within the River Corrib between Lough Corrib and Bridge Street, Galway City is described in Section 9.1.2.1 and in Section 9.1.2.1.1. The species composition is variable with no clear pattern or zonation. The most frequent and consistently recorded species were *Elodea canadensis*, *Lemna trisulca*, *Myriophyllum spicatum*, *Chara virgata*, *Ceratophyllum demersum*, *Utricularia vulgaris* agg. and *Potamogeton perfoliatus*. The six sample points from 2023 surveys that are at and closest to the proposed River Corrib Bridge are described in Appendix N (sample points 503, 504, 505, 506, 549, 550). At these sample points, a total of six submerged aquatic plant species associated with Vegetation of flowing waters [3260] habitat were recorded (*Ceratophyllum demersum*, *Elodea canadensis*, *Lemna trisulca*, *Myriophyllum spicatum*, *Potamogeton perfoliatus*, *Utricularia vulgaris* agg.). Of these, most were given low abundance scores (i.e. ranked rare to occasional, as opposed to frequent or abundant to dominant) with only two species given the slightly higher frequent score (*Myriophyllum spicatum* at sample point 503 and *Potamogeton perfoliatus* at sample point 505). Of the six species recorded present in these six sample points, all are also amongst those most frequently and consistently recorded during 2023 and were present at between one quarter and one half of all 130 sample stations taken between Lough Corrib and Bridge Street, Galway City.

The light indicator scale Ellenberg values for the six submerged aquatic plant species recorded at these six sample stations and which are associated with Vegetation of flowing waters [3260] habitat, range from 5 to 8 as follows: *Myriophyllum spicatum* (5), *Ceratophyllum demersum* and *Potamogeton perfoliatus* (6), *Elodea canadensis* and *Lemna trisulca* (7) and *Utricularia vulgaris* agg. (8)[56].

With light indicator scale Ellenberg values between 5 and 8 (requiring partially and well-lit conditions), these submerged aquatic plant species (which are associated with Vegetation of flowing waters [3260] habitat), recorded at the six sample stations at and near to the proposed River Corrib Bridge, may experience shading effects under the bridge structure, and within 20m of it in summer (the main growing/flowering season) and within 120m upstream of it in winter. Only one of these six species has an Ellenberg value for light that puts it in the 'light-loving' category with a lower tolerance for shade, however even it can tolerate some levels of shading.

As noted above, complete vegetation and habitat loss is not anticipated for a bridge structure with a HW ratio of between 0.52 and 0.69, and with the level of daylight and shading effects predicted to occur beneath and near the structure (with background light levels reached within 20m in summer, and within 120m in winter on the upstream side). However there is likely to be some effect on plant growth and productivity both beneath the bridge and within the 20m-120m zone of shading effects.

Of the nine attributes and targets set out in the SSCOs for the QI Annex I habitat within the Lough Corrib SAC, four are relevant to the potential effects from shading of the proposed N6 GCRR as discussed in Table 9.8 below.

[56] The light indicator scale Ellenberg values from 5 to 8 are defined as follows (as per Bunce, 1999):
5 - Semi-shade plant, rarely in full light, but generally with more than 10% relative illumination when trees are in leaf (Carex pendula, Hyacinthoides non-scripta, Primula vulgaris)
6 - Between 5 and 7
7 - Plant generally in well-lit places, but also occurring in partial shade
8 - Light-loving plant rarely found where relative illumination in summer is less than 40%

Table 9.8 Attributes and targets from the SSCO (NPWS, 2017a) for QI habitat 3260 for Lough Corrib SAC that are relevant to shading impacts

To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in Lough Corrib SAC, which is defined by the following list of attributes and targets:			
Attribute	**Measure**	**Target Notes**	**Assessment of effects**
Habitat Area	Kilometres	Area stable or increasing, subject to natural processes	Complete habitat or vegetation loss will not occur at or near the River Corrib Bridge crossing location, therefore the overall area of habitat within the Lough Corrib SAC will not be altered or reduced as a result of the Project. The natural state of the habitat at this location does not depend on total cover within the river channel, evidenced by the survey results which report the natural state of aquatic vegetation cover along this stretch of the river as patchy. To further support this conclusion Appendix N indicates the habitat unit along the entire length of the sampled river, including continuity along the east bank under the existing N6 bridge and under the various bridges of the waterways around Galway Cathedral.
Habitat Distribution	Occurrence	No decline, subject to natural processes	Complete habitat or vegetation loss will not occur at or near the River Corrib Bridge crossing location, therefore the habitat distribution of this habitat within the Lough Corrib SAC will not be altered or reduced as a result of the Project. Appendix N indicates the habitat distribution along the entire length of the sampled river constitutes more expansive patches to intermittent patches, indicating that the habitat distribution is already varied within the River Corrib. The natural state of the habitat at this location therefore does not depend on total cover and distribution within the river channel to persist. Furthermore, the intermittent and more continuous habitat was mapped under the existing N6 bridge and under the various bridges of the waterways around Galway Cathedral, indicting tolerance to shading in terms of the distribution of the habitat.
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	Of the six species recorded present in the six sample points at and near the proposed river crossing point, all are also amongst those most frequently and consistently recorded during 2023 and were present at between one quarter and one half of all 130 sample stations taken between Lough Corrib and Galway City. Any effect on plant growth and productivity both beneath the bridge due to reduced daylight and a 20m-120m zone of shading effects, which might alter vegetation composition or condition, will not affect the overall occurrence of this habitat within the overall Lough Corrib SAC. The maximum 120m zone of shading (which is in fact only 20m during the summer growing/flowering season) is a very small proportion (less than 10%) of the overall 4km extent of the habitat between Lough Corrib and Galway City. Any effects of shading on vegetation at and adjacent to the bridge crossing point, will not affect the maintenance or the occurrence or condition of the typical species of this habitat type within this Lough Corrib SAC which are commonly occurring throughout the 4km stretch of River Corrib between Lough Corrib and Galway City, despite the presence of the existing N6 bridge and the various

To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in Lough Corrib SAC, which is defined by the following list of attributes and targets:			
			bridges of the waterways around Galway Cathedral (Appendix N).
Riparian habitat: area	Hectares	Maintain the area and condition of fringing habitats necessary to support the habitat and its sub-types	There are no fringing habitats supporting this QI habitat at or adjacent to the proposed River Corrib crossing point, nor within the maximum 20m (summer) to 120m (winter on the upstream side) zone of daylight and shading effects. The raw aquatic survey data indicates the following at the six nearest sample points: trees and willows overhanging the banks, patches of Phragmites and Schoenoplectus swamp patch, stone shelf in the shallower waters, boulders, no in-stream vegetation in deeper water. The persistence of the habitat unit along the entire length of the river, even along canalised lengths of river with no fringing vegetation (downstream of Salmon Weir, Friars River and Middle River), indicates that the community mapped within the River Corrib is resilient to lack of riparian habitat.

Separately to the 3260 habitat itself, the terrestrial and fringing habitats within Lough Corrib SAC that are affected by shading from the proposed N6 GCRR are not QI habitats. The shading effects predicted will be minor and localised and will furthermore not have any direct or indirect impact upon the conservation objectives supporting the QI species (Otter, Atlantic salmon, Brook lamprey and Sea lamprey); i.e. would not compromise any habitat or habitat used by these species within Lough Corrib SAC.

Therefore as per the 2018 NIS, any habitat degradation that may occur as a result of shading will not affect the conservation objective attributes and targets supporting the conservation condition of the QI species of Lough Corrib SAC (see Table 9.13).

Summary

A summary of the potential shading impacts associated with the Project are presented in Table 9.9 below

Table 9.9 Summary of Shading Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction/Operation		
A reduction in sunlight and direct precipitation affecting the vegetation composition and structure of habitats within Lough Corrib SAC beneath or adjacent to elevated structures/embankment: River Corrib Bridge Embankment from Ch. 9+850 to Ch. 10+100 of the proposed N6 GCRR	No Shading impacts from the proposed bridge will not impact the attributes and targets of QI Annex I habitats or habitats supporting QI Annex I habitats and therefore there are no impacts to the conservation objectives of the Lough Corrib SAC.	No

9.1.4.7 Habitat degradation – non-native invasive species

Non-native invasive plant species have been recorded along, or in close proximity to the Project[57] (see Section 5.6). Therefore, construction works have the potential to accidentally cause their introduction/spread to habitat areas within Lough Corrib SAC as per the 2018 NIS. This has the potential to have long-term effects on plant species composition, diversity and abundance in affected habitats.

[57] Non-native invasive aquatic plant species (or fauna species) were not recorded in aquatic habitats impacted by construction works.

Given the presence of non-native invasive plant species cover in the immediate vicinity of the Project, there is the potential that these species will recolonise vegetated areas within the Assessment Boundary post-construction as per the 2018 NIS. As such, there is also a risk that routine maintenance works may inadvertently spread contaminated vegetation cuttings.

Summary
Introducing or spreading non-native invasive plant species to Lough Corrib SAC, during construction or operation, has the potential to affect the conservation objective attributes and targets supporting the conservation condition of its QI habitats (see Table 9.13).

A summary of the potential direct and indirect impacts associated with non-native invasive plant species is presented in Table 9.10.

Table 9.10 Summary of Non-native Invasive Species Impacts

Potential Direct and Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction/Operation		
Introducing or spreading non-native invasive species to habitats within Lough Corrib SAC	Yes Introducing/spreading non-native invasive plant species could affect the distribution, extent, diversity and area of QI habitats or habitat areas supporting QI species	Yes To ensure that non-native invasive plant species are not spread within, or introduced to, habitat areas within Lough Corrib SAC (as outlined in Section 10.8)

9.1.4.8 Mortality Risk
As detailed in the 2018 NIS, during construction of the proposed River Corrib Bridge, there is a risk of construction materials accidentally falling into the River Corrib and killing/injuring aquatic QI species of Lough Corrib SAC – Otter, Atlantic salmon, Brook lamprey and Sea lamprey. It is extremely unlikely that any such event would occur in the first place, and would result in any of the above species being killed or injured. Even if such an event were to occur, it is also extremely unlikely to affect more than a small number of individuals. Therefore, it is unlikely to have any effect on the populations of these QI species. Nevertheless, mitigation is required to remove this risk (see Section 10.11, and Appendix D).

The introduction of a new bridge structure over the River Corrib increases the risk of road traffic collisions with Otter. Given that the proposed River Corrib Bridge is an elevated structure through the river valley for a significant distance on each river bank (c.450m to the west and c.90m to the east) the risk is greatly reduced, and removed entirely in the vicinity of the River Corrib itself. There are also a small number of drainage channels and a stream (close to Ch. 9+950 of the proposed N6 GCCRR) which could potentially bring Otter into close proximity with the proposed N6 GCRR where it is on embankment, even though none of these are crossed by the proposed N6 GCRR. There are sections of retaining wall in this area over 2m in height which will prevent Otter gaining access to the proposed road carriageway. There are however some sections of embankment which will require the installation of mammal fencing to prevent Otter gaining access to the proposed road carriageway (National Roads Authority, 2008b).

Summary
As there is a risk of construction works and road traffic during operation posing a mortality risk to aquatic QI species of Lough Corrib SAC, the proposed N6 GCRR and as such the Project has the potential to affect the conservation objective attributes and targets supporting the conservation condition of Otter, Atlantic salmon, Brook lamprey or Sea lamprey in Lough Corrib SAC (see Table 9.13).

A summary of the potential impacts associated with the mortality risk posed by the Project is presented in Table 9.11.

Table 9.11 Summary of Mortality Risk Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction		
Accidentally dropping construction materials into the River Corrib during construction of the proposed River Corrib Bridge could result in the mortality of aquatic QI species: Otter Atlantic salmon Sea lamprey Brook lamprey	Yes Mortality of QI species could affect populations numbers – although given the low risk and temporary nature of works above the river, this is unlikely to result in any long-term population level effects	Yes To ensure that construction materials are contained within the works area (as outlined in Section 10.10.1)
Operation		
Mortality/road traffic collision risk to Otter	Yes Operation of the Project present a permanent risk of Otter mortality due to road traffic collisions and could have long-term effects on the Otter population of Lough Corrib SAC	Yes To ensure that Otter cannot gain access to the road carriageway (as outlined in Section 10.11.2)

9.1.4.9 Freshwater pearl mussel

There are no Freshwater pearl mussel populations within the ZoI of the Project; the QI population in Lough Corrib SAC is associated with the Owenriff River, c.23km to the north. The glochidial larval stage of the Freshwater pearl mussel's life-cycle relies upon salmonid fish as a host species. As a result, it is important to maintain a sufficient juvenile salmonid population to maintain the Freshwater pearl mussel population. Therefore, the Project could affect the conservation objectives of this species in Lough Corrib SAC if it were to affect salmonid fish species populations in the River Corrib catchment.

However, the proposed N6 GCRR has the potential to affect the conservation condition of Atlantic salmon in Lough Corrib SAC (and therefore, also the potential to affect any other salmonid fish populations in the catchment) via any of the potential impacts: habitat loss, habitat degradation affecting water quality, disturbance/displacement effects, barrier effect, or mortality risk. Therefore, the proposed N6 GCRR and as such the Project has the potential to affect the conservation objective attributes and targets supporting the conservation condition of the Freshwater pearl mussel in Lough Corrib SAC (see Table 9.13).

9.1.4.10 Summary

This section presents a summary of the potential impacts on the QIs of Lough Corrib SAC as a result of the Project and how these impacts relate to affecting the site's conservation objectives.

Table 9.12 below, lists the QIs of Lough Corrib SAC (NPWS 2017a) and how the impacts discussed below relate to each. Those highlighted in green are those QIs which are present within the ZoI of the Project.

Table 9.12 Qualifying Interests of Lough Corrib SAC and Potential Impacts

Qualifying Interests	Impact
Annex I Habitats	
[3110] Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	No potential impact – not present within the ZoI
[3130] Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	No potential impact – not present within the ZoI

Qualifying Interests	Impact
[3140] Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	Habitat degradation – hydrogeology Habitat degradation – hydrology
[3260] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (or Vegetation of flowing waters)	Habitat degradation – hydrogeology Habitat degradation – hydrology
[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia) (*important orchid sites)	Habitat loss Habitat degradation – tunnelling/excavation Habitat degradation – air quality Habitat degradation – non-native invasive species
[6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	Habitat degradation – hydrogeology Habitat degradation – hydrology Habitat degradation – non-native invasive species
[7110] Active raised bogs *	No potential impact – not present within the ZoI
[7120] Degraded raised bogs still capable of natural regeneration	No potential impact – not present within the ZoI
[7150] Depressions on peat substrates of the Rhynchosporion	No potential impact – not present within the ZoI
[7210] Calcareous fens with Cladium mariscus and species of the Caricion davallianae *	Habitat degradation – hydrogeology Habitat degradation – hydrology Habitat degradation – non-native invasive species
[7220] Petrifying springs with tufa formation (Cratoneurion) *	No potential impact – not present within the ZoI
[7230] Alkaline fens	Habitat degradation – hydrogeology Habitat degradation – hydrology Habitat degradation – non-native invasive species
[8240] Limestone pavements *	Habitat loss Habitat degradation – tunnelling/excavation Habitat degradation – air quality Habitat degradation – non-native invasive species
[91A0] Old sessile oak woods with Ilex and Blechnum in the British Isles	No potential impact – not present within the ZoI
[91D0] Bog woodland *	No potential impact – not present within the ZoI
Annex II Species	
[1029] Freshwater Pearl Mussel - Margaritifera margaritifera	None recorded within watercourses affected by the Project, however impacts to salmonid fish species could indirectly affect the Freshwater pearl mussel – see Atlantic salmon below for impacts
[1092] White-clawed Crayfish - Austropotamobius pallipes	No potential impact – not present within the ZoI
[1095] Sea Lamprey - Petromyzon marinus	Habitat degradation – hydrology Mortality risk
[1096] Brook Lamprey - Lampetra planeri	Habitat degradation – hydrology

Qualifying Interests	Impact
	Mortality risk
[1106] Atlantic Salmon - Salmo salar (only in fresh water)	Habitat degradation – hydrology Mortality risk
[1303] Lesser Horseshoe Bat - Rhinolophus hipposideros	No potential impact – QI population not present within the ZoI (Section 9.1.2.5)
[1355] Otter - Lutra lutra	Habitat degradation – hydrology Mortality risk
[1393] Slender green feather-moss (Varnished hook-moss) - Drepanocladus (Hamatocaulis) vernicosus	No potential impact – not present within the ZoI
[1833] Slender naiad - Najas flexilis	No potential impact – not present within the ZoI

The relationship between, and potential influence of, these impacts with respect to the QI habitat and species within the ZoI of the Project and the attributes/targets upon which their favourable conservation condition is considered and measured is considered further below and also presented Table 9.13.

[3140] Hard oligo - mesotrophic waters with benthic vegetation of Chara spp.
Affecting water quality in the Coolagh Lakes and/or affecting the functioning or quality of the existing hydrogeological regime during construction (even though the risk of any perceptible effect is low) could affect the Annex I status of the lake thereby reducing habitat area and the distribution of this habitat type within Lough Corrib SAC. These impacts could also affect the type, abundance and distribution of the typical species supported by the lakes, the vegetation composition and distribution, the area and condition of the fringing aquatic vegetation, lake substratum quality and water chemistry.

[3260] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho - Batrachion vegetation (or Vegetation of flowing waters)
Affecting water quality in the River Corrib catchment during construction (even though the risk of any perceptible effect is low) could affect the aquatic environment supporting the Vegetation of flowing waters, and could have a long-term effect on the European sites' conservation objectives regarding the QI Annex I habitat.

[6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae), [7210] Calcareous fens with Cladium mariscus and species of the Caricion davallianae * and [7230] Alkaline fens
Affecting water quality in the receiving environment and/or affecting the functioning or quality of the existing hydrogeological regime could affect ecosystem functioning and the condition of areas of these habitat types such that their area and distribution is reduced within Lough Corrib SAC. These impacts could also affect the vegetation composition and structure and the abundance and distribution of typical and locally distinctive species associated with QI habitats.

Introducing/spreading non-native invasive plant species could locally affect the extent, diversity, and vegetation composition or structure of habitats within Lough Corrib SAC.

[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia) (*important orchid sites) and [8240] Limestone pavements *
Construction of the Lackagh Tunnel could affect the structural integrity[58] of the rock mass supporting the habitats above within Lough Corrib SAC, and result in damage to, or loss of, the QI Annex I habitats Limestone pavement and Calcareous grassland habitat area. With respect to these QI habitats and their conservation objectives, habitat loss could affect the habitat area of Calcareous grassland and Limestone

[58] Structural Integrity of the mosaic of Limestone pavement and Calcareous grassland is the physical and mechanical geotechnical properties that control the behaviour of the geotechnical Limestone pavement environment

pavement within Lough Corrib SAC, and could also affect the distribution of these habitat types within the European site.

Within Lough Corrib SAC there are areas of the QI habitats Limestone pavement [*8240] and Calcareous grassland [6210] that lie within the Assessment Boundary yet outside of the footprint of the proposed N6 GCRR which could be directly impacted, if not protected from construction works. With respect to these QI habitats and their conservation objectives, habitat loss could affect the habitat area of Calcareous grassland and Limestone pavement within Lough Corrib SAC, and could also affect the distribution of these habitat types within the European site.

Dust deposition arising from construction activities could locally affect the extent, diversity, and vegetation composition or structure of these habitats within Lough Corrib SAC, where they are present in the vicinity of the Project.

Introducing/spreading non-native invasive plant species could locally affect the extent, diversity, and vegetation composition or structure of these habitats within Lough Corrib SAC.

[1095] Sea Lamprey
Affecting water quality in the River Corrib catchment during construction (even though the risk of any perceptible effect is low) could affect the quality, extent and availability of any spawning or juvenile habitat present downstream of the Project which could have a long-term effect on the European sites' Sea lamprey population. Constructing a bridge over the River Corrib poses a mortality risk to fish species beneath the structure which, in a worst case scenario, could also have a population level effect.

[1096] Brook Lamprey
Affecting water quality in the River Corrib catchment during construction (even though the risk of any perceptible effect is low) could affect the quality, extent and availability of any juvenile habitat present downstream of the Project which could have a long-term effect on the European sites' Brook lamprey population. Constructing a bridge over the River Corrib poses a mortality risk to fish species beneath the structure which, in a worst case scenario, could also have a population level effect.

[1106] Atlantic Salmon
Affecting water quality in the River Corrib catchment during construction (even though the risk of any perceptible effect is low) could affect fish numbers, particularly so where the impact to occur during the adult/smolt migration periods, and could have a long-term effect on the European sites' Atlantic salmon population. Constructing a bridge over the River Corrib poses a mortality risk to fish species beneath the structure which, in a worst case scenario, could also have a population level effect.

[1029] Freshwater Pearl Mussel
As discussed above for Atlantic salmon, affecting water quality in the River Corrib catchment during construction (even though the risk of any perceptible effect is low) and/or the mortality risk associated with bridge construction works over the River Corrib, could affect salmonid fish numbers. This in turn could also affect recruitment in the Freshwater pearl mussel populations upstream as salmonid fish are a host species for the glochidial larval stage of the Freshwater pearl mussel's life cycle. Therefore, affecting salmonid fish numbers could have a long-term effect on the European sites' Freshwater pearl mussel population.

[1355] Otter
Reducing water quality in the River Corrib catchment during construction (even though the risk of any perceptible effect is low) could affect the quality and availability of breeding/resting sites downstream in Lough Corrib SAC and affect fish numbers locally. This impact could have a long-term effect on the European sites' Otter population.

The mortality risk posed by the Project could have a long term effect on Otter numbers and distribution within Lough Corrib SAC. Constructing a bridge over the River Corrib poses a mortality risk to Otter beneath the structure which, in a worst case scenario, could also have a population level effect.

Table 9.13 Potential Impacts on the Conservation Objectives of Lough Corrib SAC (Those rows highlighted in green are the attributes potentially affected by the Project)

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
[3140] Hard oligo - mesotrophic waters with benthic vegetation of Chara spp. To restore the favourable conservation condition of Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. in Lough Corrib SAC, which is defined by the following list of attributes and targets:			
Habitat area - Hectares	Area stable or increasing, subject to natural processes	Over the long-term, affecting surface water quality, groundwater quality or reducing groundwater supply to the Coolagh Lakes could affect the Annex I status of the lakes, affecting the area of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Habitat distribution - Occurrence	No decline, subject to natural processes.	Over the long-term, affecting surface water quality, groundwater quality or reducing groundwater supply to the Coolagh Lakes could affect the Annex I status of the lakes, affecting distribution of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Typical species - Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	Over the long-term, affecting surface water quality, groundwater quality or reducing groundwater supply to the Coolagh Lakes could affect the type, abundance and distribution of the typical species supported by the lakes	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: characteristic zonation – Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Over the long-term, affecting surface water quality, groundwater quality or reducing groundwater supply to the Coolagh Lakes could affect the vegetation zonation, distribution and condition associated with the lakes	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation distribution: maximum depth – Metres	Restore maximum depth of vegetation, subject to natural processes	Affecting groundwater supply to the Coolagh Lakes could reduce water levels and hence the depth and vegetation profiles	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Hydrological regime: water level fluctuations – Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Reducing groundwater supply to the Coolagh Lakes would affect the natural hydrogeological regime required to support the habitat in its current state	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Lake substratum quality – Various	Restore appropriate substratum type, extent and chemistry to support the vegetation	Affecting surface water quality or groundwater quality could affect substratum chemistry and quality Affecting groundwater supply could affect the depth profile of the lakes and hence the substratum extent – reducing lake substratum quality	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Water quality: transparency – Metres	Restore appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Affecting surface water quality, groundwater quality or reducing groundwater supply to the Coolagh Lakes would not directly affect water transparency values However, reducing groundwater supply could affect water levels and hence indirectly affect water transparency through increasing the concentrations of suspended solids/sediments in the water column	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Water quality: nutrients – µg/l P or mg/l N	Restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	Affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes would not directly affect nutrient levels However, reducing groundwater supply could affect water levels and hence indirectly lead to increased concentrations of nutrients in the lakes	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Water quality: phytoplankton biomass – µg/l Chlorophyll a	Maintain appropriate water quality to support the habitat, including high chlorophyll a status	Affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes would not directly affect nutrient levels However, reducing groundwater supply could affect water levels and hence indirectly lead to increased concentrations of nutrients in the lakes	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Water quality: phytoplankton composition – EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	Affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes would not directly affect nutrient levels However, reducing groundwater supply could affect water levels and hence indirectly lead to increased concentrations of nutrients in the lakes	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Water quality: attached algal biomass – Algal cover and EPA phytobenthos metric	Restore/maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes would not directly affect nutrient levels However, reducing groundwater supply could affect water levels and hence indirectly lead to increased concentrations of nutrients in the lakes	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Water quality: macrophyte status – EPA macrophyte metric (The Free Index)	Restore high macrophyte status	Affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes would not directly affect nutrient levels However, reducing groundwater supply could affect water levels and hence indirectly lead to increased concentrations of nutrients in the lakes	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Acidification status – pH units, mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Affecting surface water quality, groundwater quality or reducing groundwater supply to the Coolagh Lakes would not directly affect nutrient levels However, reducing groundwater supply could affect water levels and hence indirectly lead to increased concentrations of nutrients in the lakes - eutrophication can lead to at least temporary increases in pH to toxic levels (>9/9.5)	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Water colour - mg/l PtCo	Restore/maintain appropriate water colour to support the habitat	No Affecting groundwater quality or groundwater supply to the Coolagh Lakes would not affect water colour in the Coolagh Lakes	No
Dissolved organic carbon (DOC) – mg/l	Restore/maintain appropriate organic carbon levels to support the habitat	Affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes would not directly affect nutrient levels However, reducing groundwater supply could affect water levels and hence indirectly lead to increased DOC concentrations in the lakes	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Turbidity - nephelometric turbidity units/ mg/l SS/ other appropriate unit	Restore/maintain appropriate turbidity to support the habitat	No Affecting groundwater quality or groundwater supply to the Coolagh Lakes would not affect turbidity levels in the Coolagh Lakes	No
Fringing habitat: area and condition – Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3140	Over the long-term, affecting surface water quality, groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce the area and condition of fringing habitats	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
[3260] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho - Batrachion vegetation (or Vegetation of flowing waters) To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in Lough Corrib SAC, which is defined by the following list of attributes and targets:			

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Habitat area – Kilometres	Area stable or increasing, subject to natural processes	Over the long-term, affecting surface water quality or groundwater quality feeding into the River Corrib could affect the Annex I status of the water course habitat, affecting the length of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Habitat Distribution – Occurrence	No decline, subject to natural processes	Over the long-term, affecting surface water quality or groundwater quality feeding into the River Corrib could affect the Annex I status of the water course habitat, affecting the distribution of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Hydrological regime: river flow – Metres per second	Maintain appropriate hydrological regimes	No Surface water quantity will not be impacted by the Project, nor will the river channel characteristics.	No
Hydrological regime: groundwater discharge – Metres per second	Maintain appropriate hydrological regimes	No River Corrib is largely dependent on rainfall for its hydrological regime	No
Substratum composition: particle size range – Millimetres	Maintain appropriate substratum particle size range, quantity and quality, subject to natural process	Affecting surface water quality or groundwater quality could affect substratum chemistry and quality	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Water quality – Various	Maintain appropriate water quality to support the natural structure and functioning of the habitat	Affecting surface water quality or groundwater quality could affect overall quality of the River Corrib	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: typical species - Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	Over the long-term, affecting surface water quality or groundwater quality feeding into the River Corrib could affect the vegetation composition	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Floodplain connectivity: area – Hectares	The area of active floodplain at and upstream of the habitat should be maintained	No The Project will not alter the river channel characteristics at any point along the length of the River Corrib.	No
Riparian habitat: area – Hectares	Maintain the area and condition of fringing habitats necessary to support the habitat and its sub-types	Over the long-term, affecting surface water quality or groundwater quality feeding into the River Corrib could affect the fringing vegetation composition	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
[6210] Semi - natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia) (*important orchid sites) To maintain the favourable conservation condition of Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) in Lough Corrib SAC in owing list of attributes and targets:			

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Habitat area - Hectares	Area stable or increasing, subject to natural processes	There are areas of Calcareous grassland [6210] in Lough Corrib SAC that lie within the Assessment Boundary yet are not directly beneath the footprint of the proposed N6 GCRR. Construction works could result in the loss of areas of Calcareous grassland habitat. Restricting grazing from calcareous grassland habitat above the proposed Lackagh Tunnel could result in habitat area loss through scrub encroachment. The proposed Lackagh Tunnel has been designed to avoid any impacts to the structural integrity of the rock mass support to Limestone pavement and Calcareous grasslands habitat above it in Lough Corrib SAC – however the tunnel must be constructed as detailed in Appendix F for impacts to be avoided. Dust emissions during construction could result in the loss of Calcareous grassland habitat within Lough Corrib SAC, and a reduction in habitat distribution locally, where present adjacent to the construction works between Ch. 9+850 to Ch. 10+100. Introducing/spreading non-native invasive plant species to Lough Corrib SAC could result in the loss of areas of Calcareous grassland habitat and potentially affect habitat distribution	Retain areas of QI Annex I habitat within Lough Corrib SAC and within the Assessment Boundary, and avoid vegetation change or scrub encroachment by not restricting grazing access. Section 10.2 (Figures 17.1 to 17.5 and Figures 18.1 to 18.5) Monitoring that sufficient rock stability measures are installed to protect structural integrity of the rock mass Section 10.3 Measures to contain dust emissions during construction Section 10.6 Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Habitat distribution - Occurrence	No decline, subject to natural processes.	As above for habitat area	As above for habitat area
Vegetation composition: typical species – Number at a representative number of monitoring stops	At least 7 positive indicator species present, including 2 "high quality" species	The potential impacts associated with the proposed Lackagh Tunnel, dust emissions and introducing/spreading non-native invasive plant species could affect the number of positive indicator species recorded locally within Limestone pavement and Calcareous grasslands habitat areas adjacent to the Project (as above under Habitat area). Restricting grazing from Calcareous grassland habitat above the proposed Lackagh Tunnel could affect the vegetation composition and result in scrub encroachment.	As above for habitat area

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: negative indicator species – Percentage at a representative number of monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%.	No The Project will not directly affect Calcareous grassland habitat within Lough Corrib SAC and therefore, will not affect negative indicator species cover on Calcareous grassland habitat (non-native species as per O'Neill et al., 2013)	No
Vegetation composition: non-native species – Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1%	Introducing or spreading non-native invasive plant species to habitat areas within Lough Corrib SAC would have the potential to negatively affect Calcareous grassland habitat areas in terms of vegetation composition	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation composition: woody species and bracken (Pteridium aquilinum) – Percentage at a representative number of monitoring stops	Cover of woody species (except certain listed species) and bracken (Pteridium aquilinum) not more than 5% cover	Although, the Project will not directly affect Calcareous grassland habitat within Lough Corrib SAC, restricting grazing from calcareous grassland habitat above the proposed Lackagh Tunnel could affect the vegetation structure and result in scrub encroachment.	Retain areas of QI Annex I habitat within Lough Corrib SAC and within the Assessment Boundary, and avoid vegetation change or scrub encroachment by not restricting grazing access Section 10.2 (Figures 17.1 to 17.5 and Figures 18.1 to 18.5)
Vegetation structure: broadleaf herb: grass ratio – Percentage at a representative number of monitoring stops	Broadleaf herb component of vegetation between 40% and 90%	Restricting grazing from calcareous grassland habitat above the proposed Lackagh Tunnel could affect the vegetation composition and result in scrub encroachment. The impacts associated with dust emissions and introducing/spreading non-native invasive plant species could affect the broadleaved herb to grass ratio of Calcareous grassland habitat areas adjacent to the Project (as above under Habitat area).	Retain areas of QI Annex I habitat within Lough Corrib SAC and within the Assessment Boundary, and avoid vegetation change or scrub encroachment by not restricting grazing access. Section 10.2 (Figures 17.1 to 17.5 and Figures 18.1 to 18.5) Measures to contain dust emissions during construction Section 10.6 Measures to control the introduction/ spread of non-native invasive plant species Section 10.8

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation structure: sward height – Percentage at a representative number of monitoring stops	At least 30% of sward between 5cm and 40cm tall	Restricting grazing from calcareous grassland habitat above the proposed Lackagh Tunnel could affect the vegetation composition and result in scrub encroachment. Introducing/spreading non-native invasive plant species to Lough Corrib SAC could affect the percentage of Calcareous grassland habitat at a suitable sward height.	Retain areas of QI Annex I habitat within Lough Corrib SAC and within the Assessment Boundary, and avoid vegetation change or scrub encroachment by not restricting grazing access. Section 10.2 (Figures 17.1 to 17.5 and Figures 18.1 to 18.5) Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation structure: litter – Percentage at a representative number of monitoring stops	Litter cover not more than 25%	No The Project will not directly affect Calcareous grassland habitat within Lough Corrib SAC and therefore, will not increase litter cover in Calcareous grassland habitat in Lough Corrib SAC	No
Physical structure: bare soil – Percentage at a representative number of monitoring stops	Not more than 10% bare soil	No The Project will not contribute to physical disturbance levels leading to any increase in bare ground in Calcareous grassland habitats in Lough Corrib SAC	No
Physical structure: disturbance – Square metres	Area showing signs of serious grazing or other disturbance less than 20m²	No The Project will not contribute to, or affect physical disturbance or increase grazing levels in Calcareous grassland habitats in Lough Corrib SAC	No
[6410] Molinia meadows on calcareous, peaty or clayey-silt laden soils (Molinion caeruleae) To maintain the favourable conservation condition of Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) in Lough Corrib SAC, which is defined by the following list of attributes and targets:			

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Habitat area - Hectares	Area stable or increasing, subject to natural processes	Over the long-term, reducing surface water quality or groundwater supply/quality to the Coolagh Lakes could reduce the area of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Habitat distribution - Occurrence	No decline, subject to natural processes	Over the long-term, reducing surface water quality or reducing groundwater supply to the Coolagh Lakes could reduce the area (and hence distribution) of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: typical species – Number at a representative number of monitoring stops	At least seven positive indicator species present, including one "high quality" species as listed in O'Neill et al. (2013)	Over the long-term, reducing surface water quality or reducing groundwater supply to the Coolagh Lakes could result in drying out of this habitat type here (and hence affect the species composition)	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: negative indicator species – Percentage at a representative number of monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%	No The Project will not directly affect Molinia meadow habitat within Lough Corrib SAC and therefore, will not affect negative indicator species cover on Molinia meadow habitat (non-native species as per O'Neill et al., 2013)	No

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: non-native species – Percentage at a representative number of monitoring stops	Non-native species cover not more than 1%	The Project will not directly affect Molinia meadow habitat within Lough Corrib SAC and therefore, will not affect negative indicator species cover on Molinia meadow habitat (non-native species as per O'Neill et al., 2013) However, non-native invasive plant species could also be considered separate to that list – and could have the potential to negatively affect Molinia meadow habitat areas	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation composition: moss species – Percentage at a representative number of monitoring stops	Hair mosses (Polytrichum spp.) not more than 25% cover	Over the long-term, reducing surface water quality or reducing groundwater supply to the Coolagh Lakes could result in drying out of this habitat type here (and hence affect the species composition and moss cover)	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation structure: woody species and bracken – Percentage at a representative number of monitoring stops	Cover of woody species and bracken (Pteridium aquilinum) not more than 5% cover	No The Project will not directly affect Molinia meadow habitat within Lough Corrib SAC and therefore, will not increase woody species or bracken cover in Molinia meadow habitat in Lough Corrib SAC	No
Vegetation structure: broadleaf herb: grass ratio – Percentage at a representative number of monitoring stops	Broadleaf herb component of vegetation between 40% and 90%	Over the long-term, reducing surface water quality or reducing groundwater supply to the Coolagh Lakes could result in drying out of this habitat type here (and hence affect the vegetation structure)	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation structure: sward height – Percentage at a representative number of monitoring stops	At least 30% of sward between 10cm and 80cm tall	Over the long-term, reducing surface water quality or reducing groundwater supply to the Coolagh Lakes could result in drying out of this habitat type here (and hence affect the vegetation structure)	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation structure: litter – Percentage at a representative number of monitoring stops	Litter cover not more than 25%	No The Project will not directly affect Calcareous grassland habitat within Lough Corrib SAC and therefore, will not increase litter cover in Calcareous grassland habitat in Lough Corrib SAC	No
Physical structure: bare soil – Percentage at a representative number of monitoring stops	Not more than 10% bare soil	No The Project will not contribute to physical disturbance levels leading to any increase in bare ground in Molinia meadow habitats in Lough Corrib SAC	No
Physical structure: disturbance – Square metres	Area showing signs of serious grazing or other disturbance less than 20m²	No The Project will not contribute to, or affect, physical disturbance or increase grazing levels in Calcareous grassland habitats in Lough Corrib SAC	No
[*7210] Calcareous fens with Cladium mariscus and species of the Caricion davallianae To maintain the favourable conservation condition of Calcareous fens with Cladium mariscus and species of the Caricion davallianae in Lough Corrib SAC, which is defined by the following list of attributes and targets:			
Habitat area - Hectares	Area stable or increasing, subject to natural processes	Over the long-term, reducing surface water quality in the River Corrib or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce the area of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Habitat distribution - Occurrence	No decline, subject to natural processes	Over the long-term, reducing surface water quality in the River Corrib or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce the area (and hence distribution) of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Ecosystem function: hydrology – Metres	Maintain appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Reducing groundwater supply to the Coolagh Lakes would affect the natural hydrogeological regime supporting any associated fen habitat	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Ecosystem function: peat formation – Flood duration	Maintain active peat formation, where appropriate	Reducing groundwater supply to the Coolagh Lakes could affect the duration of flooding and areas where there is active peat formation	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Ecosystem function: water quality – Water chemistry measures	Maintain appropriate water quality, particularly nutrient levels, to support the natural structure and functioning of the habitat	Over the long-term, reducing groundwater supply to the Coolagh Lakes could reduce water levels and affect background nutrient concentrations	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Vegetation structure: typical species – Presence	Maintain vegetation cover of typical species including brown mosses and vascular plants	Reducing surface water quality in the River Corrib or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce or result in the loss of typical species from areas of this habitat type (at least locally) in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: non-native species – Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Introducing or spreading non-native invasive plant species to habitat areas within Lough Corrib SAC could have the potential to negatively affect fen habitat areas in terms of vegetation composition	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: trees and shrubs – Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs not more than 10%	Reducing groundwater supply to the Coolagh Lakes would affect the natural hydrogeological regime which could result in the drying out of fen habitat, potentially leading to increases in tree/shrub cover	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Physical structure: disturbed bare ground – Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground not more than 10%. Where tufa is present, disturbed bare ground not more than 1%	No The Project will not contribute to physical disturbance levels leading to any increase in bare ground in fen habitats in Lough Corrib SAC	No
Physical structure: drainage – Percentage area in local vicinity of a representative number of monitoring stops	Areas showing signs of drainage as a result of drainage ditches or heavy trampling not more than 10%	No The Project will not contribute to the installation of artificial drainage nor will it lead to any increase in the trampling of fen habitat in Lough Corrib SAC	No
Indicators of local distinctiveness - Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat This includes species on the Flora (Protection) Order, 2022 and/or the red data lists	Over the long-term, reducing surface water quality in the River Corrib or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could affect population sizes and/or the distribution of rare, threatened or scarce species associated with fen habitat in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
[7230] Alkaline fens To maintain the favourable conservation condition of Alkaline fens in Lough Corrib SAC, which is defined by the following list of attributes and targets:			
Habitat area - Hectares	Area stable or increasing, subject to natural processes	Over the long-term, reducing surface water quality or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce the area of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Habitat distribution - Occurrence	No decline, subject to natural processes	Over the long-term, reducing surface water quality or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce the area (and hence distribution) of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Ecosystem function: soil nutrients– Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	No The Project will not directly impact upon any fen habitat areas in Lough Corrib SAC and will not contribute to soil nutrient levels.	No
Ecosystem function: peat formation – Flood duration	Maintain active peat formation, where appropriate	Reducing groundwater supply to the Coolagh Lakes could affect the duration of flooding and areas where there is active peat formation	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Ecosystem function: hydrology – Metres	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	Reducing groundwater supply to the Coolagh Lakes would affect the natural hydrogeological/hydrological regime supporting any associated fen habitat	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Ecosystem function: water quality – Water chemistry measures	Maintain appropriate water quality, particularly nutrient levels, to support the natural structure and functioning of the habitat	Over the long-term, reducing surface water quality or reducing groundwater supply to the Coolagh Lakes could reduce water levels and affect background nutrient concentrations	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Community diversity – Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Over the long-term, reducing surface water quality or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce the community diversity of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: number of positive indicator species (brown mosses) – Number of species at a representative number of 2m x 2m monitoring stops	Number of brown moss species present at each monitoring stop is at least one	Over the long-term, reducing surface water quality or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce the number of brown moss species associated with affected areas of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: number of positive indicator species (vascular plants) – Number of species at a representative number of 2m x 2m monitoring stops	Number of positive vascular plant indicator species present at each monitoring stop is at least two for small-sedge flushes and at least three for black bog-rush (Schoenus nigricans) flush and bottle sedge (Carex rostrata) fen	Over the long-term, reducing surface water quality or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce the number of positive indicator species associated with affected areas of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: cover of positive indicator species – Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of brown moss species and positive vascular plant indicator species at least 20% for small-sedge flushes and at least 75% cover for black bog-rush (Schoenus nigricans) flush and bottle sedge (Carex rostrata) fen	Over the long-term, reducing surface water quality or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could reduce the percentage cover of brown moss species associated with affected areas of this habitat type in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: negative indicator species – Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could result in drying out of fen habitat affording opportunities for negative indicator species to spread or colonise affected fen areas.	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Vegetation composition: non-native species – Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Introducing or spreading non-native invasive plant species to habitat areas within Lough Corrib SAC would have the potential to negatively affect fen habitat areas in terms of vegetation composition	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation composition: native trees and shrubs – Percentage cover in local vicinity of a representative number of monitoring stop	Cover of scattered native trees and shrubs less than 10%	Affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could result in drying out of fen habitat affording opportunities for tree/shrub species to spread or colonise affected fen areas.	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Vegetation composition: soft rush and common reed cover – Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of soft rush (Juncus effusus) and common reed (Phragmites australis) less than 10%	Affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could result in drying out of fen habitat affording opportunities for soft rush to spread or colonise affected fen areas.	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4
Vegetation structure: height – Percentage of leaves/shoots at a representative number of 2m x 2m monitoring stops	Proportion of live leaves and/or flowering shoots of vascular plants that are more than 5cm above the ground surface should be at least 50%	No As the Project is remote from fen habitats in Lough Corrib SAC it cannot influence vegetation height (the principle cause of vegetation height impacts is grazing)	No
Physical structure: disturbed bare ground – Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%.	No The Project will not contribute to physical disturbance levels leading to any increase in bare ground in fen habitats in Lough Corrib SAC	No

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Physical structure: drainage – Percentage area in local vicinity of a representative number of monitoring stops	Areas showing signs of drainage as a result of drainage ditches or heavy trampling less than 10%	No The Project will not contribute to the installation of artificial drainage nor will it lead to any increase in the trampling of fen habitat in Lough Corrib SAC	No
Physical structure: tufa formations – Percentage cover in local vicinity of a representative number of 2m x 2m monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%	No The Project will not contribute to physical disturbance levels affecting tufa formations in fen habitats in Lough Corrib SAC	No
Indicators of local distinctiveness – Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat. This includes species on the Flora (Protection) Order, 2022 and/or the red data lists	Over the long-term, reducing surface water quality or affecting groundwater quality or reducing groundwater supply to the Coolagh Lakes could affect population sizes and/or the distribution of rare, threatened or scarce species associated with fen habitat in Lough Corrib SAC	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
[8240] Limestone pavements * To maintain the favourable conservation condition of Limestone pavements* in Lough Corrib SAC, which is defined by the following list of attributes and targets:			

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Habitat area - Hectares	Area stable or increasing, subject to natural processes.	There are areas of Limestone pavement [*8240] in Lough Corrib SAC that lie within the Assessment Boundary yet are not directly beneath the footprint of the proposed N6 GCRR. Construction works could result in the loss of areas of Limestone pavement habitat. Restricting grazing from exposed Limestone pavement habitat above the proposed Lackagh Tunnel could result in habitat area loss through scrub encroachment. The proposed Lackagh Tunnel has been designed to avoid any impacts to the structural integrity of the rock mass support to Limestone pavement habitat above it in Lough Corrib SAC – however the tunnel must be constructed as detailed in Appendix F for impacts to be avoided. Dust emissions during construction could result in the loss of Limestone pavement habitat within Lough Corrib SAC, and a reduction in habitat distribution locally, where present adjacent to the construction works between Ch. 9+850 to Ch. 10+100 Introducing/spreading non-native invasive plant species to Lough Corrib SAC could result in the loss of areas of Limestone pavement habitat and potentially affect habitat distribution	Retain areas of QI Annex I habitat within Lough Corrib SAC and within the Assessment Boundary, and avoid vegetation change or scrub encroachment by not restricting grazing access. Section 10.2 (Figures 17.1 to 17.5 and Figures 18.1 to 18.5) Monitoring that sufficient rock stability measures are installed to protect structural integrity of the rock mass Section 10.3 Measures to contain dust emissions during construction Section 10.6 Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Habitat distribution - Occurrence	No decline, subject to natural processes	As above for habitat area	As above for habitat area
Vegetation composition: typical species – Number at a representative number of monitoring stops	At least seven positive indicator species present	The impacts associated with the proposed Lackagh Tunnel, dust emissions and introducing/spreading non-native invasive plant species could affect the number of positive indicator species recorded locally within Limestone pavement habitat areas adjacent to the Project (as above under Habitat area)	As above for habitat area

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: bryophyte layer – Percentage at a representative number of monitoring stops	Bryophyte cover at least 50% on wooded pavement	Dust emissions during construction or introducing/spreading non-native invasive plant species could reduce bryophyte cover on wooded Limestone pavement habitat within Lough Corrib SAC, where present adjacent to the construction works between Ch. 9+850 to Ch. 0+100	Measures to contain dust emissions during construction Section 10.6 Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation composition: negative indicator species – Percentage at a representative number of monitoring stops	Collective cover of negative indicator species on exposed pavement not more than 1%	The Project will not directly affect Limestone pavement habitat within Lough Corrib SAC and therefore, will not affect negative indicator species cover on Limestone pavement habitat (non-native species as per Wilson & Fernandez, 2013) However, non-native invasive plant species could also be considered separate to that list – and would have the potential to negatively affect Limestone pavement habitat areas	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation composition: non-native species – Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1%on exposed pavement; on wooded pavement not more than 10% with no regeneration	The Project will not directly affect Limestone pavement habitat within Lough Corrib SAC and therefore, will not affect non-native species cover on Limestone pavement habitat (non-native species as per Wilson & Fernandez, 2013) However, non-native invasive plant species could also be considered separate to that list – and would have the potential to negatively affect Limestone pavement habitat areas	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation composition: scrub – Percentage at a representative number of monitoring stops	Scrub cover no more than 25% of exposed pavement	Restricting grazing from Limestone pavement habitat above the proposed Lackagh Tunnel could affect the vegetation composition and result in scrub encroachment.	Retain areas of QI Annex I habitat within Lough Corrib SAC and within the Assessment Boundary, and avoid vegetation change or scrub encroachment by not restricting grazing access. Section 10.2 (Figures 17.1 to 17.5 and Figures 18.1 to 18.5)

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: bracken cover – Percentage at a representative number of monitoring stops	Bracken (Pteridium aquilinum) cover no more than 10% on exposed pavement	Restricting grazing from Limestone pavement habitat above the proposed Lackagh Tunnel could affect the vegetation composition and result in bracken encroachment.	Retain areas of QI Annex I habitat within Lough Corrib SAC and within the Assessment Boundary, and avoid vegetation change or scrub encroachment by not restricting grazing access. Section 10.2 (Figures 17.1 to 17.5 and Figures 18.1 to 18.5)
Vegetation structure: woodland canopy – Percentage at a representative number of monitoring stops	Canopy cover on wooded pavement at least 30%	No The Project will not directly affect Limestone pavement habitat within Lough Corrib SAC and therefore, will not affect woodland canopy cover on Limestone pavement habitat	No
Vegetation structure: dead wood – Occurrence in a representative number of monitoring stops	Sufficient quantity of dead wood on wooded pavement to provide habitat for saproxylic organisms	No The Project will not directly affect Limestone pavement habitat within Lough Corrib SAC and therefore will not restrict the supply/presence of dead wood on Limestone pavement habitat	No
Physical structure: disturbance – Occurrence in a representative number of monitoring stops	No evidence of grazing pressure on wooded pavement	No The Project will not contribute to physical disturbance levels from increased grazing (or otherwise) to Limestone pavement habitat in Lough Corrib SAC	No
Indicators of local distinctiveness - Occurrence	Indicators of local distinctiveness are maintained. This includes species on the Flora (Protection) Order, 2022 and/or the red data lists, and other rare or localised species, as well as archaeological and geological features, which often support distinctive species	No The Project will not directly affect Limestone pavement habitat within Lough Corrib SAC and there are no locally distinctive species within those areas of Limestone pavement habitat present within the Assessment Boundary. The survey results on the wider area within Lough Corrib SAC did not note any locally distinct areas of Limestone pavement (nor archaeological or geological features) that could potentially be affected by the Project. Therefore this attribute/target will not be affected	No
[1029] Freshwater Pearl Mussel - Margaritifera margaritifera To restore the favourable conservation condition of Freshwater Pearl Mussel in Lough Corrib SAC, which is defined by the following list of attributes and targets:			

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Distribution - Kilometres	Maintain at 9.1km. The conservation objective applies to the Owenriff freshwater pearl mussel population	No The QI population is more than 20km upstream of the Project and therefore, it cannot affect the distribution of the species in the Owenriff River	No
Population size - Number of adult mussels	Restore Owenriff population to at least one million adult mussels	Although the Project does not directly affect Freshwater pearl mussel populations in Lough Corrib SAC, affecting host fish numbers could have knock-on-effects on Freshwater pearl mussel recruitment and the overall population	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5 Measures to prevent construction materials entering the River Corrib during bridge construction Section 10.11.1
Population structure: recruitment – Percentage per size class	Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	Although the Project does not directly affect Freshwater pearl mussel populations in Lough Corrib SAC, affecting host fish numbers could have knock-on-effects on Freshwater pearl mussel recruitment and the overall population	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5 Measures to prevent construction materials entering the River Corrib during bridge construction Section 10.11.1
Population structure: adult mortality – Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	No The QI population is more than 20km upstream of the Project and therefore, it cannot affect adult mortality rates in the Owenriff River	No
Suitable habitat extent – Kilometres	Restore suitable habitat in more than 8.3km in the Owenriff and Glenawbeg rivers and any additional stretches necessary for salmonid spawning	No The Owenriff River is more than 20km upstream of the Project and therefore, it cannot affect habitat extent	No
Suitable habitat: condition – Kilometres	Restore condition of suitable habitat	No The Owenriff River is more than 20km upstream of the Project and therefore, it cannot affect habitat condition	No

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Water quality: macroinvertebrate and phytobenthos (diatoms) – Ecological Quality Ratio (EQR)	Restore water quality - macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93	No The Owenriff River is more than 20km upstream of the Project and therefore, it cannot affect water quality	No
Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants) – Percentage	Restore substratum quality - filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	No The Owenriff River is more than 20km upstream of the Project and therefore, it cannot affect substratum quality	No
Substratum quality: sediment – Occurrence	Restore substratum quality - stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	No The Owenriff River is more than 20km upstream of the Project and therefore, it cannot affect substratum quality	No
Substratum quality: oxygen availability – Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	No The Owenriff River is more than 20km upstream of the Project and therefore, it cannot affect oxygen levels/conditions	No
Hydrological regime: flow variability – Metres per second	Restore appropriate hydrological regimes	No The Owenriff River is more than 20km upstream of the Project and therefore, it cannot affect the hydrological regime	No
Host fish - Number	Maintain sufficient juvenile salmonids to host glochidial larvae	As discussed below – under Atlantic salmon – the Project has the potential to affect fish numbers in the River Corrib as a consequence of affecting water quality in the river	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5 Measures to prevent construction materials entering the River Corrib during bridge construction Section 10.11.1

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Fringing habitat: area and condition – Hectares	Maintain the area and condition of fringing habitats necessary to support the population	No The Owenriff River is more than 20km upstream of the Project and therefore, it cannot affect the associated fringing habitat	No
[1095] Sea Lamprey - Petromyzon marinus To restore the favourable conservation condition of Sea Lamprey in Lough Corrib SAC, which is defined by the following list of attributes and targets:			
Distribution: extent of anadromy – Percentage of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	No The Project has a clear span bridge design over the River Corrib and will not present a barrier to Sea lamprey accessing habitat in the River Corrib catchment/Lough Corrib SAC	No
Population structure of juveniles - Number of age/size groups	At least three age/size groups present	Affecting water quality in the River Corrib could influence the quality, extent and availability of any juvenile habitat present downstream of the Project, which may, at least locally, affect the population structure	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5
Juvenile density in fine sediment - Juveniles/m²	Mean catchment juvenile density at least 1/m²	Affecting water quality in the River Corrib could influence the quality, extent and availability of any juvenile habitat present downstream of the Project and affect the density of juvenile lamprey present	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5
Extent and distribution of spawning habitat - m² and occurrence	No decline in extent and distribution of spawning beds	The success of Sea lamprey spawning activity below the Salmon Weir in Galway City is unknown (O'Connor, 2007). Affecting water quality in the River Corrib could influence the quality, extent and availability of any spawning habitat present downstream of the Project	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5
Availability of juvenile habitat - Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive, with a minimum of four positive sites in a catchment, which are at least 5km apart	Affecting water quality in the River Corrib could influence the quality, extent, usage and availability of any juvenile habitat present downstream of the Project	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Mortality risk	Not defined in any existing conservation objectives document	Although unlikely to have a population level effect, construction materials falling into the River Corrib during bridge construction could result in fish mortality	Measures to prevent construction materials entering the River Corrib during bridge construction Section 10.11.1
[1096] Brook Lamprey - Lampetra planeri To maintain the favourable conservation condition of Brook Lamprey in Lough Corrib SAC, which is defined by the following list of attributes and targets:			
Distribution - Percentage of river accessible	Access to all water courses down to first order streams	No The Project has a clear span bridge design over the River Corrib and will not present a barrier to Sea lamprey accessing habitat in the River Corrib catchment/Lough Corrib SAC	No
Population structure of juveniles - Number of age/size groups	At least three age/size groups of brook/river lamprey present	Affecting water quality in the River Corrib could influence the quality, extent and availability of any juvenile habitat present downstream of the Project, which may, at least locally, affect the population structure	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5
Juvenile density in fine sediment - Ammocoetes/m²	Mean catchment juvenile density of brook/river lamprey at least 5/m²	Affecting water quality in the River Corrib could influence the quality, extent and availability of any juvenile habitat present downstream of the Project and affect the density of juvenile lamprey present	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5
Extent and distribution of spawning habitat - m² and occurrence	No decline in extent and distribution of spawning beds	No Habitat downstream of the Project is not suitable as Brook lamprey spawning habitat and therefore, is beyond the ZoI of construction or operation – i.e. slow, deep flow to the Salmon Weir and a relatively deep (>40cm) tidally influenced channel between it and Galway Bay	No
Availability of juvenile habitat - Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Affecting water quality in the River Corrib could influence the quality, extent and availability of any juvenile habitat present downstream of the Project and affect the density of juvenile lamprey present	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Mortality risk	Not defined in any existing conservation objectives document	Although unlikely to have a population level effect, construction materials falling into the River Corrib during bridge construction could result in fish mortality	Measures to prevent construction materials entering the River Corrib during bridge construction Section 10.11.1
[1106] Atlantic Salmon - Salmo salar (only in fresh water) To maintain the favourable conservation condition of Atlantic Salmon in Lough Corrib SAC, which is defined by the following list of attributes and targets:			
Distribution: extent of anadromy – Percentage of river accessible	100% of river channels down to second order accessible from estuary	No The Project has a clear span bridge design over the River Corrib and will not present a barrier to Atlantic salmon accessing habitat in the River Corrib catchment/Lough Corrib SAC	No
Adult spawning fish - Number	Conservation Limit (CL) for each system consistently exceeded	A reduction in water quality in the River Corrib could affect stocks of Atlantic salmon in the river, with an increased risk of a population level effect if a pollution event were to occur in conjunction with fish migrating upstream from the sea to spawning grounds Although unlikely to have a population level effect, construction materials falling into the River Corrib during bridge construction could result in fish mortality	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5 Measures to prevent construction materials entering the River Corrib during bridge construction Section 10.11.1
Salmon fry abundance - Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment - wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	No With spawning areas and nursery habitat for fry (shallow, fast flowing riffle habitat) upstream of the Project, the Project will not affect salmon fry abundance in the catchment	No
Out-migrating smolt abundance - Number	No significant decline	A reduction in water quality in the River Corrib could affect numbers of out-migrating smolt in the river, with an increased risk of a population level effect if a pollution event were to occur in conjunction with fish migrating downstream to the sea Although unlikely to have a population level effect, construction materials falling into the River Corrib during bridge construction could result in fish mortality	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5 Measures to prevent construction materials entering the River Corrib during bridge construction Section 10.1.2

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Number and distribution of redds - Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	No There is no Atlantic salmon spawning habitat downstream of the Project and therefore, it cannot affect the number and distribution of redds	No
Water quality - EPA Q value	At least Q4 at all sites sampled by EPA	The Project has the potential to reduce water quality in the River Corrib at EPA sampling points downstream	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5
[1355] Otter Lutra lutra To maintain the favourable conservation condition of Otter in Lough Corrib SAC, which is defined by the following list of attributes and targets:			
Distribution - Percentage positive survey sites	No significant decline	Disturbance or displacement of Otter during construction or operation will not affect the distribution of Otter along the River Corrib However, there is a mortality risk to Otter posed by road traffic. Although the potential or Otter to gain access to the road carriageway within Lough Corrib SAC is limited (given the elevated bridge structure across the river valley) there is still the potential for the Project to pose a permanent mortality risk to Otter, which could have long-term effects on the local population	Use of Otter resistant fencing to prevent Otter gaining access to the road carriageway Section 10.11.2
Extent of terrestrial habitat - Hectares	No significant decline. Area mapped and calculated as c.1,054ha along river banks/lake shoreline/around ponds	No The Project will not result in a significant decline in terrestrial Otter habitat Area of habitat that will be affected along the river banks and the at the N59 drainage outfall (S15) is c.67m^2 – an area that is insignificant in the context of the c.1,054ha of Otter habitat mapped in Lough Corrib SAC (i.e. 0.0007%)	No
Extent of freshwater (river) habitat - Kilometres	No significant decline. Length mapped and calculated as 314.2km	No The Project will not reduce the extent of river habitat in Lough Corrib SAC	No

Attributes and Measures (NWPS, 2017a)	Target (NWPS, 2017a)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Extent of freshwater (lake) habitat - Hectares	No significant decline. Area mapped and calculated as 4,178ha	No The Project will not reduce the extent of lake habitat in Lough Corrib SAC	No
Couching sites and holts - Number	No significant decline	The Project affecting water quality in the River Corrib during construction could (at least temporarily) affect usage of holt/couch sites available for Otter in the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Fish biomass available - Kilograms	No significant decline	As discussed above under Atlantic salmon, the potential for the Project to affect water quality and to result in the mortality of fish species during bridge construction, has the potential to affect fish numbers in the River Corrib	Measures to maintain water quality in receiving watercourses during construction and operation Section 10.5 Measures to prevent construction materials entering the River Corrib during bridge construction Section 10.11.1
Barriers to connectivity - Number	No significant increase	No The Project has a clear span bridge design over the River Corrib and will not present a barrier to Otter movement along the River Corrib corridor	No
Mortality risk posed by road traffic	Not defined in any existing conservation objectives document	Although the potential or Otter to gain access to the road carriageway within Lough Corrib SAC is limited (given the elevated bridge structure across the river valley) there is still the potential for the proposed road development to pose a permanent mortality risk to Otter, which could have long-term effects on the local population	Use of Otter resistant fencing to prevent Otter gaining access to the road carriageway Section 10.11.2

9.2 Galway Bay Complex SAC

9.2.1 Qualifying Interests and Conservation Objectives of Galway Bay Complex SAC

The QI habitats and species of Galway Bay Complex SAC, and the overall conservation objective for each, are listed below Table 9.14 (NPWS, 2013a). The Project does not traverse the Galway Bay Complex SAC and the pathway for potential impacts between the Project and this SAC are hydrological. Those highlighted (in green) are the QIs which have been recorded within Galway Bay Complex SAC and within the hydrological/hydrogeological ZoI of the Project. The two terrestrial habitats listed in Table 9.21, are at risk of invasive species introductions and infestation by way of hydrological pathways from the Project.

Table 9.14 Qualifying Interests and Conservation Objectives of Galway Bay Complex SAC

Qualifying Interests	Conservation Objective
Annex I Habitats	
[1140] Mudflats and sandflats not covered by seawater at low tide	To maintain the favourable conservation condition
[1150] Coastal lagoons*	To restore the favourable conservation condition
[1160] Large shallow inlets and bays	To maintain the favourable conservation condition
[1170] Reefs	To maintain the favourable conservation condition
[1220] Perennial vegetation of stony banks	To maintain the favourable conservation condition
[1230] Vegetated sea cliffs of the Atlantic and Baltic coasts	To restore the favourable conservation condition[59]
[1310] *Salicornia* and other annuals colonising mud and sand	To maintain the favourable conservation condition
[1330] Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	To restore the favourable conservation condition
[1410] Mediterranean salt meadows (*Juncetalia maritimi*)	To restore the favourable conservation condition
[3180] Turloughs *	To maintain the favourable conservation condition
[5130] *Juniperus communis* formations on heaths or calcareous grasslands	To restore the favourable conservation condition
[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites)	To maintain the favourable conservation condition
[7210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* *	To maintain the favourable conservation condition
[7230] Alkaline fens	To maintain the favourable conservation condition
[8240] Limestone Pavements	To restore the favourable conservation condition
Annex II Species	
[1355] Otter *Lutra lutra*	To restore the favourable conservation condition
[1365] Harbour seal *Phoca vitulina*	To maintain the favourable conservation condition

[59] Conservation Objective used to assess newly-listed QI is based on conservation objectives available for other European sites with equivalent QI habitats (recommended by the NPWS - Section 3.1), in this case the more recent Conservation Objectives for the nearby East Burren Complex SAC 001926 (NPWS, 2022)

The site specific conservation objectives document for Galway Bay Complex SAC (NPWS, 2013a) informed this assessment. This document sets out the attributes, measures and targets that define the favourable conservation condition of QI habitats and species within the European site, although the newly-listed QIs, [1230] Vegetated sea cliffs of the Atlantic and Baltic Coasts (not recorded within this updated NIS' ZoI) and [*8240] Limestone Pavements, are not yet included in the Galway Bay Complex SSCO. Affecting the conservation condition of QI habitats or species would constitute an adverse effect on the integrity of Galway Bay Complex SAC.

The specific attributes and targets used to define the conservation objectives of the QI habitats and species within the ZoI of the Project are presented in Table 9.21below. These have been compiled from the available site specific conservation objectives document for Galway Bay Complex SAC (NPWS, 2013a) with the exception of those for [8249] Limestone pavements which are not provided in that document and in that case, the specific attributes and targets used to define the conservation objectives of that QI habitat have been compiled from the Conservation Objectives for the nearby East Burren Complex SAC (NPWS, 2022).

9.2.2 Ecological Baseline

Galway Bay Complex SAC is selected for a range of Annex I habitat types ranging from Limestone pavement [*8240] and Calcareous grassland [*6210] to coastal and marine Annex I habitat types (Table 9.14).

The Project does not traverse the Galway Bay Complex SAC and given the nature of the Project and the potential impact pathways (see Section 9.2.3 below), the description here is focussed on the downstream coastal and marine habitats, and the QI species they support, which are the QIs which fall within the zone of influence of the Project. The descriptions are based upon the information presented in the conservation objectives for Galway Bay Complex SAC, and the relevant supporting documents.

Galway Bay is classified as the Annex I habitat Large shallow inlets and bays [1160], associated with which are Reefs [1170], Tidal mudflats [1140], Lagoons [*1150], Salicornia mud [1310], Perennial vegetation of stony banks [1220] and Atlantic salt meadows [1330]. These habitats are also supported by a network of other habitat types including the freshwater rivers and streams that flow into the bay, the transitional waters of the estuary and terrestrial habitat along the coastline.

Rusheen Bay, to which some of the rivers/streams crossed by the Project will drain (Bearna Stream catchment and the Knocknacarragh Stream), comprises a mosaic of most of these habitat types: Large shallow inlets and bays [1160], associated with which are Reefs [1170], Tidal mudflats [1140], Perennial vegetation of stony banks [1220] and Atlantic salt meadows [1330].

The habitats within Galway Bay also support QI populations of Otter and Harbour seal.

9.2.3 Potential Direct and Indirect Impacts

As the Project does not traverse Galway Bay Complex SAC, none of the QI habitats or species will be directly impacted by the Project and there is no risk of direct habitat loss or habitat fragmentation. Galway Bay Complex SAC is also beyond the ZoI of any air quality effects from the Project.

The unmitigated hydrogeological ZoI of the Project (see Figures 11.3.001 to 11.3.010 and Figures 12.1.001 to 12.1.008 and also Figures 6.01 and 6.02 of the Hydrogeology Assessment Report in Appendix A) does not extend as far as Galway Bay Complex SAC. Therefore, there is no potential for indirect impacts to groundwater dependant habitats within Galway Bay Complex SAC through affecting the existing hydrogeological regime.

The Project will not affect any Otter breeding/resting sites and will not result in any long-term disturbance or displacement of Otter from habitat areas within, or connected to, Galway Bay Complex SAC. At a distance of more than 1km from the construction or operation of the Project it poses no risk of disturbance to Harbour seal in Galway Bay.

However as per the 2018 NIS, there are the following impacts by which the Project could (in the absence of mitigation measures) potentially affect the QIs of Galway Bay Complex SAC:

- Habitat degradation as a result of the Project affecting the functioning and quality of the existing hydrogeological regime

- Habitat degradation as a result of the Project affecting water quality in receiving watercourses and Galway Bay during construction
- Habitat degradation as a result of introducing/spreading non-native invasive plant species to habitat areas within Galway Bay Complex SAC
- Barrier effect - the installation of new culvert structures on watercourses within the Bearna Stream catchment has the potential to present a barrier to Otter movement (the lower portion of the Bearna Stream catchment lies within Galway Bay Complex SAC)
- Mortality risk - with new watercourse crossings on watercourses within the Bearna Stream catchment, the Project poses a mortality risk to Otter through collisions with road traffic

9.2.4 Examination and Analysis of Potential Direct and Indirect Impacts

9.2.4.1 Habitat degradation – hydrogeology

As discussed above in Section 6.3, a direct pathway is present between the swallow hole at Galway Racecourse and Galway Bay through the shared Clarinbridge GWB. A pollution event, of a sufficient magnitude, has the potential to affect the receiving groundwater environment to an extent that it undermines the conservation objectives supporting groundwater dependent habitats in the Inner Galway Bay SPA and Galway Bay Complex SAC. Mitigation measures are required to ensure that groundwater quality is not affected during construction and operation.

Although the drainage design (as described in Section 2, and Appendices A, B, C, and F) will ensure that groundwater quality will be maintained during operation, it is important that they are inspected to ensure they are functioning as required (see Section 10.1.2 and 10.4).

Summary

A summary of the potential hydrogeological impacts associated with the Project are presented in Table 9.15 below.

Table 9.15 Summary of Hydrogeological Impacts

Potential Direct and Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction		
Construction works affecting groundwater quality	Yes An accidental pollution event during construction could affect the groundwater inputting to Galway Bay and could affect the quality of the habitats and the fauna communities	Yes To ensure that construction works will not affect groundwater quality in the underlying aquifer (as outlined in the design measures of Section 10.4)
Operation		
Groundwater quality being affected during operation	Yes An accidental pollution event during operation could affect the groundwater inputting to Galway Bay and could affect the quality of the habitats and the fauna communities It is important that drainage design features are inspected to ensure that they are operating as intended	Yes To ensure that the drainage-related mitigation measures and features are maintained for the life of operations (as outlined in Section 10.1)

9.2.4.2 Habitat degradation – hydrology

As per the 2018 NIS, during construction, contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water feature has the potential to have a significant negative impact on water quality in receiving watercourses, and consequently downstream in Galway Bay. The effects of frequent and/or prolonged pollution events in a river system can be extensive and far-reaching and can have significant long-term effects. In an extreme scenario, with a pollution event of sufficient magnitude, the marine environment could also be affected. A reduction in water quality in Galway Bay has the potential to reduce the area and distribution of affected habitats, the structure, extent and distribution of vegetation and fauna species communities, and affect the quality/condition of breeding and resting sites for Otter and the Harbour seal (see Table 9.21).

However, it is extremely unlikely that a pollution event of such a magnitude would occur during construction. Any pollution events that may occur would be expected to be relatively minor in comparison to the dilution factor and assimilative capacity of a coastal water body the size of Galway Bay, or to be any more than temporary in nature, and therefore would not have any perceptible or far-reaching effects within the bay. This is particularly so given the high flushing by tidal waters over spring and neap tides and the tidal mixing available.

Nevertheless, a precautionary approach is being taken in assuming a level of risk of water quality impacts and mitigation measures are required to further minimise the risk of the Project having any effect on water quality in receiving watercourses during construction.

A total of 16 of the proposed road drainage outfalls for the proposed N6 GCRR will discharge to surface watercourses, (five of which discharge to the River Corrib, three directly (S15, S18A and S18B) and two indirectly (S14A and S14B), one road drainage outfalls to a tributary of Ballindooley Lough, seven road drainage outfalls will discharge to existing public surface water sewers and two (covered tunnel sections) are to be pumped to the public foul sewer, one road drainage networks discharges to an existing infiltration field for the existing N6. There are additional side road drainage networks which also discharge to local ditches and surface water sewer networks.

The drainage network and discharge points are shown on Figures 2.1 to 2.15. However, given the drainage design, as described in Section 2 and in Appendix B and C (which includes attenuation and pollution control elements), it is not predicted that the normal operating water quality of the drainage outfalls, even in the unlikely event of a pollution incident, would have any significant effect on water quality in receiving watercourses or in Galway Bay.

As a consequence of the small scale of the Project surface area relative to the overall freshwater catchment that discharges to Galway Bay, there will be no discernible impact on the flow regime within the Galway Bay Complex SAC at either local or regional scale. The conservation objective of the various QIs of this SAC require that the natural hydrological regime is maintained in terms of the natural tidal regime, salinities, sediment supply and water quality. The drainage design proposed minimises the potential for local change in runoff and recharge rates having 39 outfalls over the 17.5km length of the proposed N6 GCRR, and the provision of storm water treatment and attenuation upstream of these outfalls to throttle discharge rates to greenfield runoff rates.

Summary

Considering the design of the proposed N6 GCRR and the other elements of the Project, and in particular the drainage design which will attenuate and treat road drainage prior to discharge to the surface water network (see Sections 2 above and Section 10 below, and in Appendix A, Appendix B and Appendix C of this updated NIS), and it's location relative to Galway Bay, the Project will not directly or indirectly affect the functioning of the existing hydrological regime during construction or operation and will not affect surface water quality (or water quality in Galway Bay) during operation. This is unchanged from the 2018 NIS.

However, taking the precautionary approach there is the potential for water quality to be affected during construction and operation. During construction there is the potential for accidental spillages of pollutants to affect water quality in receiving watercourses/waterbodies and mitigation measures are required.

The proposed N6 GCRR and as such the Project has the potential to affect the range, area, or structure/function of QI habitats within Galway Bay Complex SAC, the range of QI species, or the ability of these QI habitats or species populations to maintain themselves in the long-term due to effects on water

quality. The proposed N6 GCRR, and as such the Project, therefore also has the potential to inhibit any efforts to restore favourable conservation status, where this forms part of the conservation objectives (or might in the future).

Therefore, the proposed N6 GCRR and as such the Project has the potential to affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats and species of Galway Bay Complex SAC (see Table 9.21) through impacts on water quality during construction.

A summary of the potential direct or indirect impacts associated with the Project are presented in Table 9.16 below.

Table 9.16 Summary of Hydrological Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction		
Construction works affecting the hydrological regime	No Construction of the Project will not affect the functioning of any rivers which flow into or lie within Galway Bay Complex SAC, either in terms of flow of flooding regime, and will not affect the tidal regime or hydrological functioning of Galway Bay	No
Construction works affecting surface water quality	Yes Affecting the quality of surface water discharging to the marine environment could affect the associated aquatic/coastal/marine habitats and species	Yes To ensure that water quality in the receiving environment is not affected during construction (as outlined in Section 10.5)
Operation		
The hydrological regime being affected during operation	No The design of the Project will not affect the functioning of any rivers which flow into or lie within Galway Bay Complex SAC, either in terms of flow of flooding regime, and will not affect the tidal regime or hydrological functioning of Galway Bay	No
Surface water quality being affected during operation	No The drainage design (as described in Section 2, and Appendix A, B and C) will ensure that surface water quality will be maintained during operation	No

9.2.4.3 Habitat degradation – non-native invasive species

Non-native invasive plant species have been recorded along, or in close proximity to the Project[60] (see Section 5.7). Therefore, construction works have the potential to accidentally cause their introduction/spread to habitat areas within Galway Bay Complex SAC, as per the 2018 NIS. This has the potential to have long-term effects on plant species composition, diversity and abundance in affected habitats. Although the Project is remote from Galway Bay Complex SAC, there are two principal pathways by which non-native invasive species could be introduced to this European site from the Project: the haul routes shown on Figures 3.1 and 3.2 which cross the Galway Bay Complex SAC at Bearna Woods, along the R336, and construction works will be carried out upstream in the Bearna Stream catchment and non-native invasive plant species could be

[60] Non-native invasive aquatic plant species (or fauna species) were not recorded in aquatic habitats impacted by construction works.

carried downstream to Bearna Woods and Rusheen Bay. This could potentially affect the areas of Calcareous grassland habitat [*6210/6210] known to be present around the margins of Rusheen Bay.

Given the presence of non-native invasive plant species cover in the immediate vicinity of the Project, there is the potential that these species will recolonise vegetated areas within the Assessment Boundary post-construction. As such, there is also a risk that routine maintenance works may inadvertently spread contaminated vegetation cuttings.

Summary
Introducing or spreading non-native invasive plant species to Galway Bay Complex SAC, during construction or operation, has the potential to affect the conservation objective attributes and targets supporting the conservation condition of its QI habitats (see Table 9.21).

A summary of the potential direct and indirect impacts associated with non-native invasive plant species are presented in Table 9.17 below.

Table 9.17 Summary of Non-native Invasive Species Impacts

Potential Direct and Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction / Operation		
Introducing or spreading non-native invasive species to habitats within Galway Bay Complex SAC	Yes Introducing/spreading non-native invasive plant species could affect the distribution, extent, diversity and area of QI habitats or habitat areas supporting QI species	Yes To ensure that non-native invasive plant species are not spread within, or introduced to, habitat areas within Galway Bay Complex SAC (as outlined in Section 10.8)

9.2.4.4 Barrier effect

As detailed in the 2018 NIS, Otter were recorded in the Bearna Stream catchment and within that catchment where the proposed N6 GCRR crosses the Bearna Stream and the Tonabrocky Stream. Two culvert structures are proposed on these watercourses which have the potential to present a barrier to Otter movement during the construction (as instream works will be required) and operation of the proposed N6 GCRR. Although where the proposed N6 GCRR crosses these watercourses they are not within Galway Bay Complex SAC, the lower portion of the Bearna Stream does lie within this European site. Otter using these watercourses are likely to form part of that European site's Otter population. Construction of these culverts will likely be completed within a twelve month period (and also considering that instream works are not permitted by IFI between the months of October and June (inclusive)) and any barrier effect created would not result in any long-term effects on the local Otter population.

Summary
The proposed N6 GCRR and as such the Project may present a barrier effect to Otter within the Bearna Stream catchment which may affect the Otter population of Galway Bay Complex SAC and therefore, may affect the conservation objectives supporting the conservation condition of Otter in Galway Bay Complex SAC.

A summary of the potential impacts associated with the barrier effect posed by the Project are presented in Table 9.18 below.

Table 9.18 Summary of Barrier Effect Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Operation		
Barrier effect to Otter movement throughout the Bearna Stream catchment	Yes Operation of the Project may present barrier to Otter movement that could affect the Otter population of Galway Bay Complex SAC	Yes To ensure that Otter movements are not restricted in the Bearna Stream catchment (as outlined in Section 10.10)

9.2.4.5 Mortality risk

As detailed in the 2018 NIS, the introduction of new culverts on watercourses within the Bearna Stream catchment increases the risk of road traffic collisions with Otter. Sections of the proposed N6 GCRR in the vicinity will require the installation of mammal fencing to prevent Otter gaining access to the carriageway (National Roads Authority, 2008b).

Summary

As there is a risk of road traffic during operation posing a mortality risk to the Otter population of Galway Bay Complex SAC, the proposed N6 GCRR and as such the Project has the potential to affect the conservation objective attributes and targets supporting the conservation condition of Otter in Galway Bay Complex SAC (see Table 9.21).

A summary of the potential impacts associated with the mortality risk posed by the Project are presented in Table 9.19 below.

Table 9.19 Summary of Mortality Risk Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Operation		
Mortality/road traffic collision risk to Otter	Yes Operation of the Project presents a permanent risk of Otter mortality due to road traffic collisions and could have long-term effects on the Otter population of Galway Bay Complex SAC	Yes To ensure that Otter cannot gain access to the proposed road carriageway (as outlined in Section 10.11.2)

9.2.4.6 Summary

This section presents a summary of the potential impacts of the Project on the QIs of Galway Bay Complex SAC and how these impacts relate to affecting the site's conservation objectives.

Table 9.20 below, lists the QIs of Galway Bay Complex (NWPS, 2013a[61]) SAC and how the impacts associated with the Project relate to each. Those highlighted in green are those QIs which are present within the ZoI of the Project.

[61]Supplemented by QIs listed at https://www.npws.ie/protected-sites/sac/000268

Table 9.20 Qualifying Interests of Galway Bay Complex SAC and Potential Impacts

Qualifying Interests	Impact
Annex I Habitats	
[1140] Mudflats and sandflats not covered by seawater at low tide	Habitat degradation – hydrology
[1150] Coastal lagoons*	Habitat degradation – hydrology Habitat degradation – hydrogeology
[1160] Large shallow inlets and bays	Habitat degradation – hydrology
[1170] Reefs	Habitat degradation – hydrology
[1220] Perennial vegetation of stony banks	Habitat degradation – hydrology
[1230] Vegetated sea cliffs of the Atlantic and Baltic coasts	No potential impact – not present within ZoI.
[1310] *Salicornia* and other annuals colonising mud and sand	Habitat degradation – hydrology
[1330] Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	Habitat degradation – hydrology
[1410] Mediterranean salt meadows (*Juncetalia maritimi*)	Habitat degradation – hydrology
[3180] Turloughs *	Habitat degradation – hydrogeology
[5130] *Juniperus communis* formations on heaths or calcareous grasslands	No potential impact – not present within ZoI.
[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites)	Habitat degradation - non-native invasive plant species
[7210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* *	Habitat degradation – hydrogeology
[7230] Alkaline fens	Habitat degradation – hydrogeology
[8240] Limestone Pavements[62]	Habitat degradation - non-native invasive plant species
Annex II Species	
[1355] Otter *Lutra lutra*	Habitat degradation – hydrology Barrier effect (Bearna Stream catchment) Mortality risk (Bearna Stream catchment)
[1365] Harbour seal *Phoca vitulina*	Habitat degradation – hydrology

The relationship between, and potential influence of, these impacts with respect to the QI habitat and species within the ZoI of the Project and the attributes/targets upon which their favourable conservation condition is considered and measured is considered further below and also presented in Table 9.21(NPWS, 2013a).

[62]Conservation Objective used to assess newly-listed QI is based on conservation objectives available for other European sites with equivalent QI habitats (recommended by the NPWS - Section 3.1), in this case the more recent Conservation Objectives for the nearby East Burren Complex SAC 001926 (NPWS, 2022)

[1140] Mudflats and sandflats not covered by seawater at low tide
Affecting water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) could affect the natural condition of the intertidal sand/mud community complex that is an integral part of this habitat type.

[1150] Coastal lagoons*
Affecting water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) could affect the number and extent of typical plant species and specialised fauna species associated with coastal lagoon habitat.

[1160] Large shallow inlets and bays
Affecting water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) could affect the extent, distribution and structure of the plant and animal communities that are an integral part of this habitat type.

[1170] Reefs
Affecting water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) could affect the extent and structure of the plant and animal communities that are an integral part of this habitat type.

[1220] Perennial vegetation of stony banks
Affecting water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) could affect the area and distribution of this habitat type, could affect the vegetation structure through the range of coastal habitats present, and could affect the range of typical shingle flora plant communities.

[3180] Turloughs *, [7210] Calcareous fens with Cladium mariscus and species of the Caricion davallianae * & [7230] Alkaline fens
Affecting water quality in the Galway Bay and/or affecting the functioning or quality of the existing hydrogeological regime during construction (even though the risk of any perceptible effect is low) could affect the groundwater dependent habitats or habitats receiving groundwater and therefore the habitat area and the distribution of this habitat type within Galway Bay Complex SAC. These impacts could also affect the type, abundance and distribution of the typical species supported by the habitat, the vegetation composition and distribution, the area and condition of the fringing aquatic vegetation.

[1310] Salicornia and other annuals colonising mud and sand
Affecting water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) could affect the area and distribution of this habitat type, could affect the vegetation structure through the range of coastal habitats present, and could affect vegetation cover, vegetation height and the typical plant species and plant sub-communities present.

[1330] Atlantic salt meadows (Glauco-Puccinellietalia maritimae), [1410] Mediterranean salt meadows (Juncetalia maritimi)
Affecting water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) could affect the area and distribution of this habitat type, could affect the vegetation structure through the range of coastal habitats present, and could affect vegetation cover, vegetation height and the typical plant species and plant sub-communities present.

[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia) (*important orchid sites)
There is the potential for the proposed N6 GCRR and as such the Project to introduce or spread non-native invasive plant species to Rusheen Bay, via the Bearna Stream as a result of the proposed haul route along the R336 which could potentially affect the areas of Calcareous grassland habitat [*6210/6210] known to be present around the margins of Rusheen Bay. This impact could affect habitat area and distribution and negatively affect the vegetation structure and composition.

[8240] Limestone pavements
There is the potential for the proposed N6 GCRR and as such the Project to introduce or spread non-native invasive plant species to the Galway Bay via runoff and streams which could potentially affect the areas of Limestone Pavements [8240] known to be present around the margins of the bay. This impact could affect habitat area and distribution and negatively affect the vegetation structure and composition.

[1355] Otter

Affecting water quality in the Bearna Stream and Galway Bay during construction (even though the risk of any perceptible effect is low) could affect the quality and availability of breeding/resting sites downstream in Galway Bay Complex SAC and affect fish numbers, particularly in the Bearna Stream. Any barrier effect associated with the proposed N6 GCRR within the Bearna Stream catchment could affect the territory size of any QI Otter populations that use watercourses within that catchment, which in turn could affect local population dynamics through factors such intraspecific competition for resources. The mortality risk posed by the proposed N6 GCRR and as such the Project within the Bearna Stream catchment could have a long term effect on Otter numbers within Galway Bay Complex SAC.

[1365] Harbour seal

Affecting water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) could affect the condition of Harbour seal breeding and haul out sites.

Table 9.21 Potential Impacts on the Conservation objectives for QIs of Galway Bay Complex SAC (Those rows highlighted in green are the attributes potentially affected by the Project)

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
[1140] Mudflats and sandflats not covered by seawater at low tide **To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area - Hectares	The permanent habitat area is stable or increasing, subject to natural processes	No, the Project affecting water quality in Galway Bay during construction will not affect the area of mudflats/sandflats in the SAC	No
Community distribution - Hectares	Conserve the following community types in a natural condition: Intertidal sandy mud community complex; and Intertidal sand community complex.	A reduction in water quality in receiving watercourses during construction could affect the distribution of fauna communities in Galway Bay	Measures to maintain water quality in receiving watercourses during construction Section 10.5
[1150] Coastal lagoons* **To restore the favourable conservation condition of Coastal lagoons in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area - Hectares	Area stable, subject to slight natural variation Favourable reference area 76.7ha	No, the Project affecting water quality in Galway Bay during construction will not affect the area of Coastal lagoons in the SAC	No
Habitat distribution - Occurrence	No decline, subject to natural processes	No, the Project affecting water quality in Galway Bay during construction will not affect the distribution of Coastal lagoons in the SAC	No
Salinity regime - Practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	No, the Project affecting water quality in Galway Bay during construction will not affect the salinity profile of Coastal lagoons in the SAC	No
Hydrological regime - Metres	Annual water level fluctuations and minima within natural ranges	No, the Project affecting water quality in Galway Bay during construction will not affect the hydrological regime in Galway Bay	No
Barrier: connectivity between lagoon and sea - Permeability	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	No, the Project affecting water quality in Galway Bay during construction will not affect lagoon/sea connectivity	No

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Water quality: Chlorophyll a - µg/L	Annual median chlorophyll a within natural ranges and less than 5µg/L	No, the Project affecting water quality in Galway Bay during construction will not affect Chlorophyll levels in lagoon habitats in Galway Bay	No
Water quality: Molybdate Reactive Phosphorus (MRP) - mg/L	Annual median MRP within natural ranges 0.1mg/L	No, the Project affecting water quality in Galway Bay during construction will not affect MRP levels in lagoon habitats in Galway Bay	No
Water quality: Dissolved Inorganic Nitrogen (DIN) - mg/L	Annual median DIN within natural ranges and less than 0.15mg/L	No, the Project affecting water quality in Galway Bay during construction will not affect DIN levels in lagoon habitats in Galway Bay	No
Depth of macrophyte colonisation - Metres	Macrophyte colonisation to at least 2m depth	No, the Project affecting water quality in Galway Bay during construction will not affect macrophyte colonisation depth in lagoon habitats in Galway Bay	No
Typical plant species - Number and m²	Maintain number and extent of listed lagoonal specialists, subject to natural variation	A reduction in water quality in Galway Bay during construction and operation could affect the diversity, number and extent of plant species associated with this habitat type in the SAC (e.g. Lough Atalia)	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Typical animal species - Number	Maintain listed lagoon specialists, subject to natural variation	A reduction in water quality in Galway Bay during construction and operation could affect the diversity, number and extent of plant species associated with this habitat type in the SAC (e.g. Lough Atalia)	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Negative indicator species - Number and % cover	Negative indicator species absent or under control	No, the Project affecting water quality in Galway Bay during construction will not affect the control or spread of negative indicator species in lagoon habitats in Galway Bay	No

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
[1160] Large shallow inlets and bays To maintain the favourable conservation condition of Large shallow inlets and bays in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:			
Habitat area - Hectares	The permanent habitat area is stable or increasing, subject to natural processes.	No, the Project affecting water quality in Galway Bay during construction will not affect the area of this habitat type	No
Community extent - Hectares	Maintain the extent of the Zostera-dominated community complex and the maërl-dominated community, subject to natural processes	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Community structure: Zostera density – Shoots per m^2	Conserve the high quality of Zostera-dominated communities, subject to natural processes	A reduction in water quality in Galway Bay during construction could affect the density of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Community structure - Biological composition	Conserve the high quality of the maërl-dominated community, subject to natural processes	A reduction in water quality in Galway Bay during construction could affect the quality of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Community distribution - Hectares	Conserve the following community types in a natural condition: Intertidal sandy mud community complex; Intertidal sand community complex; Fine to medium sand with bivalves community complex; Sandy mud to mixed sediment community complex; Mixed sediment dominated by Mytilidae community complex; Shingle; Fucoid-dominated community complex; Laminaria-dominated community complex; and Shallow sponge-dominated community complex	A reduction in water quality in Galway Bay during construction could affect the distribution of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
[1170] Reefs **To maintain the favourable conservation condition of Reefs in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Distribution - Occurrence	The distribution of reefs is stable or increasing, subject to natural processes	No, the Project affecting water quality in Galway Bay during construction will not affect the distribution of reef habitats	No
Habitat area - Hectares	The permanent habitat area is stable, subject to natural processes.	No, the Project affecting water quality in Galway Bay during construction will not affect the area of reef habitat cover	No
Community extent - Hectares	Maintain the extent of the Mytilus-dominated reef community, subject to natural processes	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Community structure: Mytilus density – Individuals per m²	Conserve the high quality of the Mytilus-dominated reef community, subject to natural processes	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Community structure - Biological composition	Conserve the following community types in a natural condition: Fucoid-dominated community complex; Laminaria-dominated community complex; and Shallow sponge-dominated community complex	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
[1220] Perennial vegetation of stony banks **To maintain the favourable conservation condition of Perennial vegetation of stony banks in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area - Hectares	Area stable or increasing, subject to natural processes, including erosion and succession	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Habitat distribution - Occurrence	No decline, or change in habitat distribution, subject to natural processes	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Physical structure: functionality and sediment supply - Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	No The Project will not pose a barrier to the natural circulation of sediment or organic matter	No
Vegetation structure: zonation - Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: typical species and sub-communities - Percentage cover at a representative sample of monitoring stops	Maintain the typical vegetated shingle flora including the range of sub-communities within the different zones. Typical species include Sea sandwort (Honckenya peploides), Sea beet (Beta vulgaris ssp maritima), Rock samphire (Crithmum maritimum), Sea mayweed (Tripleurospermum maritimum), yellow-horned poppy (Glaucium flavum) and sea campion (Silene uniflora)	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: negative indicator species – Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	No The proposed N6 GCRR and as such the Project affecting water quality in Galway Bay during construction will not affect the control or spread of negative indicator species in the stoney banks associated with Galway Bay	No
[1310] Salicornia and other annuals colonising mud and sand **To maintain the favourable conservation condition of Salicornia and other annuals colonizing mud and sand in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area - Hectares	Area stable or increasing, subject to natural processes, including erosion and succession	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Habitat distribution - Occurrence	No decline, or change in habitat distribution, subject to natural processes	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Physical structure: sediment supply - Presence/absence of physical barriers	Maintain/restore, natural circulation of sediments and organic matter, without any physical obstructions	No The Project will not pose a barrier to the natural circulation of sediment or organic matter	No
Physical structure: creeks and pans - Occurrence	Maintain, or where necessary restore creek and pan structure, subject to natural processes, including erosion and succession	No The Project will not affect how the tidal regime/processes interacts with this habitat type	No
Physical structure: flooding regime – Hectares flooded; frequency	Maintain natural tidal regime	No The Project will not affect how the tidal regime/processes interacts with this habitat type	No
Vegetation structure: zonation – Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation structure: vegetation height – Centimetres	Maintain structural variation within sward	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation structure: vegetation cover – Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: typical species and sub-communities - Percentage cover	Maintain the range of species-poor communities with typical species listed in SMP (McCorry and Ryle, 2009)	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation structure: negative indicator species - Spartina anglica –	There is currently no common cordgrass (Spartina anglica) in this	No	No

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Hectares	SAC. Prevent establishment of cordgrass	The Project does not interact directly with the coastal zone and therefore, there is not potential for any interaction with habitat supporting common cordgrass	
[1330] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) & **[1410] Mediterranean salt meadows (Juncetalia maritimi)** **To restore the favourable conservation condition of Mediterranean salt meadows (Juncetalia maritimi) in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area - Hectares	Area increasing, subject to natural processes, including erosion and succession	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Habitat distribution - Occurrence	No decline or change in habitat distribution, subject to natural processes	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Physical structure: sediment supply – Presence absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	No The Project will not pose a barrier to the natural circulation of sediment or organic matter	No
Physical structure: creeks and pans – Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	No The Project will not affect how the tidal regime/processes interacts with this habitat type	No
Physical structure: flooding regime – Hectares flooded; frequency	Maintain natural tidal regime	No The Project will not affect how the tidal regime/processes interacts with this habitat type	No
Vegetation structure: zonation – Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation structure: vegetation height – Centimetres	Maintain structural variation within sward	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation structure: vegetation cover – Percentage cover at a representative sample of monitoring stops	Maintain more than 90% area outside creeks vegetated	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation composition: typical species and sub-communities - Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in SMP (McCorry and Ryle, 2009)	A reduction in water quality in Galway Bay during construction could reduce the extent of these communities within the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Vegetation structure: negative indicator species - Spartina anglica – Hectares	There is currently no common cordgrass (Spartina anglica) in this SAC. Prevent establishment of cordgrass	No The Project does not interact directly with the coastal zone and therefore, there is not potential for any interaction with habitat supporting common cordgrass	No
Turloughs* [3180] **To maintain the favourable conservation condition of Turloughs in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area/Hectares	Area stable at c.59ha or increasing, subject to natural processes	A reduction in water quality in Galway Bay during construction and operation could affect the habitat area in the SAC	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Habitat distribution/Occurrence	No decline, subject to natural processes	A reduction in water quality in Galway Bay during construction and operation could affect the habitat distribution in the SAC	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Hydrological regime: flood duration, frequency, area, depth; permanently flooded area/Various	Appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	No The Project will not affect flood regime/processes interacts with this habitat type	No

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Soil type: area/Hectares	Variety, area and extent of soil types necessary to support turlough vegetation and other biota	No The Project will not affect substrate	No
Soil nutrient status: nitrogen and phosphorous/N and P concentration in soil	Nutrient status appropriate to soil types	No The Project will not affect substrate	No
Physical structure: bare ground/Presence	Sufficient wet bare ground, as appropriate	No The Project will not affect substrate	No
Chemical processes: calcium carbonate deposition and concentration/$CaCO_3$ deposition rate/soil concentration	Appropriate $CaCO_3$ deposition rates and concentration in soil	No The Project will not affect chemical processes	No
Water quality: nutrients; colour; phytoplankton; epiphyton/Various	Appropriate water quality to support the natural structure and functioning of the habitat	A reduction in water quality in Galway Bay during construction and operation could affect the water quality features effecting habitat quality	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Active peat formation/Flood duration	Active peat formation, where appropriate	No The Project will not affect flood regime or peat formation	No
Vegetation composition: area of vegetation communities/Hectares	Maintain area of sensitive and high conservation value vegetation communities/units at each turlough	A reduction in water quality in Galway Bay during construction and operation could affect vegetation composition	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Vegetation composition: vegetation zonation/Distribution	Maintain vegetation zonation/mosaic characteristic of each turlough	A reduction in water quality in Galway Bay during construction and operation could affect vegetation composition	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Vegetation structure: sward height/Centimetres	Sward heights appropriate to the vegetation unit, and a variety of sward heights across each turlough	A reduction in water quality in Galway Bay during construction and operation could affect vegetation structure	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Typical species: terrestrial, wetland and aquatic plants, invertebrates and birds/Presence	Maintain typical species within and across all turloughs	A reduction in water quality in Galway Bay during construction and operation could affect habitat species composition	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Fringing habitats: area/Hectares	Maintain marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations	A reduction in water quality in Galway Bay during construction and operation could affect vegetation structure	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Vegetation structure: turlough woodland/Species diversity and woodland structure	Maintain appropriate turlough woodland diversity and structure	A reduction in water quality in Galway Bay during construction and operation could affect vegetation structure	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
[6210] Semi - natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia) (*important orchid sites) **To maintain the favourable conservation condition of Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area - Hectares	Area stable or increasing, subject to natural processes	Introducing/spreading non-native invasive plant species to Galway Bay Complex SAC could result in the loss of areas of Calcareous grassland habitat and potentially affect habitat distribution	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Habitat distribution - Occurrence	No decline, subject to natural processes.	As above for habitat area	As above for habitat area
Vegetation composition: typical species – Number	At least 7 positive indicator species present, including 2 "high quality" species	As above for habitat area	As above for habitat area
Vegetation composition: negative indicator species – Percentage	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10% Non-native invasive species, absent or under control	No The Project will not directly affect Calcareous grassland habitat within Galway Bay Complex SAC and therefore, will not affect negative indicator species cover on Calcareous grassland habitat (non-native species as per O'Neill et al., 2013)	No

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation structure: woody species and bracken (Pteridium aquilinum) – Percentage	Cover of bracken (Pteridium aquilinum) and woody species (except juniper Juniperus communis) and not more than 5% cover	No The Project will not directly affect Calcareous grassland habitat within Galway Bay Complex SAC and therefore, will not increase woody species or bracken cover in Calcareous grassland habitat in Galway Bay Complex SAC	No
Vegetation composition: broadleaf herb: grass ratio – Percentage	Broadleaf herb component of vegetation between 40 and 90%	Introducing/spreading non-native invasive plant species to Galway Bay Complex SAC could affect the broadleaved herb to grass ratio of Calcareous grassland habitat areas	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation structure: sward height – Percentage	30-70% of sward between 5cm and 40cm high	Introducing/spreading non-native invasive plant species to Galway Bay Complex SAC could affect the percentage of Calcareous grassland habitat at a suitable sward height	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Physical structure: bare ground – Percentage	Not more than 10% bare ground	No The Project will not contribute to physical disturbance levels leading to any increase in bare ground in Calcareous grassland habitats in Galway Bay Complex SAC	No
Calcareous fens with Cladium mariscus and species of the Caricion davallianae [7210] **To maintain the favourable conservation condition of Calcareous fens with Cladium mariscus and species of the Caricion davallianae in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area/Hectares	Area stable or increasing, subject to natural processes	A reduction in water quality in Galway Bay during construction and operation could affect habitat extent	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Habitat distribution/Occurrence	No decline, subject to natural processes	A reduction in water quality in Galway Bay during construction and operation could affect habitat distribution	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Hydrological regime/Flow rates, metres	Appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	No The Project will not affect flood regime	No

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Peat formation/Flood duration	Active peat formation, where appropriate	No The Project will not affect flood regime or peat formation	No
Water quality: nutrients/Water chemistry measures	Appropriate water quality to support the natural structure and functioning of the habitat	A reduction in water quality in Galway Bay during construction and operation could affect water quality and chemical characteristics	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Vegetation composition: typical species/Presence	Maintain vegetation cover of typical species including brown mosses and vascular plants	A reduction in water quality in Galway Bay during construction and operation could affect vegetation composition	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Vegetation composition: trees and shrubs/Percentage	Cover of scattered native trees and shrubs not more than 10%	A reduction in water quality in Galway Bay during construction and operation could affect vegetation composition	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Physical structure: disturbed bare ground/Percentage	Cover of disturbed bare ground not more than 10%. Where tufa is present, disturbed bare ground not more than 1%	No The Project will not affect substrate	No
Physical structure: drainage/Percentage	Areas showing signs of drainage as a result of drainage ditches or heavy trampling not more than 10%	No The Project will not affect the drainage structures	No
Alkaline fens [7230] **To maintain the favourable conservation condition of Alkaline fens in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area/Hectares	Area stable or increasing, subject to natural processes	A reduction in water quality in Galway Bay during construction and operation could affect habitat extent	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Habitat distribution/Occurrence	No decline, subject to natural processes	A reduction in water quality in Galway Bay during construction and operation could affect habitat distribution	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Hydrological regime/Flow rates, metres	Appropriate natural hydrological regime necessary to support the	No	No

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
	natural structure and functioning of the habitat	The Project will not affect flood regime or flow dynamics	
Peat formation/Flood duration	Active peat formation, where appropriate	No The Project will not affect flood regime or peat formation	No
Water quality: nutrients/Water chemistry measures	Appropriate water quality to support the natural structure and functioning of the habitat	A reduction in water quality in Galway Bay during construction and operation could affect water quality and chemical characteristics	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Vegetation composition: typical species/Presence	Maintain vegetation cover of typical species including brown mosses and vascular plants	A reduction in water quality in Galway Bay during construction and operation could affect vegetation composition	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Vegetation composition: trees and shrubs/Percentage	Cover of scattered native trees and shrubs less than 10%	A reduction in water quality in Galway Bay during construction and operation could affect vegetation composition	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Physical structure: disturbed bare ground/Percentage	Cover of disturbed bare ground less than 10%. Where tufa is present, disturbed bare ground less than 1%	A reduction in water quality in Galway Bay during construction and operation could affect vegetation structure	General design measures to maintain water quality to the receiving hydrogeological environment Section 10.4
Physical structure: drainage/Percentage	Areas showing signs of drainage as a result of drainage ditches or heavy trampling less than 10%	No The Project will not affect the drainage structures	No
[8240] Limestone pavements *[63] **To restore the favourable conservation condition of Limestone pavements* in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Habitat area: - Hectares	Area stable or increasing, subject to natural processes.	Introducing/spreading non-native invasive plant species to Galway Bay Complex SAC could result in the loss of areas of Limestone pavement habitat and potentially affect habitat distribution	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8

[63] Conservation Objective used to assess newly-listed QI is based on conservation objectives available for other European sites with equivalent QI habitats (recommended by the NPWS - Section 3.1), in this case the more recent Conservation Objectives for the nearby East Burren Complex SAC 001926 (NPWS, 2022)

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Distribution: - Occurrence	No decline	As above for habitat area	As above for habitat area
Vegetation composition: typical species: positive indicator species - Number at a representative number of monitoring stops	At least seven positive indicator species present	As above for habitat area	As above for habitat area
Vegetation composition: bryophyte layer - Percentage at a representative number of monitoring stops	Bryophyte cover at least 50% on wooded pavement	Introducing/spreading non-native invasive plant species to Galway Bay Complex SAC could affect the bryophyte layer and cover percentage	Measures to control the introduction/ spread of non-native invasive plant species Section 10. 8
Vegetation composition: negative indicator species - Percentage at a representative number of monitoring stops	Collective cover of negative indicator species on exposed pavement not more than 1%	No The Project will not directly affect Limestone pavements habitat within Galway Bay Complex SAC and therefore, will not affect negative indicator species cover on Limestone pavements habitat (non-native species as per O'Neill et al., 2013)	No
Vegetation composition: non-native species - Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1% on exposed pavement; on wooded pavement not more than 10% with no regeneration	Introducing/spreading non-native invasive plant species to Galway Bay Complex SAC could affect the presence of non-native species in the Limestone pavement habitat	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation composition: scrub - Percentage at a representative number of monitoring stops	Scrub cover no more than 25% of exposed pavement	Introducing/spreading non-native invasive plant species to Galway Bay Complex SAC could affect the scrub layer and cover percentage	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
Vegetation composition: bracken cover – Percentage at a representative number of monitoring stops	Bracken (Pteridium aquilinum) cover no more than 10% on exposed pavement	No The Project will not directly affect Limestone pavement habitat within Galway Bay Complex SAC and therefore will not increase the incidence or cover of bracken in the Limestone pavement habitat	No
Vegetation structure: woodland canopy -	Canopy cover on wooded pavement at least 30%	No	No

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Percentage at a representative number of monitoring stops		The Project will not directly affect Limestone pavement habitat within Galway Bay Complex SAC and therefore will not increase the incidence or cover of woody species in the Limestone pavement habitat	
Vegetation structure: dead Wood – Occurrence in a representative number of monitoring stops	Sufficient quantity of dead wood on wooded pavement to provide habitat for saproxylic organisms	No The Project will not directly affect Limestone pavement habitat within Galway Bay Complex SAC and therefore will not affect the quantity of dead wood for saproxylic organisms	No
Physical structure: disturbance - Occurrence in a representative number of monitoring stops	No evidence of grazing pressure on wooded pavement	No The Project will not directly affect Limestone pavement habitat within Galway Bay Complex SAC nor contribute to increased grazing pressure in this habitat	No
Indicators of local distinctiveness – Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	Introducing/spreading non-native invasive plant species to Galway Bay Complex SAC could result in the loss of areas of Limestone pavement habitat and potentially affect species composition which in turn could cause declines in distinctive species of Limestone pavement habitat	Measures to control the introduction/ spread of non-native invasive plant species Section 10.8
[1355] Otter *Lutra lutra* **To restore the favourable conservation condition of Otter in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			
Distribution - Percentage positive survey sites	No significant decline	No, the proposed N6 GCRR and as such the Project affecting water quality in Galway Bay during construction will not affect the distribution or range of the species in Galway Bay	No
Extent of terrestrial habitat - Hectares	No significant decline. Area mapped and calculated as c.262ha above high water mark (HWM); c.14ha along river banks/around ponds	No, the proposed N6 GCRR and as such the Project affecting water quality in Galway Bay during construction will not affect the extent of terrestrial habitat available for Otter in the SAC	No
Extent of marine habitat - Hectares	No significant decline. Area mapped and calculated as 2040ha	No, the proposed N6 GCRR and as such the Project affecting water quality in Galway Bay during construction will not affect the extent of marine habitat available for Otter in the SAC	No

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Extent of freshwater (river) habitat - Kilometres	No significant decline. Length mapped and calculated as 4km	No, the proposed N6 GCRR and as such the Project affecting water quality in Galway Bay during construction will not affect the extent of river habitat available for Otter in the SAC	No
Extent of freshwater (lake/lagoon) habitat - Hectares	No significant decline. Area mapped and calculated as 21ha	No, the proposed N6 GCRR and as such the Project affecting water quality in Galway Bay during construction will not affect the extent of lake habitat available for Otter in the SAC	No
Couching sites and holts - Number	No significant decline	The proposed N6 GCRR and as such the Project affecting water quality in Galway Bay during construction could (at least temporarily) affect usage of holt/couch sites available for Otter in the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Fish biomass available - Kilograms	No significant decline	A reduction in water quality in the Bearna Stream catchment or Galway Bay during construction could affect fish populations in the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Barriers to connectivity - Number	No significant increase	No The Project does not pose a barrier to Otter movement within the SAC. However, it may pose a barrier to Otter movement within the Bearna Stream catchment – watercourses that are likely to be used by the Galway Bay Complex SAC Otter population	Measures to ensure continued passage of Otter throughout watercourses in the Bearna Stream catchment Section 10.10
Mortality risk posed by road traffic	Not defined in any existing conservation objectives document	Although the potential for Otter to gain access to the proposed N6 GCRR lies outside of the boundary of Galway Bay Complex SAC there is still the potential for the proposed N6 GCRR to pose a permanent mortality risk to the Galway Bay Otter population (which are likely to use habitat along the Bearna Stream and the Tonabrocky Stream), which could have long-term effects on the local population	Use of Otter resistant fencing to prevent Otter gaining access to the road carriageway Section 10.11.2
[1365] Harbour seal Phoca vitulina **To maintain the favourable conservation condition of Harbour Seal in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:**			

Attributes and Measures (NPWS, 2013a)	Target (NPWS, 2013a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Access to suitable habitat - Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use	No The Project is more than 1km from the coastal zone within the SAC and poses no risk of restricting the range of Harbour seal in Galway Bay	No
Breeding behaviour - Breeding sites	Conserve breeding sites in a natural condition	A reduction in water quality in Galway Bay during construction could affect the quality/condition of breeding sites in the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Moulting behaviour - Moult haul-out sites	Conserve moult haul-out sites in a natural condition	A reduction in water quality in Galway Bay during construction could affect the quality/condition of breeding sites in the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Resting behaviour: - Resting haul-out sites	Conserve resting haul-out sites in a natural condition	A reduction in water quality in Galway Bay during construction could affect the quality/condition of breeding sites in the SAC	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Disturbance - Level of impact	Human activities should occur at levels that do not adversely affect the harbour seal population at the site	No The Project is more than 1km from the coastal zone within the SAC and poses no risk of disturbance to Harbour seal	No

9.3 Lough Corrib SPA

9.3.1 Special Conservation Interests and Conservation Objectives of Lough Corrib SPA

The SCI bird species, and the overall conservation objective for each, for which Lough Corrib SPA is designated are listed below in Table 9.22 (NPWS, 2023a). Those highlighted (in green) are the SCIs which were recorded within the ZoI of the Project and are therefore, at risk from impacts associated with the Project.

Table 9.22 SCIs of Lough Corrib SPA

SCIs	Conservation Objective
Greenland white-fronted goose *Anser albifrons flavirostris* [A395] – Wintering	To restore the favourable conservation condition
Gadwall *Anas strepera* [A051] – Wintering	To restore the favourable conservation condition
Shoveler *Anas clypeata* [A056] – Wintering	To restore the favourable conservation condition
Pochard *Aythya ferina* [A059] – Wintering	To restore the favourable conservation condition
Tufted duck *Aythya fuligula* [A061] – Wintering	To restore the favourable conservation condition
Common scoter *Melanitta nigra* [A065] – Breeding	To maintain the favourable conservation condition
Hen harrier *Circus cyaneus* [A082] – Wintering	To restore the favourable conservation condition
Coot *Fulica atra* [A125] – Wintering	To restore the favourable conservation condition
Golden plover *Pluvialis apricaria* [A140] – Wintering	To maintain the favourable conservation condition
Black-headed gull *Chroicocephalus ridibundus* [A179] – Breeding/Wintering	To restore the favourable conservation condition
Common gull *Larus canus* [A182] – Breeding/Wintering	To restore the favourable conservation condition
Common tern *Sterna hirundo* [A193] – Breeding	To restore the favourable conservation condition
Arctic tern *Sterna paradisaea* [A194] – Breeding	To restore the favourable conservation condition
Wetlands and Waterbirds [A999]	To maintain the favourable conservation condition

The specific attributes and targets used to define the conservation objectives of the SCI species are presented in Table 9.28.

The baseline populations of the SCIs are taken from the data presented in Table 3.2 of the European sites Standard Data Form for Lough Corrib SPA.[64]

Although the extents of areas surveyed altered between the surveys undertaken during 2022-2024 (surveys were undertaken within a 300m buffer of the Assessment Boundary) and the surveys undertaken during 2014-2015 (surveys were focussed on defined wintering bird sites across the Scheme Study Area), the results are discussed in terms of the discrete wintering bird sites identified during the 2014/2015 surveys taking full cognisance of the results from the 2022-2024 surveys. The SCI activity was largely concentrated around these sites in the surveys undertaken between 2022 to 2024. In general, the findings of the breeding and wintering bird surveys completed over 2022 to 2024 supported findings from 2014/2015 surveys, other than the increased Golden Plover populations noted at the Galway Racecourse in 2023. The updated ecological

[64] available at https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=IE0004042

baseline data has not altered the overall findings of the assessment presented below compared to the 2018 NIS.

9.3.2 Ecological Baseline

Lough Corrib SPA is a vast site comprising Lough Corrib, most of its islands, and much of the wetland habitat that surrounds the lake margin. The Project does not traverse the Lough Corrib SPA, however, the closest areas of its wetland habitat to the Project are at Tonacurragh and Coolanillaun where there is a wetland mosaic of bog, heath, reed swamp, marsh and wet grassland habitats.

Although this SPA lies outside, and upstream of, the Project, many bird species listed as SCIs of the SPA were recorded at winter bird survey sites across the Scheme Study Area. The habitat types associated with these sites ranged from natural/semi-natural lakes and wetland complexes (Ballindooley Lough, Coolagh Lakes and Lough Inch), the River Corrib, and upland mosaics of bog, heath, wet and acid grasslands, to improved and intensively managed habitats such as agricultural fields and amenity areas within Galway City (e.g. UoG Sporting Campus).

There were three bird species recorded during the various breeding bird surveys which are SCIs of Lough Corrib SPA for their breeding population: Common tern and Black-headed gull (2023 and 2024 breeding season surveys) and the Common gull (2023 breeding surveys). This supports earlier findings of the surveys carried out along the River Corrib corridor in 2005/2006 for the N6 Galway City Outer Bypass Project (Appendix G), where these species were recorded frequently over the summer months along the river, but in low numbers. All three species are known to breed on islands and rock outcroppings in both Galway Bay and Lough Corrib.

The full breeding bird survey results are provided in Appendix I. The results of the breeding bird surveys with respect to these species are shown on Figures 8.1 to 8.2 and Figures 9.1 to 9.2.

The full results of the winter bird surveys, as they relate to those species listed as SCIs of Lough Corrib SPA and Inner Galway Bay SPA, are provided in Appendix J. The winter bird survey sites referred to therein, are shown on Figure 10. Confirmed SCI wintering birds include: Gadwall, Shoveler, Tufted duck, Hen harrier, Coot, Golden plover, Black-headed gull and Common gull.

9.3.3 Potential Direct and Indirect Impacts

As the Project does not traverse the SPA, none of the SCI species, or their supporting habitats within the SPA, are directly impacted by the Project.

However, there are the following impacts by which the Project could (in the absence of mitigation measures) potentially affect SCI bird species or their supporting wetland habitats within Lough Corrib SPA:

- Habitat degradation as a result of hydrogeological impacts - the Project has the potential to affect the existing hydrogeological regime supporting groundwater dependant wetland habitats (at potential *ex-situ* sites[65]) which in turn support wintering bird species listed as SCIs of Lough Corrib SPA
- Habitat degradation as a result of hydrological impacts - the Project has the potential to affect water quality in the receiving environment supporting aquatic and wetland habitats (within the SPA and at potential *ex-situ* sites) which in turn support bird species listed as SCIs of Lough Corrib SPA
- Disturbance/displacement - disturbance during construction and/or operation could result in the displacement of SCI birds from important habitat areas within and outside of the SPA boundary (i.e. at potential *ex-situ* sites)

[65] The need to consider use of habitat areas outside of an SPA by SCI bird species is set out in Section 3.1 and 5.2 of the *Inner Galway Bay Special Protection Area (Site Code 4031), Conservation Objectives Supporting Document, Version 1* (NPWS, 2013b). These areas are termed '*ex-situ*' sites and are defined as areas of habitat situated within the immediate hinterland of the SPA, or in areas ecologically connected to it, which support SCI bird species. There is no information or evidence to confirm whether any of the bird species recorded in habitats outside of European sites, which are within the ZoI of the Project, are birds from either Lough Corrib SPA and/or Inner Galway Bay SPA, or are not part of the population from either European site. Therefore, a precautionary approach is being taken in assuming that any habitat areas supporting SCI bird species are potentially '*ex-situ*' sites under that definition, and are assessed accordingly.

- Habitat loss/fragmentation - the Project passes through, and will result in habitat loss in potential "*ex-situ*" sites where SCI bird species were recorded

9.3.4 Examination and Analysis of Potential Direct and Indirect Impacts

9.3.4.1 Habitat degradation as a result of hydrogeological/hydrological impacts

Hydrogeology

In terms of interaction with groundwater, the Project has the potential to affect both groundwater quantity (dewatering and drawdown effects during construction, and drawdown effects during operation as a consequence of road cuttings) and groundwater quality within the receiving environment. This is unchanged from the 2018 NIS.

The hydrogeological ZoI of the Project extends beyond the Assessment Boundary in many locations, where it has the potential to influence groundwater dependant habitats outside of the Assessment Boundary. The only wintering bird survey site supporting SCI listed bird species in the western part of the study area that lies within this extended ZoI is WB07 (An Chloch Scoilte) (see Figure 8.1 and Figure 9.1). At this winter bird site, the hydrogeological ZoI for dewatering (1.8m between Ch. 1+600 and Ch. 1+950 of the proposed N6 GCRR, and 10.6m between Ch. 2+230 and Ch. 2+640 of the proposed N6 GCRR,) does not extend to affect any groundwater dependant habitat areas (e.g. wet heath) and, therefore, it will not affect the suitability of this peatland/scrub habitat mosaic to continue to support wintering birds. No bird species listed as SCIs of Lough Corrib SPA were recorded at WB07 during the winter bird surveys over 2022/2023 or 2014/2015. Over the 2023/2024 surveys Common gulls were recorded flying over and in the vicinity of WB07 (5 records all <5 individuals and no sedentary birds noted).). Despite the limited extent of activity within WB07 and the short duration of construction there may be small risk of groundwater quality impact from those works. More generally, across the western section of the proposed N6 GCRR, the proposed N6 GCRR passes through areas of dense scrub and/or bracken, and improved/wet agricultural grasslands. Equally, the effects of the Project in terms of hydrogeological impacts will not affect the suitability of the site to support wintering birds.

Along the eastern part of the proposed N6 GCRR, only three wetland areas supporting groundwater dependant habitats lie within the unmitigated hydrogeological ZoI: Coolagh Lakes, Ballindooley Lough (refer to Table 8 of Appendix A for the zone of influence associated with each of the cuttings) and western floodplain of the River Corrib (where it overlaps the Ross Lake GWB).

The proposed N6 GCRR and as such the Project lies within the same groundwater bodies that supply groundwater to the Coolagh Lakes (Lough Corrib Fen 1 (Menlough) GWB and the Lough Corrib Fen 1 (Lackagh) GWB) – see Figures 11.3.003 and 11.3.004 and Figures 12.1.003 and 12.1.004) and supports some of the fringing aquatic vegetation (Clare-Corrib GWB – see Figures 11.3.7 and 11.3.8 and Figure 12.1.007 and 12.1.008). As detailed above in Section 9.1.4.3 (Lough Corrib SAC), only the groundwater supply to the Coolagh Lakes (WB04), and the supported wetland habitats, could potentially be affected during the construction of the piers for Menlough Viaduct (although this is highly unlikely to occur) which lie within the Lough Corrib Fen 1 (Menlough) GWB[66]. This site was used by the bird species listed as SCIs of the SPA (Common gull and Coot in 2022/2023, Common gull, Coot and Tufted Duck in 2023/2024, and Black-headed gull and Coot in 2014/2015), but when recorded the numbers were low (generally between one and five individuals) – see Appendix J. Considering this, and that the River Corrib also contributes to the Coolagh Lakes, whilst some degree of effect on water levels and extent might occur, it would not result in the area being unusable or unable to support those wintering bird species recorded there (in those numbers). In any case, mitigation measures are required to prevent such an impact occurring and to ensure the Project poses no risk to groundwater quantity or quality supplying the Coolagh Lakes (see Section 10.4). As discussed in both Appendix A, Appendix F and Appendix L, the Project will not restrict or inhibit existing groundwater flow paths supporting groundwater dependant habitats.

[66] The Western Coolagh Spring is a karst spring within the Lough Corrib Fen 1 (Menlough) GWB and is the main source of groundwater flow to the Coolagh Lakes

There is a risk, in those sections of the Project underlain by limestone, of accidental spills during construction in areas where the bedrock outcrops, such as those areas where the groundwater has extreme or high vulnerability (Figure 3.01 and 3.02 of Appendix A) or where the karst limestone outcrops due to cuttings and excavations. Mitigation measures are therefore required to ensure that groundwater quality is not affected during construction (see Section 10.4).

The drainage design of the Project (as described in Section 2) will ensure that groundwater quality will be maintained during operation – as outlined in Appendix A, Appendix B, Appendix C and Appendix F.

Although the drainage design will ensure that groundwater quality will be maintained during operation, it is important that it is inspected to ensure that karst features do not affect the functioning of the infiltration basins during operation. If this is identified during routine inspections of the infiltration basins then mitigation will be required to ensure any issues are addressed so that the infiltration basins continue to function as designed for the operational lifespan of the Project (see Section 10.1 and Section 10.4).

As described in the Hydrogeology Assessment Report in Appendix A, Ballindooley Lough is up gradient from the Project in both of the groundwater bodies that supply groundwater to that lake (Clare-Corrib (Ballindooley East) GWB and the Clare-Corrib (Ballindooley West) GWB). Therefore, the Project poses no risk to groundwater quantity or quality supplying Ballindooley Lough.

Hydrology

During construction, contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water feature has the potential to have a negative impact on water quality in the receiving environment. There is also the potential for construction works to affect water quality in the River Corrib, Coolagh Lakes and Ballindooley Lough; all wetland sites supporting bird species listed as SCIs of Lough Corrib SPA. As discussed in Section 9.1.4.4 (in relation to Lough Corrib SAC and the River Corrib and Coolagh Lakes) the hydrological regime supporting the wetland habitats at these sites will not be affected. The effects of frequent and/or prolonged pollution events in a river system have the potential to be extensive and far-reaching, and could potentially have significant long-term effects. In an extreme scenario, with a pollution event of sufficient magnitude, the marine environment could also be affected.

However, it is extremely unlikely that a pollution event of such a magnitude would occur during construction. Any pollution events that may occur would be expected to be relatively minor in comparison to the dilution factor and assimilative capacity of the River Corrib, or to be any more than temporary in nature, and therefore is unlikely to have any perceptible or far-reaching effects. Nevertheless, a precautionary approach is being taken in assuming a level of risk of water quality impacts and mitigation measures are required to minimise the risk of the Project having any perceptible effect on water quality during construction.

Although Common tern were recorded along the River Corrib corridor during the 2023 (four birds in flight) and the 2015 breeding bird surveys (supported by more surveys of the River Corrib during the 2006 surveys for the 2006 N6 Galway City Outer Bypass Project (Appendix G)), any impact on water quality here will not affect the breeding success of the Common tern population in any way given that it could only affect a relatively small habitat area within the average foraging range for the species (c.15km, which includes the whole of Lough Corrib).

There will be outfall points to surface water features from the proposed road drainage network during operation. However, given the drainage design as described in Section 2 above and Section 10 below, and in Appendix A, Appendix B and Appendix C (which includes attenuation and pollution control elements) the normal operating water quality of the drainage outfalls, even in the unlikely event of a pollution incident, will not result in any perceptible impact on water quality in receiving watercourses. There will not be any drainage discharges to the Coolagh Lakes as per the 2018 NIS.

Summary

A summary of the potential hydrogeological/hydrological impacts associated with the Project are presented in Table 9.23 below.

Table 9.23 Summary of Hydrogeological/Hydrological Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
Construction		
Construction works affecting groundwater quantity	No Although the Project has the potential to affect groundwater supply to wetland habitats locally, this will not affect their usage by birds such that any population level effects would occur to the SCI populations	No
Construction works affecting groundwater quality	Yes Affecting the quality of groundwater supporting groundwater dependant habitats could affect the type, quality and extent of suitable habitat available to SCI bird species	Yes To ensure that construction works will not affect groundwater quality in the underlying aquifer Section 10.4
Construction works affecting surface water quality	Yes Affecting the quality of surface water supporting aquatic/wetland/marine habitats and species could affect the type, quality and extent of suitable habitat available to SCI bird species	Yes To ensure that water quality in the receiving environment is not affected during construction Section 10.5
Operation		
Groundwater quantity being affected during operation	No The design of the Project will not restrict or inhibit existing groundwater flow paths supporting groundwater dependant habitats used by bird species listed as SCIs of Lough Corrib SPA, However, it is important that they are inspected to ensure that karst features do not affect the functioning of the infiltration basins during operation	Yes To ensure that the infiltration basins continue to function as designed for the operational lifespan of the Project (as outlined in Section 10.4)
Groundwater quality being affected during operation	Yes Although the drainage design (as described in Section 2, and Appendices A, B, C and F) will ensure that groundwater quality will be maintained during operation, it is important that they are inspected to ensure that karst features do not affect the functioning of the infiltration basins during operation	Yes To ensure that the infiltration basins continue to function as designed for the operational lifespan of the Project (as outlined in Section 10.4)

9.3.4.2 Disturbance/displacement – within SPA

The SPA boundary is more than 700m from the main construction works associated with the proposed N6 GCRR, i.e. mainline and tie in with the existing road network. At this distance, no disturbance or displacement effects would be experienced within the SPA during construction. There will also not be any blasting within 800m of Lough Corrib SPA. With the Project more than 700m from the SPA during operation, no disturbance to wintering birds would be experienced. Construction of the proposed outfall for N59 Link Road North drainage from the Bushypark Junction to the River Corrib is c.200m from the SPA at its most northeasterly extent (Figures 15.2, 16.2,17.2 and 18.2), and the construction of an access road at Menlough is c.70m from the SPA, and some level of construction disturbance to bird species on the river channel itself, and at the southern end of Coolanillaun, would be expected. However, as these works will be temporary in nature (approximately one month construction period), would only cover a relatively small area of the SPA within the disturbance ZoI (c.9ha), and that bird species would be expected to habituate to the predicted noise levels at a distance of 200-300m, construction related disturbance will not result in any long-term displacement of SCI bird species from habitats within the SPA.

Black-headed gull, Common gull and Common tern are listed as SCIs for their breeding populations. The nearest Black-headed gull breeding site were known from Angliham Quarry; c.1.3km to the north of the Project, where 11 of 431 nest sites recorded during the 2007 survey were located. From Conservation

Objectives report for Lough Corrib (NPWS, 2023a), a 2017 survey identified one breeding colony located in the upper basin, an overall decline from the two breeding colonies identified in 2010, one in each of the two basins (McGreal, 2011).

There are many islands in Lough Corrib traditionally used as Common gull breeding sites, and many bays, islands and sections of shoreline in the lake traditionally used as Common tern nest sites. The 2010 surveys (McGreal, 2011 in NPWS, 2023a) identified 30 Common Gull breeding sites across the lough, with the greatest concentration in the narrows (McGreal, 2011). Common tern breeds colonially usually on islands/islets and often with congener species and/or gulls. Hunt and Heffernan (2007) recorded common tern at four sites within Lough Corrib. The nearest of these sites was at Walsh's Island, more than 8.5km to the north of the Project. At this distance, the breeding sites would be beyond the ZoI of any disturbance/displacement effects during construction or operation.

Summary

A summary of the potential disturbance/displacement impacts at Lough Corrib SPA associated with the Project are presented in Table 9.24 below.

Table 9.24 Summary of Disturbance/Displacement Impacts at Lough Corrib SPA

Potential Direct and Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
Construction		
Construction works disturbing/displacing SCI bird species within Lough Corrib SPA	No As Lough Corrib SPA is beyond the ZoI of any long-term construction related disturbance	No
Operation		
Disturbing/displacing SCI bird species within Lough Corrib SPA during operation	No As Lough Corrib SPA is beyond the ZoI of any disturbance during operation of the Project	No

Therefore, to the limited extent that there will be disturbance of SCI within the SPA during construction or operation of the Project, this will not result in long-term displacement and will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Lough Corrib SPA (see Table 9.28).

9.3.4.3 Disturbance/displacement – at potential ex-situ sites

As discussed in Section 7.8, only those winter bird, or potential "*ex-situ*", sites which lie within 300m of the Project, or those that lie within 800m of areas where prolonged blasting activity is likely, are predicted to be subject to some level of prolonged construction related disturbance.

Of the 60 winter bird sites surveyed in 2014/2015, 19 fall within or partially within the disturbance ZoI. Most records for bird species listed as SCIs for Lough Corrib SPA (Gadwall, Black-headed gull, Common gull, Common tern, Coot, Golden plover, Hen harrier, Shoveler and Tufted duck) were recorded at 12 sites and immediate surrounds in the 2023/2024 surveys, 10 sites and immediate surrounds in the 2022/2023 surveys, and eight sites in 2014/15 surveys. The full results of the winter bird surveys are provided in Appendix J.

Greenland white-fronted goose, Pochard, Common scoter, and Arctic tern

Greenland white-fronted goose, Pochard, Common scoter, and Arctic tern were not recorded in any of the winter bird survey sites for the Project during any of the survey periods (2022-2024 and 2014-2015), nor were they recorded along the River Corrib corridor during the preceding 2006 surveys undertaken for the 2006 N6 Galway City Outer Bypass (Appendix G). Therefore, these SCIs are not at risk of any disturbance effects from the construction or operation of the Project. Two of these species are listed as SCIs for their

breeding populations, Common scoter and Arctic tern, but the nearest breeding sites are more than 14km and 10km, respectively, from the Project and therefore beyond the disturbance ZoI.

Therefore, any disturbance or displacement associated with construction or operation of the Project at any potential *ex-situ* sites will not affect the conservation objective attributes and targets supporting the conservation condition of these species in Lough Corrib SPA (see Table 9.28).

Gadwall and Shoveler

Gadwall was recorded on one occasion only (2023/2024 survey season), with 5 individuals (>10% of the 48 mean wintering population) to the north of Ballindooley Lough (WB02) in March 2024. The birds were recorded in a field more than 800m from the Assessment Boundary.

In 2023/2024, Shoveler were only recorded at Ballindooley Lough (WB02) on nine occasions. The maximum number of individuals recorded was 40 birds in December 2023, with all other records being less than 15 individuals. Shoveler were only recorded at Ballindooley Lough (WB02) on six occasions during the 2022/2023 surveys. The number of individuals were low (2-11 birds). Shoveler were recorded on, or flying into, only one of the winter bird survey sites in 2014/15: Ballindooley Lough (WB02). They were recorded in five of the seven survey visits in numbers ranging from 10 to 144. A flock of 144 birds is a significant number and is in excess of the SPA's baseline winter population of 90.

As would be expected for a diving duck species, the principle habitat used at Ballindooley Lough was the main body of the lake itself, which lies c.300m from the Project at its nearest point. There are three elements of the proposed N6 GCRR, and as such the Project, which have the potential to affect Ballindooley Lough, and any SCI listed species therein, through construction related disturbance: the installation of the fencing to the north of the proposed N6 GCRR, between Ch. 12+250 and Ch. 12+400, approximately 240m from the lake shore; the cutting east of Lackagh Quarry (which lies c.450m from the lake); and the cutting at Castlegar (c.350m from the lake).

Noise levels associated with installing the fencing would be temporary (a matter of days) and expected to be below 50dB at that distance and therefore, would not displace wintering birds from the lake as a result of noise. Increased human presence may have a temporary disturbance effect in the immediate vicinity; with the majority of wetland habitat unaffected. Neither would affect usage of the lake by the species in the long-term. Blasting at Ballindooley and Castlegar has the potential to disturb and displace wintering birds using Ballindooley Lough and mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects.

Tufted duck

Tufted duck were recorded at Coolagh Lakes (WB16) in 2023/2024 (three records of two birds each) and Ballindooley Lough (WB02) (10 records with individual birds ranging from 2-14 birds) over the 2023-2024 survey. Tufted duck were recorded at Ballindooley Lough (WB02) (five records with individual birds ranging from 4-8 birds) over the 2022/2023 survey. Tufted duck were recorded at one of the winter bird sites surveyed in 2014/2015, namely Ballindooley Lough (WB02), where the species was recorded on four occasions over that winter (November, January, February and March). The maximum number recorded was a count of 26 in January 2015, corresponding with what could be <0.5% of the SPA's baseline winter population of 5,521.

As discussed above in relation to Shoveler and construction related disturbance to water birds on the main body of the lake, mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects.

Hen harrier

Hen harrier (a single individual) was only recorded in the vicinity of Lough Inch in January 2015. The species was not observed again in the latter surveys carried out over 2022 to 2024. The Lough Inch location is more than 1km from the Project and at that distance will not be subject to any construction or operation disturbance/displacement effects. Internationally important numbers of Hen harrier are also known to

communally roost in winter within the SPA[67] and there are records of the species from Tonacurragh, Coolanillaun, Menlough and Angliham (Appendix G). None of the winter roost sites are within the construction or operational disturbance ZoI and would not therefore displace Hen harrier.

Therefore, disturbance or displacement of Hen harrier from the SPA or from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Lough Corrib SPA (see Table 9.28).

Coot

Coot were recorded at three of the winter bird sites surveyed in 2023/2024, 2022/2023 and 2014/2015: Ballindooley Lough (WB02), the Coolagh Lakes (WB04), and along the River Corrib corridor (WB12, and Appendix G). Although Coot were regularly recorded at all of these sites, the numbers were low with a maximum of 11 recorded at Ballindooley Lough in February/March 2015 (corresponding with what could be 0.08% of the SPA's baseline winter population of 14,473). Coot were recorded either on open water or amongst the fringing aquatic vegetation at each of these locations. At each of the winter bird sites these habitats are present within the general construction disturbance ZoI and some level of disturbance/displacement would be expected. However, disturbance would only affect relatively low numbers of Coot in the context of the SPA population. Both the construction and operational disturbance ZoI at the Coolagh Lakes and along the River Corrib corridor covers a relatively small area in the context of suitable alternative habitat available for the species locally, and during construction disturbance effects will not displace Coot from those sites. During operation, Coot would not be displaced from habitat within these winter bird sites.

Blasting at Ballindooley and Castlegar has the potential to disturb and displace wintering birds using Ballindooley Lough and mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects.

Golden plover

Golden plover were recorded three times during the 2022-2024 surveys, on all occasions at the eastern extent of the study area (WB01 and WB023). In January 2024, 74 birds (4.3% of the SPA's baseline winter population of 1,727) were recorded at Galway Racecourse (WB23) and another group of 28 birds (1.6% of the SPA's baseline winter population of 1,727) flying in the neighbouring adjacent area (cumulatively 102 birds or 5.9% of the SPA's baseline winter population of 1,727). In January 2023, 200 birds (11.6% of the SPA's baseline winter population of 1,727) were recorded at Ardaun (WB01).

Previously, Golden plover were recorded at two of the winter bird sites surveyed in 2014/15: to the east and west of Lough Inch (WB06 and WB08, respectively). The survey site east of Lough Inch is more than 700m from the proposed N6 GCRR, a distance well beyond the construction and operational disturbance ZoI at which disturbance or displacement effects would affect usage of the area by Golden plover.

Golden plover were recorded frequently at WB08 (on four out of seven survey visits) but, on all but one occasion when a flock of 73 were recorded (November 2014), in relatively low numbers (maximum of 9 birds, which corresponds with what could be 0.5% of the SPA's baseline winter population of 1,727[33]; the record of 73 would equate to 4.2%). The proposed N6 GCRR only clips the southernmost edges of this winter bird site, in an area with a relatively high density of residential dwellings for an upland area, far removed (more than 700m away) from the peatlands west of Lough Inch where the birds were observed. At this distance, disturbance or displacement effects associated with either construction or operation of the Project would not affect usage of the area by Golden plover.

The site peak counts of 102 and 200 individual birds, recorded during the 2023/2024 and 2022/2023 respectively, equates to 11.6% and 5.9% respectively of the mean peak count of the Lough Corrib SPA. The populations at Galway Racecourse (WB23) are more likely to be exposed to impacts from the development, temporary use and decommissioning of the temporary stable yards (Phase 1, 3 and 4 as per Section 2.1 and Section 2.4.7), but any significant impacts to the SCI populations from the temporary stables are ruled out, due to the infrequency of records of this species within the Assessment Boundary and WB23 (recorded in

[67] Information from the current version of the Site Synopsis for the SPA (not available on the NPWS website at the time of writing) and from consultation with NPWS staff members – due to the sensitive nature of the locations of Hen harrier roosting sites the winter roost locations were provided in confidence and are not therefore mapped nor are distances to the winter roost sites published.

two of the 19 sites surveyed over 2022/2023 and 2023/2024 and previously in 2014/2015,), low numbers of this species recorded within the Assessment Boundary, and the limited disturbance of an area of low suitability for foraging and breeding in relation to the abundance of more suitable foraging habitat for this species in the wider locality.

Black-headed gull (breeding and wintering)

Although Black-headed gull were recorded along the River Corrib corridor during the 2023 and 2015 breeding bird surveys, in areas between the River Corrib and Lackagh Quarry during the 2023 breeding bird surveys undertaken for the Project, and were also recorded along the River Corrib as part of the 2006 surveys undertaken for the 2006 N6 Galway City Outer Bypass (Appendix G), any disturbance/displacement of birds as a result of bridge construction works will only be confined to the immediate vicinity of the proposed River Corrib Bridge and will not prevent birds feeding or commuting along the river corridor. Temporary displacement from such a relatively small habitat area during construction will not affect the breeding success of the species in any way. The operation of the Project, particularly given its elevation above the river (c.10m), will not displace birds from the area.

In winter surveys (2023/2024, 2022/2023 and 2014/2015), Black-headed gull were recorded widely across Galway City and its environs (from nine of the 19 sites during the wintering bird survey in the 2023/2024; eight of the 19 sites during the wintering bird survey in the 2022/2023, and 39 out of the 60 winter bird sites surveyed in 2014/2015). Individual numbers of birds ranged from single individuals to a flock of 37 (2023/2024), 65 (2022/2023) and 130 birds (2014/2015).

Those sites within 300m of the Project which recorded the larger flocks of over 40 individuals, were the River Corrib corridor (WB12 during all three surveys) and the UoG Sporting Campus (WB45 during the 2022/2023 and 2014/2015 surveys). The coastal areas outside the western extent of the Assessment Boundary had higher records over 2023/2024 surveys (larger flocks of 9, 14 and 30 birds). Black-headed gull were also frequently recorded along the River Corrib corridor during surveys undertaken in 2006 for the 2006 N6 Galway City Outer Bypass (Appendix G). Beyond the construction and operational disturbance ZoI there are other sites locally where larger flocks were recorded (>40 individuals), and are likely to be of importance to the local population: several urban parks within Galway City (WB24, WB28, WB31, WB38, and WB44) and fields along the northern shore of Oranmore Bay (WB71), where 130 were recorded in October 2014 (the highest single record during the surveys). Accounting for the fact that along the River Corrib corridor the majority of birds were recorded in the area immediately upstream of the Salmon Weir, the UoG Sporting Campus is the only one of these winter bird sites likely to be subject to significant disturbance/displacement effects during construction.

Operational displacement will not pose a significant risk at this site given that birds recorded in parks throughout Galway City have habituated to the proximity of existing roads and that the proposed N6 GCRR would be elevated above ground level through the UoG Sporting Campus, visually screening habitats used by the gulls from traffic. It was also noted during the 2014/2015 surveys at this site, that birds were regularly disturbed and temporarily displaced from playing fields by users of the sports facilities; quickly settling/returning to the same field or relocating to another nearby.

Black-headed gull were recorded in four of the seven survey visits to the UoG Sporting Campus, with 47 the maximum number recorded on any one visit (February 2015); a number which could represent approximately 23.9% of the SPA's baseline population of 197, and an average of 30 over the survey period which would account for approximately 15.2%. A maximum of 27 individuals (from a total of 5 records) were observed during the surveys undertaken over 2022/2023 (only one record of 17 individuals during the 2023/2024 surveys). Despite the percentage of the baseline population that could potentially be displaced during construction at UoG Sporting Campus, it is considered that this impact will not affect numbers, distribution, or the existing population trend for the species in the SPA (current data on the species' wintering population trend in the SPA is not currently published on the NPWS website) given the abundance of alternative suitable habitat, (e.g. amenity grassland) both within the UoG Sporting Campus and in the wider area (as evidenced by the amount of sites at which the species was recorded throughout Galway City

and its environs during the 2023/2024, 2022/2023 and 2014/2015 surveys), and the transient usage by Black-headed gulls of the majority of the surveyed sites used within the Scheme Study Area.[68]

Therefore, disturbance or displacement of Black-headed gull from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Lough Corrib SPA (see Table 9.28).

Common gull (breeding and wintering)

Although Common gull were recorded along the River Corrib corridor during the 2015 breeding bird surveys (none recorded in the River Corrib corridor during 2023 breeding bird surveys) undertaken for the Project, and were also recorded along the River Corrib as part of the 2006 surveys undertaken for the 2006 N6 Galway City Outer Bypass (Appendix G), any disturbance/displacement of birds as a result of bridge construction works will be confined to the immediate vicinity of the proposed River Corrib Bridge and will not prevent birds feeding or commuting along the river corridor. Temporary displacement from such a relatively small habitat area during construction will not affect the breeding success of the species in any way. The operation of the proposed N6 GCRR, particularly given its elevation above the river (c.10m), will not displace birds from the area.

In winter surveys (2023/2024, 2022/2023 and 2014/2015), Common gull were recorded widely across Galway City and its environs (from nine of the 19 sites during the wintering bird survey in the 2023/2024, seven of the 19 sites during the wintering bird survey in the 2022/2023, and27 out of the 60 winter bird sites surveyed in 2014/2015). Individual numbers of birds ranged from single individuals to a flock of 35 (2023/2024), 5 (2022/2023) and 120 birds (2014/2015).

Of the 27 survey sites at which Common gull were recorded, eight are within 300m of the Project. With the exception of the River Corrib (WB12) and the UoG Sporting Campus (WB45), Common gull were recorded infrequently (on one out of the seven survey visits) and in low numbers (16 or fewer individuals) in affected sites (2014/2015). The 2022/2023 records were concentrated around the River Corrib (WB12), UoG Sports Campus (WB45) and Coolagh Lakes (WB04), and supported the previous findings in terms of trends, but records and flock numbers were very low (total of 11 records across the Assessment Boundary with flock sizes ranging from 1-5). This is consistent with the trend across all 27 positive sites in the Scheme Study Area where at 23 of those, Common gull were only recorded on one or two of the seven survey visits and at 21 surveyed sites fewer than ten birds were recorded during all survey visits.

The 2023/2024 records are clustered around the coastal area outside the western extent of the Assessment Boundary (nine records with maximum flock size of 13), the area between and inclusive of WB07 and WB50 (6 records with maximum flock size of 35 at WB50), the area between and inclusive of WB04 (Coolagh Lakes) and WB36 (six records of 1-6 birds per flock), and the Galway Racecourse (WB23) and surrounds (5 records of 1-5 birds per flock).

Although frequently recorded in the River Corrib survey site (on six out of seven survey visits for the 2014/2015 study), and also frequently recorded along the River Corrib corridor during surveys undertaken in 2006 for the 2006 N6 Galway City Outer Bypass (Appendix G), the larger flocks were recorded on only two occasions in the 2014/15 surveys. These larger flock records were at locations more than 2km from the proposed River Corrib Bridge, in the area immediately upstream of the Salmon Weir, in September and November 2014 where 48 and 78 birds were recorded, respectively. The larger groups over the latter 2022-2024 surveys were recorded at WB31 (35 individuals in the 2023/2024 survey), the coast (9 and 13 individuals in the 2023/2024 survey) and open fields of WB24 south of Ballybrit Business Park (20 individuals in the 2023/2024 survey). Flock sizes did not exceed 5 during the 2022/2023 surveys. At these distances, disturbance or displacement effects associated with either construction or operation of the Project would not affect usage of the area by Common gull.

Common gull were less frequently recorded at the UoG Sporting Campus (on three of the seven survey visits) with only single birds recorded on two occasions, a flock of 21 were recorded in November 2014. Records were low over the 2022/2023 survey with no records at the UoG Sporting Campus over the 2023/2024 surveys. Overall, the potential displacement of relatively significant numbers of Common gull

[68] 77% of positive survey sites (i.e. where Black-headed gull were recorded at least once) only had the species present on three or fewer of the seven survey visits; only one surveyed site, the River Corrib corridor, had records of the species from all survey visits

during construction or operation (a record of 21 (2014/2015) and 35 (between 2022-2024) corresponds with what could be <43.8% to <72.9%) of the SPA's baseline winter population of 48) will not affect numbers, distribution, or the existing population trend for the species in the SPA[69] given the transient usage by Common gulls of the majority of the surveyed sites at which they were present, and the abundance of suitable alternative habitat available (i.e. the majority of the sites used by the species locally comprised managed amenity grassland or managed agricultural fields along the coastline).

Therefore, disturbance or displacement of Common gull from potential *ex-situ* sites during construction or operation of the Project will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Lough Corrib SPA (see Table 9.28).

Common tern

Although Common tern were recorded along the River Corrib corridor during the 2023 and 2015 breeding bird surveys, and were also recorded along the River Corrib as part of the 2006 surveys for the 2006 N6 Galway City Outer Bypass (Appendix G), any disturbance/displacement of birds as a result of bridge construction works will only be confined to the immediate vicinity of the proposed River Corrib Bridge and will not prevent birds feeding or commuting along the river corridor. Temporary displacement from such a relatively small habitat area within the average foraging range for the species (c.15km, which includes the whole of Lough Corrib) during construction will not affect the breeding success of the species in any way. The operation of the Project, particularly given its elevation above the river (c.10m), will not displace birds from the area.

Therefore, disturbance or displacement of Common tern from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Lough Corrib SPA (see Table 9.28).

Summary

A summary of the potential disturbance/displacement impacts at potential *ex-situ* sites associated with the Project are presented in Table 9.25 below.

Table 9.25 Summary of Disturbance/Displacement Impacts at Potential Ex-situ Sites

Potential Direct or Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
Construction		
General construction works disturbing/displacing SCI bird species at potential ex-situ sites outside of Lough Corrib SPA	No As construction related disturbance will not restrict the extent of habitat available to any SCI species such that any population level effects would occur	No
Long-term blasting at Lackagh Quarry and Castlegar disturbing displacing bird species listed as SCIs of Lough Corrib SPA at Ballindooley Lough	Yes As long-term blasting could displace SCI listed bird species from Ballindooley Lough for one or more winter seasons; potentially negatively affecting the wintering SPA population	Yes Seasonal restriction to blasting works in the vicinity of Ballindooley Lough to ensure no long-term disturbance or displacement Section 10.9
Operation		
Disturbing/displacing SCI bird species at potential ex-situ sites outside of Lough Corrib SPA during operation	No As operational disturbance will not restrict the extent of habitat	No

[69] Current data on the species' wintering population trend in the SPA is not currently published on the NPWS website

Potential Direct or Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
Construction		
	available to any SCI species such that any population level effects would occur	

9.3.4.4 Habitat loss/fragmentation – at potential ex-situ sites

The Project will result in varying degrees of habitat loss in nine of the winter bird sites where bird species listed as SCIs of Lough Corrib SPA were recorded: WB01, WB02, WB03, WB07, WB08, WB10, WB16, WB23 and WB45.

Overall, the areas of habitat loss are small relative to the extent of each affected winter bird survey site. The habitat types being lost are also common and widespread in the wider locality, in particular the peat/heathland habitats between Bearna and the N59 Moycullen Road, which extend to the northwest into Connemara. Similarly, for birds (as highly mobile species), habitat fragmentation is only likely to be an issue where it would result in the fragmented habitat patches being unviable in the long-term due to their reduced size, and consequently limit the availability of large areas of a given habitat type locally. In most cases the Project clips these winter bird sites along their southern boundary (WB01, WB02, WB03, WB07, WB08, WB10 and WB23) and the effects of habitat fragmentation are minimal, particularly given that for some winter bird sites (e.g. WB01 and WB23) the habitats represented are only a small proportion of those same habitats in the locality.

Loss of habitat, and any associated habitat fragmentation, at the winter bird sites will not result in a decline in the number and range of habitat areas available locally to bird species listed as SCIs of Lough Corrib SPA and will not therefore, affect the conservation objective attributes and targets supporting the conservation condition of SCI populations in Lough Corrib SPA (see Table 9.28).

Summary

A summary of the potential habitat loss and fragmentation impacts at potential *ex-situ* sites associated with the Project are presented in Table 9.26 below

Table 9.26 Summary of Habitat Loss/Fragmentation Impacts at Potential Ex-situ Sites

Potential Direct or Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
Construction/Operation		
Habitat loss and fragmentation at potential ex-situ sites outside of Lough Corrib SPA affecting habitat area available to SCI bird species	No As the scale of habitat loss and fragmentation will not restrict the extent of habitat available to any SCI species such that any population level effects would occur	No

9.3.4.5 Summary

This section presents a summary of the potential impacts on the SCI bird populations of Lough Corrib SPA as a result of the Project and how these impacts relate to affecting the site's conservation objectives.

Table 9.27 (NPWS, 2023a) below, lists the SCIs of Lough Corrib SPA and how the impacts discussed below relate to each. Those highlighted in green are those SCIs which are present within the ZoI of, and potentially affected by, the Project.

Table 9.27 SCIs of Lough Corrib SPA and Potential Impacts

SCIs	Impact
Greenland white-fronted goose *Anser albifrons flavirostris* [A395] – Wintering	No potential impact – none recorded within ZoI.
Gadwall *Anas strepera* [A051] – Wintering	Disturbance/displacement at potential ex-situ sites
Shoveler *Anas clypeata* [A056] – Wintering	Habitat degradation – hydrology Disturbance/displacement at potential ex-situ sites
Pochard *Aythya ferina* [A059] – Wintering	No potential impact – none recorded within ZoI.
Tufted duck *Aythya fuligula* [A061] – Wintering	Habitat degradation – hydrology Disturbance/displacement at potential ex-situ sites
Common scoter *Melanitta nigra* [A065] – Breeding	No potential impact – none recorded within ZoI.
Hen harrier *Circus cyaneus* [A082] – Wintering	None of the potential impacts will affect the winter roost site(s)
Coot *Fulica atra* [A125] – Wintering	Habitat degradation – hydrogeology at potential ex-situ sites (Coolagh Lakes) Habitat degradation – hydrology Disturbance/displacement at potential ex-situ sites
Golden plover *Pluvialis apricaria* [A140] – Wintering	Habitat degradation – hydrology
Black-headed gull *Chroicocephalus ridibundus* [A179] – Breeding/Wintering	Habitat degradation – hydrogeology at potential ex-situ sites (Coolagh Lakes) Habitat degradation – hydrology Disturbance/displacement at potential ex-situ sites
Common gull *Larus canus* [A182] – Breeding/Wintering	Habitat degradation – hydrology
Common tern Sterna hirundo [A193] – Breeding	Habitat degradation – hydrology
Arctic tern *Sterna paradisaea* [A194] – Breeding	No potential impact – none recorded within ZoI.
Wetlands [A999]	Habitat degradation – hydrogeology at potential ex-situ sites Habitat degradation – hydrology

The relationship between, and potential influence of, these impacts with respect to the SCI listed bird species within the ZoI of the Project and the attributes/targets upon which their favourable conservation condition is considered and measured, is considered further below and also presented in Table 9.35.

Gadwall [A051]

The species was noted more than 800m north of the Assessment Boundary but considered part of the Ballindooley Lough bird population.

Long-term blasting in the vicinity of Ballindooley Lough could displace Gadwall from this site for one or more winter seasons. This impact could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

Shoveler [A056]

The Project could affect surface water quality at potential *ex-situ* sites used by wintering Shoveler during construction (even though the risk of any perceptible effect is low) which could affect the type, quality and extent of wetland habitat available. These impacts could potentially negatively affect the long-term

population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

Long-term blasting in the vicinity of Ballindooley Lough could displace Shoveler from this site for one or more winter seasons. This impact could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

Tufted duck [A061]

The Project could affect surface water quality at potential *ex-situ* sites used by wintering Tufted duck during construction (even though the risk of any perceptible effect is low) which could affect the type, quality and extent of wetland habitat available. These impacts could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

Long-term blasting in the vicinity of Ballindooley Lough could displace Tufted duck from this site for one or more winter seasons. This impact could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

Coot [A125]

The Project could affect water quality in the River Corrib and groundwater and/or surface water quality at potential *ex-situ* sites used by wintering Coot during construction (even though the risk of any perceptible effect is low) which could affect the type, quality and extent of wetland habitat available. These impacts could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

Long-term blasting in the vicinity of Ballindooley Lough could displace Coot from this site for one or more winter seasons. This impact could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

Golden plover [A140]

The Project could affect surface water quality at potential *ex-situ* sites used by wintering Golden plover during construction (even though the risk of any perceptible effect is low) which could affect the type, quality and extent of wetland habitat available. These impacts could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPA's SCI bird populations.

Black-headed gull [A179]

The Project could affect water quality in the River Corrib and groundwater and/or surface water quality at potential *ex-situ* sites used by breeding/wintering Black-headed gull during construction (even though the risk of any perceptible effect is low) which could affect the type, quality and extent of wetland habitat available. These impacts could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPA's SCI bird populations.

Long-term blasting in the vicinity of Ballindooley Lough could displace Black-headed gull from this site for one or more winter seasons. This impact could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

Common gull [A182]

The Project could affect water quality in the River Corrib and groundwater and/or surface water quality at potential *ex-situ* sites used by breeding/wintering Golden plover during construction (even though the risk of any perceptible effect is low) which could affect the type, quality and extent of wetland habitat available.

These impacts could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPA's SCI bird populations.

Common tern [A193]

The Project could affect water quality in the River Corrib used by breeding Common tern during construction (even though the risk of any perceptible effect is low) which could affect the type, quality and extent of wetland habitat available. These impacts could potentially negatively affect the long-term population trends of the Lough Corrib SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

Wetlands [A999]

The permanent area of wetland habitat could be negatively affected as a result of hydrogeological impacts and/or hydrological impacts.

The Project could affect the groundwater quality at potential *ex-situ* sites used by wintering bird species listed as SCIs for Lough Corrib SPA. Groundwater quality impacts could affect the type, quality and extent of wetland habitat available to SCI bird species at those *ex-situ* sites which lie within the hydrogeological ZoI. The design of the Project avoids any long-term impacts to the existing groundwater regime that would affect any of the potential *ex-situ* sites used by SCI listed wintering birds. However, mitigation measures are required in the event that any groundwater conduits are encountered during construction and to ensure that karst features do not affect the functioning of the infiltration basins during operation.

The Project could affect the quality of surface water in the receiving environment which supports freshwater and wetland habitats, within potential *ex-situ* sites used by SCI birds species of Lough Corrib SPA (Ballindooley Lough in particular).

Table 9.28 Potential Impacts on the Conservation Objectives for SCIs of Lough Corrib SPA (Those rows highlighted in green are the attributes potentially affected by the Project)

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Gadwall **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Winter population trend - Percentage change in number of individuals	Long term winter population trend is stable or increasing	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Winter spatial distribution - Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Disturbance at wintering site – Intensity, frequency, timing and duration	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution	Disturbance/displacement of birds at Ballindooley Lough during construction	Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Barriers to connectivity and site use – Number, location, shape and hectares	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	No Project poses no barriers and species are not present within the ZoI of the Project	No
Forage spatial distribution, extent and abundance – Location, hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target	No Project poses no direct impact to the spatial extent of forage habitat for the species. Species are not present within the ZoI of the Project	No
Roost spatial distribution and extent –	Sufficient number of locations, area and availability of suitable roosting	No	No

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Location and hectares of roosting habitat	habitat to support the population target	Project poses no direct impact to the spatial extent of roost habitat for the species. Species are not present within the ZoI of the Project	
Shoveler **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Winter population trend - Percentage change in number of individuals	Long term population trend is stable or increasing	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Winter spatial distribution - Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Disturbance at wintering site – Intensity, frequency, timing and duration	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution	Disturbance/displacement of birds at Ballindooley Lough during construction	Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Barriers to connectivity and site use – Number, location, shape and hectares	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	No Project poses no barriers that would hinder species movement across the landscape.	No
Forage spatial distribution, extent and abundance – Location, hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Roost spatial distribution and Extent – Location and hectares of roosting habitat	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Pochard **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Winter population trend - Percentage change in number of individuals	Long term winter population trend is stable or increasing	No Species were not recorded within the ZoI of the Project	No
Winter spatial distribution - Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target	No Species were not recorded within the ZoI of the Project	No
Disturbance at wintering site – Intensity, frequency, timing and duration	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution	No Species were not recorded within the ZoI of the Project	No
Barriers to connectivity and site use – Number, location, shape and hectares	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	No Project poses no barriers and species are not present within the ZoI of the Project	No
Forage spatial distribution, extent and abundance – Location, hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target	No Species were not recorded within the ZoI of the Project	No
Roost spatial distribution and extent –	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target	No Species were not recorded within the ZoI of the Project	No

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Location and hectares of roosting habitat			
Tufted duck **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Winter population trend - Percentage change in number of individuals	Long term population trend is stable or increasing	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Winter spatial distribution - Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Disturbance at wintering site – Intensity, frequency, timing and duration	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution	Disturbance/displacement of birds at Ballindooley Lough during construction	Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Barriers to connectivity and site use – Number, location, shape and hectares	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	No Project poses no barriers that would hinder species movement across the landscape.	No
Forage spatial distribution, extent and abundance – Location, hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Roost spatial distribution and Extent – Location and hectares of roosting habitat	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Common Scoter **To maintain the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Breeding population trend – Percentage change in number of potential breeding pairs	Long term trend is stable or increasing	No Species were not recorded within the ZoI of the Project	No
Productivity rate – Number of young fledged per potential breeding pair	Sufficient productivity to maintain the population trend as stable or increasing	No Species were not recorded within the ZoI of the Project	No
Distribution of nesting habitat – Spatial distribution	No significant loss of distribution in the long term, other than that occurring due to natural patterns of variation	No Species were not recorded within the ZoI of the Project	No
Extent and condition of nesting habitat – Hectares of high quality nesting habitat	Sufficient area of high quality habitat to support the population target	No Species were not recorded within the ZoI of the Project	No
Disturbance at breeding site - Intensity, frequency, timing and duration	Disturbance occurs at levels that do not significantly impact the achievement of targets for breeding population trend and spatial distribution of nesting habitat	No Species were not recorded within the ZoI of the Project	No
Barriers to connectivity and site use – Number, location, shape and hectares	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	No Project poses no barriers and species are not present within the ZoI of the Project	No

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Forage spatial distribution, extent and abundance – Location, hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target	No Species were not recorded within the ZoI of the Project	No
Coot **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Winter population trend - Percentage change in number of individuals	Long term population trend is stable or increasing	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Winter spatial distribution - Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Disturbance at wintering site – Intensity, frequency, timing and duration	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution	Disturbance/displacement of birds at Ballindooley Lough during construction	Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Barriers to connectivity and site use – Number, location, shape and hectares	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	No Project poses no barriers that would hinder species movement across the landscape.	No
Forage spatial distribution, extent and abundance – Location, hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Roost spatial distribution and Extent – Location and hectares of roosting habitat	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Golden Plover **To maintain the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Winter population trend - Percentage change in number of individuals	Long term population trend is stable or increasing	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Winter spatial distribution - Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Disturbance at wintering site – Intensity, frequency, timing and duration	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Barriers to connectivity and site use – Number, location, shape and hectares	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	No Project poses no barriers that would hinder species movement across the landscape.	No
Forage spatial distribution, extent and abundance – Location, hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Roost spatial distribution and Extent – Location and hectares of roosting habitat	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Supporting habitat: area and quality – Hectares and quality	Sufficient area of utilisable habitat available in ecologically important sites outside the SPA	Construction impacts on the existing hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Hen harrier **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Roost attendance: individual hen harriers - Number	Long term winter population trend within the SPA is stable or increasing	No None of the impacts associated with the Project will result in a decline of Hen harrier numbers at winter roosts in the SPA	No
Forage area spatial distribution, extent and abundance – Location and hectares; prey biomass	Sufficient extent of suitable habitats and biomass of available prey items across the site to help support the population	No Based on the known records for Hen harrier in the southern part of Lough Corrib, none of the potential impacts associated with the Project will result in a	No

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
		decline of suitable Hen harrier foraging habitat either inside or outside of the SPA	
Roost spatial distribution and Extent – Location and hectares of roosting habitat	Sufficient number of locations, area of suitable roosting habitat to support the population	No None of the potential impacts associated with the Project will affect habitat condition at the winter roost sites	No
Disturbance at the roost site - Level of impact	Human activities should occur at levels that do not significantly impact upon wintering Hen harrier	No The Project will not increase disturbance levels at the roost sites and there will be no effects on this attribute/target	No
Black-headed gull **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Breeding population size - Number of Apparently Occupied Nests (AONs)	Long-term population is stable or increasing	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Productivity rate – Number of fledged young per breeding pair AON	Sufficient to maintain population	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Distribution: extent of available nesting options within the SPA – Numbers and spatial distribution	Sufficient availability of suitable nesting sites throughout the SPA to maintain the population	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Prey biomass available - Kilogrammes	Sufficient extent of biomass of available prey items across the site to help support the population	Yes Construction impacts on water quality in the River Corrib could affect prey abundance for breeding colonies that forage along the river and / or receiving marine environment	Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Disturbance at breeding site - Level of impact	Disturbance occurs at levels that do not significantly impact on Black-headed gull at the breeding site	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Barriers to connectivity - Number; location; shape; area (hectares)	No significant increase	No The proposed River Corrib Bridge will not pose a barrier to connectivity along the River Corrib Corridor and therefore there will be no effects on this attribute/target	No
Common gull **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Breeding population size - Number of Apparently Occupied Nests (AONs)	Long-term population is stable or increasing	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Productivity rate – Number of fledged young per breeding pair AON	Sufficient to maintain population	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Distribution: extent of available nesting options within the SPA – Numbers and spatial distribution	Sufficient availability of suitable nesting sites throughout the SPA to maintain the population	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Prey biomass available - Kilogrammes	Sufficient extent of biomass of available prey items across the site to help support the population	Yes Construction impacts on water quality in the River Corrib could affect prey abundance for breeding colonies that forage along the river and / or receiving marine environment	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Disturbance at breeding site - Level of impact	Disturbance occurs at levels that do not significantly impact on Common gull at the breeding site	No	No

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
		As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	
Disturbance at areas ecologically connected to the colony – Level of impact	Disturbance occurs at levels that do not significantly impact on breeding common gull	No Species also show tolerance to disturbance associated with roads and the urban setting around the outskirts of Galway. As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target.	No
Barriers to connectivity - Number; location; shape; area (hectares)	No significant increase	No The proposed River Corrib Bridge will not pose a barrier to connectivity along the River Corrib Corridor and therefore there will be no effects on this attribute/target	No
Common tern **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Breeding population size - Number of Apparently Occupied Nests (AONs)	Long-term population is stable or increasing	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Productivity rate – Number of fledged young per breeding pair AON	Sufficient to maintain population	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, and foraging areas will not be restricted, there will be no effects on this attribute/target	No
Distribution: extent of available nesting options within the SPA –		No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Prey biomass available - Kilogrammes	Sufficient extent of biomass of available prey items across the site to help support the population	Yes	Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
		Construction impacts on water quality in the River Corrib could affect prey abundance for breeding colonies that forage along the river	
Disturbance at breeding site/roosting site - Level of impact	Disturbance occurs at levels that do not significantly impact on Common tern at the breeding site	No As the breeding colonies (more than 8.5km to the north of the proposed River Corrib Bridge) are beyond the ZoI of any of the impacts associated with the Project, and there are no known post-breeding roosting sites within the ZoI, and any disturbance along the River Corrib during construction will be temporary and restricted to the immediate vicinity of the construction works, there will be no effects on this attribute/target	No
Disturbance at areas ecologically connected to the colony – Level of impact	Disturbance occurs at levels that do not significantly impact on breeding Common tern	No Species also show tolerance to disturbance associated with activities around the River Corrib. As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target.	No
Barriers to connectivity - Number; location; shape; area (hectares)	No significant increase	No The proposed River Corrib Bridge will not pose a barrier to connectivity along the River Corrib Corridor and therefore there will be no effects on this attribute/target	No
Arctic tern **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Breeding population size - Number of Apparently Occupied Nests (AONs)	Long-term population is stable or increasing	No As the species has not been recorded within the ZoI of the Project, and the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on these attributes/targets	No
Productivity rate – Number of fledged young per breeding pair AON	Sufficient to maintain population	No As the species has not been recorded within the ZoI of the Project, and the breeding colonies are beyond the ZoI	No

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
		of any of the impacts associated with the Project, there will be no effects on these attributes/targets	
Distribution: extent of available nesting options within the SPA –		No As the species has not been recorded within the ZoI of the Project, and the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on these attributes/targets	No
Prey biomass available - Kilogrammes	Sufficient extent of biomass of available prey items across the site to help support the population	No As the species has not been recorded within the ZoI of the Project, and the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on these attributes/targets	No
Disturbance at breeding site/roosting site - Level of impact	Disturbance occurs at levels that do not significantly impact on Arctic tern at the breeding site	No As the species has not been recorded within the ZoI of the Project, and the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on these attributes/targets	No
Disturbance at areas ecologically connected to the colony – Level of impact	Disturbance occurs at levels that do not significantly impact on breeding Arctic tern	No As the species has not been recorded within the ZoI of the Project, and the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on these attributes/targets	No
Barriers to connectivity - Number; location; shape; area (hectares)	No significant increase	No As the species has not been recorded within the ZoI of the Project, and the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on these attributes/targets	No
Greenland white-fronted goose **To restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**			
Winter population trend -	Long term winter population trend is stable or increasing	No Species are not present within the ZoI of the Project	No

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Percentage change in number of individuals			
Winter spatial distribution - Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target	No Species are not present within the ZoI of the Project	No
Disturbance at wintering site – Intensity, frequency, timing and duration	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution	No Species are not present within the ZoI of the Project	No
Barriers to connectivity and site use – Number, location, shape and hectares	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	No Species are not present within the ZoI of the Project	No
Forage spatial distribution, extent and abundance – Location, hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target	No Species are not present within the ZoI of the Project	No
Roost spatial distribution and extent – Location and hectares of roosting habitat	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target	No Species are not present within the ZoI of the Project	No
Supporting habitat: area and quality – Hectares and quality	Sufficient area of utilisable habitat available in ecologically important sites outside the SPA	No Species are not present within the ZoI of the Project	No

Attribute and Measure (NPWS, 2023a)	Target (NPWS, 2023a)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Wetlands **To maintain the favourable conservation condition of wetland habitat in Lough Corrib SPA as a resource for the regularly occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:**			
Wetland habitat area - Hectares	No significant loss to wetland habitat within the SPA, other than that occurring from natural patterns of variation	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5
Wetland habitat quality and functioning – Quality and function of the wetland habitat	No significant impact on the quality or functioning of the wetland habitat within the SPA, other than that occurring from natural patterns of variation	Indirect construction/operational impacts on the existing hydrogeological / hydrological regime of wetland habitats	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

9.4 Inner Galway Bay SPA

9.4.1 Special Conservation Interests and Conservation Objectives of Inner Galway Bay SPA

The SCI bird species for which Inner Galway Bay SPA is designated, and the overarching conservation objective for each, are listed below in Table 9.29 (NPWS, 2013f[70]). Those highlighted (in green) are the SCIs which are within the ZoI of the Project. As Inner Galway Bay SPA lies downstream of the Project, all of the SCI bird species (and the Wetlands & Waterbirds SCI) could potentially be affected via some (or all) of the potential impacts discussed above.

Table 9.29 SCIs of Inner Galway Bay SPA

SCIs	Conservation Objective
Black-throated diver *Gavia arctica* [A002] – Wintering [71]	To restore the favourable conservation condition
Great northern diver *Gavia immer* [A003] – Wintering	To maintain the favourable conservation condition
Cormorant *Phalacrocorax carbo* [A017] – Breeding/Wintering	To maintain the favourable conservation condition
Grey heron *Ardea cinerea* [A028] – Wintering	To maintain the favourable conservation condition
Light-bellied brent goose *Branta bernicla hrota* [A046] – Wintering	To maintain the favourable conservation condition
Wigeon *Anas penelope* [A050] – Wintering	To maintain the favourable conservation condition
Teal *Anas crecca* [A052] – Wintering	To maintain the favourable conservation condition
Red-breasted merganser *Mergus serrator* [A069] – Wintering	To maintain the favourable conservation condition
Ringed plover *Charadrius hiaticula* [A137] – Wintering	To maintain the favourable conservation condition
Golden plover *Pluvialis apricaria* [A140] – Wintering	To maintain the favourable conservation condition
Lapwing *Vanellus vanellus* [A142] – Wintering	To maintain the favourable conservation condition
Dunlin *Calidris alpina* [A149] – Wintering	To maintain the favourable conservation condition
Bar-tailed godwit *Limosa lapponica* [A157] – Wintering	To maintain the favourable conservation condition
Curlew *Numenius arquata* [A160] – Wintering	To maintain the favourable conservation condition
Redshank *Tringa totanus* [A162] – Wintering	To maintain the favourable conservation condition
Turnstone *Arenaria interpres* [A169] – Wintering	To maintain the favourable conservation condition
Black-headed gull *Chroicocephalus ridibundus* [A179] – Wintering	To maintain the favourable conservation condition
Common gull *Larus canus* [A182] – Wintering	To maintain the favourable conservation condition
Sandwich tern *Sterna sandvicensis* [A191] – Breeding	To maintain the favourable conservation condition
Common tern *Sterna hirundo* [A193] – Breeding	To maintain the favourable conservation condition

[70] Supplemented by information at https://www.npws.ie/protected-sites/spa/004031

[71] It should be noted that in June 2019 the Department of Culture, Heritage and the Gaeltacht made an adjustment in the bird species listed as Special Conservation Interest (SCI) of Inner Galway Bay SPA. The Black-throated diver was included as a SCI of Inner Galway Bay and the Shoveler was removed from the SCI list.

SCIs	Conservation Objective
Wetlands and Waterbirds [A999]	To maintain the favourable conservation condition

The site specific conservation objectives document for Inner Galway Bay SPA (NPWS, 2013b) sets out the attributes, measures and targets that define the favourable conservation condition of the SCI species within the European site. Affecting the conservation condition of SCI species would constitute an adverse effect on the integrity of Inner Galway Bay SPA.

The specific attributes and targets used to define the conservation objectives of the SCI species within the ZoI of the Project are presented in Table 9.35 below.

As per guidance received from the NPWS, where site specific conservation objectives are not available (the recently added Black-throated diver), the current conservation objectives which are generic, as well as the attributes and targets from the conservation objectives from similar species (Great Northern Diver) were used as a guide - using “restore” rather than “maintain” as a conservation aim as a precautionary approach.

The baseline populations, and population trends, of the SCIs are taken from the data presented in Table 2.1 of Inner Galway Bay Special Protection Area (Site Code 4031) Conservation Objectives Supporting Document, Version 1 (NPWS, 2013b).

Although the extents of areas surveyed altered between the surveys undertaken during 2022-2024 (surveys were undertaken within a 300m buffer of the Assessment Boundary) and the surveys undertaken during 2014 - 2015 surveys (surveys were focussed on the wintering bird sites), the results are discussed in terms of the discrete wintering bird sites identified during the 2014/2015 surveys taking full cognisance of the results from the 2022-2024 surveys. The SCI activity was largely concentrated around these sites in the surveys undertaken between 2022 and 2024. In general, the findings of the breeding and wintering bird surveys completed over 2022 to 2024 supported findings from 2014/2015 surveys. The updated ecological baseline data has not altered the overall findings of the assessment presented below compared to the 2018 NIS.

9.4.2 Ecological Baseline

As Inner Galway Bay SPA covers approximately the same area as Galway Bay Complex SAC, refer to the habitat description above in Section 9.2.2 for the habitat baseline of this SPA. The habitats within the SPA support the SCI bird species, providing nesting, foraging and roosting sites which include open water, intertidal and terrestrial habitats.

As noted above for Lough Corrib SPA, bird species listed as winter SCI species of the SPA were recorded at many of the winter bird survey sites across the Scheme Study Area, the majority of which are remote from the SPA itself.

There were two bird species recorded during the 2023 and 2015 breeding bird surveys which are listed as SCIs of Inner Galway Bay SPA for their breeding population: Common tern (flying over and along the River Corrib respectively over the two survey seasons) and Cormorant (flying overhead in the vicinity of the River Corrib corridor and in the western part of the Scheme Study Area and in the vicinity of Coolagh Lakes and in the western part of the Scheme Study Area; one individual observed east of River Corrib near Ballindooley Lough).

The full breeding bird survey results are provided in Appendix I. The results of the breeding bird surveys with respect to these species are shown on Figures 8.1 to 8.2 and Figures 9.1 to 9.2.

These results are generally consistent with the findings of the surveys carried out along the River Corrib corridor in 2005/2006 for the 2006 N6 Galway City Outer Bypass project (Appendix G), where these species were recorded frequently over the summer months along the river, but in low numbers.

The full results of the winter bird surveys, as they relate to those species listed as SCIs of Lough Corrib SPA and Inner Galway Bay SPA, are provided in Appendix J. The winter bird survey sites referred to therein are shown on Figure 10.

9.4.3 Potential Direct and Indirect Impacts

As the Project does not cross the SPA, none of the SCI species, or their supporting habitats within the SPA, are directly impacted by the Project. At its nearest point, the Project is more than 1km from the SPA boundary and therefore, there is no risk of disturbance/displacement of SCI birds from habitats within the SPA.

However, there are the following impacts, as per the 2018 NIS, by which the Project could (in the absence of mitigation measures) potentially affect SCI bird species or their supporting wetland habitats within Inner Galway Bay SPA:

- Habitat degradation as a result of hydrogeological impacts - the Project has the potential to affect the existing hydrogeological regime supporting groundwater dependant wetland habitats (at potential *ex-situ* sites) which in turn support wintering bird species listed as SCIs of Inner Galway Bay SPA
- Habitat degradation as a result of hydrological impacts - the Project has the potential to affect water quality in receiving watercourses and in Galway Bay supporting aquatic, wetland, estuarine and marine habitats (within the SPA and at potential *ex-situ* sites) which in turn support bird species listed as SCIs of Lough Corrib SPA
- Disturbance/displacement - disturbance during construction and/or operation could result in the displacement of SCI birds from important habitat areas at potential *ex-situ* sites
- Habitat loss/fragmentation - the Project passes through, and will result in habitat loss in potential *ex-situ* sites where SCI bird species were recorded.

9.4.4 Examination and Analysis of Potential Direct and Indirect Impacts

9.4.4.1 Habitat degradation as a result of hydrogeological impacts

As discussed above in relation to Lough Corrib SPA, in terms of interaction with groundwater, the Project has the potential to affect both groundwater quantity (dewatering of the bedrock aquifer and drawdown effects during construction, and drawdown effects during operation as a consequence of road cuttings) and groundwater quality within the receiving environment.

The only wintering bird survey site in the western part of the wintering birds study area that supports SCI bird species and lies within the hydrogeological ZoI is WB07 (An Chloch Scoilte). At this winter bird site, the hydrogeological ZoI (1.8m between Ch. 1+600 and Ch. 1+950 of the proposed N6 GCRR, and 10.6m between Ch. 2+230 and Ch. 2+640 of the proposed N6 GCRR) does not extend to affect any groundwater dependant habitat areas (e.g. wet heath) and therefore, it will not affect the suitability of this peatland/scrub habitat mosaic to continue to support wintering birds. SCIs species for Inner Galway Bay recorded at WB07 included Grey Hern, Common Gull, Cormorant and Curlew over the 2022-2024 surveys and / or 2014/15 surveys; other than the Curlew (flocks of 12 and 26 recorded in and adjacent to WB07) records indicated low numbers of birds (<5). Despite the limited extent of activity within WB07 and the short duration of construction there may be small risk of groundwater quality impact from those works. More generally, across the western section of the Project, the Project passes through areas of dense scrub and/or bracken, and improved/wet agricultural grasslands. Equally, the effects of the Project in terms of hydrogeological impacts will not affect the suitability of the site to support wintering birds.

Along the eastern part of the proposed N6 GCRR, only three wetland areas supporting groundwater dependant habitats lie within the unmitigated hydrogeological ZoI: Coolagh Lakes, Ballindooley Lough (refer to Table 8 of Appendix A for the zone of influence associated with each of the cuttings), and western shore of the River Corrib (where it overlaps the Ross Lake GWB).

The Project lies within the same groundwater body that supplies groundwater to the Galway Bay, the Coolagh Lakes (Lough Corrib Fen 1 (Menlough) GWB and the Lough Corrib Fen 1 (Lackagh) GWB) – see Figure 11.3.003 and 11.3.004 and Figures 12.1.003 and 12.1.004). As discussed above in Section 9.1.4.3 (Lough Corrib SAC), only the groundwater supply to the Coolagh Lakes (WB04) could potentially be affected during the construction of the piers for Menlough Viaduct (although this is highly unlikely to occur). This site was used by bird species listed as SCIs of the SPA (the Common gull and Grey heron in 2023/2024 (bird numbers were all <5), the Common gull, Cormorant, Grey heron, Lapwing and Teal in 2022/2023

surveys (bird numbers were all <8), and the Black-headed gull, Cormorant, Grey heron and Teal in 2014/15 (other than the Black headed gull, bird numbers were <5)) see Appendix J. Considering this, and that the River Corrib also contributes to the Coolagh Lakes, whilst some degree of effect on water levels and extent might occur, it would not result in the area being unusable or unable to support those wintering bird species recorded there (and in the numbers recorded). In any case, mitigation measures are included to prevent such an impact occurring and the Project poses no risk to groundwater quantity or quality supplying the Coolagh Lakes (see Section 10.4). As discussed in both Appendix A, Appendix F and Appendix L, the proposed N6 GCRR will not restrict or inhibit existing groundwater flow paths supporting groundwater dependant habitats.

As described in the Hydrogeology Assessment Report in Appendix A, Ballindooley Lough is up gradient from the proposed N6 GCRR in both groundwater bodies that supply groundwater to that lake (Clare-Corrib (Ballindooley East) GWB and the Clare-Corrib (Ballindooley West) GWB). Therefore, the proposed N6 GCRR and as such the Project poses no risk to groundwater quantity or quality supplying Ballindooley Lough.

There is a risk, in those sections of the Project underlain by limestone, of accidental spills during construction in areas where the bedrock outcrops, such as those areas where the groundwater has extreme or high vulnerability (Figure 3.01 and 3.02 of Appendix A) or where the karst limestone outcrops due to cuttings and excavations. Mitigation measures are required to ensure that groundwater quality is not affected during construction (see 10.1 Section 10.4).

The drainage design of the Project (as described in Section 2) will ensure that groundwater quality will be maintained during operation – as outlined in Appendices A, B, C and F.

Although the drainage design (as described in Section 2, and Appendices A, B, C and F) will ensure that groundwater quality will be maintained during operation, it is important that infiltration basins are inspected to ensure that karst features do not affect their functioning during operation. If this is identified during routine inspections of the infiltration basins then mitigation is required to ensure any issues are addressed so that they continue to function as designed for the operational lifespan of the Project (see Section 10.1 and Section 10.4).

Summary

A summary of the potential hydrogeological impacts associated with the Project are presented in Table 9.30 below.

Table 9.30 Summary of Hydrogeological Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
Construction		
Construction works affecting groundwater quantity	No Although the Project has the potential to affect groundwater supply to wetland habitats locally, this will not affect their usage by birds such that any population level effects would occur to the SCI populations	No
Construction works affecting groundwater quality	Yes Affecting the quality of groundwater supporting groundwater dependant habitats could affect the type, quality and extent of suitable habitat available to SCI bird species	Yes To ensure that construction works will not affect groundwater quality in the underlying aquifer (Section 10.4)
Operation		
Groundwater quantity being affected during operation	No Although the design of the Project will not restrict or inhibit existing	Yes

Potential Direct or Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
	groundwater flow paths supporting groundwater dependant habitats used by bird species listed as SCIs of Inner Galway Bay SPA, it is important that they are inspected to ensure that karst features do not affect the functioning of the infiltration basins during operation	To ensure that the infiltration basins continue to function as designed for the operational lifespan of the Project (as outlined in Section 10.4)
Groundwater quality being affected during operation	Yes Although the drainage design (as described in Section 2, and Appendices A, B, C and F) will ensure that groundwater quality will be maintained during operation, it is important that they are inspected to ensure that karst features do not affect the functioning of the infiltration basins during operation	Yes To ensure that the infiltration basins continue to function as designed for the operational lifespan of the Project (as outlined in Section 10.4)

9.4.4.2 Habitat degradation as a result of hydrological impacts during construction

During construction, contaminated surface water runoff and/or an accidental spillage or pollution event into any surface water feature has the potential to have a negative impact on water quality in receiving watercourses and consequently downstream in Galway Bay. There is also the potential for construction works to affect water quality in the River Corrib, Coolagh Lakes and Ballindooley Lough; all wetland sites supporting bird species listed as SCIs of Inner Galway Bay SPA. As discussed in Section 9.1.4.4 (in relation to Lough Corrib SAC and the River Corrib and Coolagh Lakes) the hydrological regime supporting the wetland habitats at these sites will not be affected. The effects of frequent and/or prolonged pollution events in a river system have the potential to be extensive and far-reaching, and could potentially have significant long-term effects. In an extreme scenario, with a pollution event of sufficient magnitude, the marine environment could also be affected.

However, it is extremely unlikely that a pollution event of such a magnitude would occur during construction. Any pollution events that may occur would be expected to be relatively minor in comparison to the dilution factor and assimilative capacity of a coastal water body the size of Galway Bay, or to be any more than temporary in nature, and therefore is unlikely to have any perceptible or far-reaching effects within the bay. Nevertheless, a precautionary approach is being taken in assuming a level of risk of water quality impacts and mitigation measures are required to minimise the risk of the Project having any perceptible effect on water quality during construction.

There will be outfall points to surface water features from the proposed road drainage network during operation. However, given the drainage design as described in Sections 2 and Section 10, and in Appendix A, Appendix B, Appendix C and Appendix F (which includes attenuation and pollution control elements) the normal operating water quality of the drainage outfalls, even in the unlikely event of a pollution incident, will not result in any perceptible impact on water quality in receiving watercourses or in Galway Bay. There will not be any drainage discharges to the Coolagh Lakes.

Summary

A summary of the potential direct or indirect impacts to the hydrological regime associated with the Project are presented in Table 9.31 below.

Table 9.31 Summary of Hydrological Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
Construction		
Construction works affecting surface water quality	Yes Affecting the quality of surface water in the receiving environment in Galway Bay (or at any important ex-situ sites) could potentially affect habitat quality and usage of important habitat areas by SCI species, which in turn could affect the conservation objective to maintain the distribution of areas used by SCI waterbirds	Yes To ensure that water quality in the receiving environment is not affected during construction (Section 10.5)

9.4.4.3 Disturbance/displacement – at potential ex-situ sites

As discussed in Section 7.8, only those winter bird, or potential "*ex-situ*", sites which lie within 300m of the Project, or those that lie within 800m of areas where prolonged blasting activity is likely, are predicted to be subject to some level of prolonged construction related disturbance. Of the 60 winter bird sites surveyed, 19 fall within or partially within this disturbance ZoI; and of those, 15 sites and immediate surrounds in the 2023/2024 surveys, 15 sites and immediate surrounds in the 2022/2023 surveys, and eight sites in 2014/15 surveys supported most records for bird species listed as SCIs for Inner Galway Bay SPA: Great northern diver, Cormorant, Grey heron, Light-bellied brent goose, Dunlin, Wigeon, Teal, Red-breasted merganser, Ringed Plover, Golden plover, Lapwing, Bar-tailed godwit, Curlew, Redshank, Turnstone, Black-headed gull, Common Gull and Common tern. The full results of the winter bird surveys are provided in Appendix J.

Black-throated diver

As a recently added QI for Galway Bay SPA, specific attribute and target information for the species has not been incorporated into the SSCO for Inner Galway Bay SPA. This species was not recorded as part of the bird surveys carried out in 2022-2024 or 2014/2015. As there are no potential *ex-situ* sites used by this species that will be affected by disturbance during construction or operation of the Project, there will be no effects on the conservation objective or condition of this species in the SPA (Table 9.35).

Great northern diver

Great northern diver were only recorded at one of the winter bird sites surveyed in 2014/15; an area of coastal grasslands at Ballyloughaun (WB30) bounding the SPA, where a single bird was recorded in January 2015. No species were recorded during the 2022-2024 bird surveys. This location is more than 1.9km from the Project and buffered from it by urban development and the expanse of Merlin Park Woods. At this distance, disturbance or displacement effects associated with either construction or operation of the Project would not affect usage of this area by Great northern diver.

Therefore, disturbance or displacement of Great northern diver from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35).

Cormorant

Cormorant were recorded at six winter bird survey sites across the Scheme Study Area (WB02, WB04, WB07, WB08, WB10 WB12, WB31 and the coastal area outside the western extent of the Assessment Boundary) but in all instances the numbers recorded were low; generally one or two individuals, with the exception of a record for eight along the coastal area west of the Assessment Boundary in June 2022, five east of River Corrib, south of Menlough Pier in March 2024 and four in February 2015 along the River Corrib (WB12),. WB31 is beyond the general construction disturbance ZoI, within which some level of

disturbance effects would be likely. Cormorant were also frequently recorded along the River Corrib corridor during surveys undertaken in 2005/2006 for the 2006 N6 Galway City Outer Bypass project (Appendix G). Records of one or two individuals would correspond with less than 1% of the SPA's baseline winter population of 266 (NPWS, 2013c). The absence of any suitable breeding habitat (rocky islets, sea stacks, cliffs etc.) within areas affected by the Project, and with the traditional Deer Island breeding site more than 5.5km to the south across Galway Bay, the Project would not have any disturbance related effects on the breeding population. At most winter bird sites, the potential displacement of such small numbers of Cormorant during construction or operation would not affect breeding success, numbers, distribution, or the existing population trend for this species in the SPA (favourable) given the abundance of alternative suitable habitat in the greater Galway City area and hinterland (Cormorants were recorded using habitats ranging from lakes, to rivers, amenity grassland and upland heath).

Ballindooley Lough, however, is an important local site for wintering birds. Blasting at Ballindooley and Castlegar has the potential to disturb and displace wintering birds using Ballindooley Lough and mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects.

Grey heron

Grey heron were recorded from 15 out of the 60 winter bird sites along the extent of the Project from the Galway Racecourse to the western coast, with maximum records of three (2022/2023) and two (2023/2024) individuals recorded in recent surveys and generally solitary birds surveyed in 2014/2015. Notable exceptions for 2014/2015 were records of 18 and eight Grey heron at two of the coastal sites along the north shore of Oranmore Bay (WB70 and WB71 respectively). However, both locations are more than 1km from the Project and would not be affected by construction or operation disturbance/displacement.

Of the 15 sites at which Grey heron were recorded, only four are within the general construction disturbance ZoI (WB02, WB04, WB08 and WB12) and the majority of records at these sites were for single individual birds. Congregations occurred around the Ballindooley Lough and Coolagh Lakes, and most other records concentrated into areas around WB05/WB07 and between WB10/WB55were mostly sightings of individual birds (all groups were <5 birds). Only one site (WB05) is within the ZoI of Ballagh, where prolonged blasting will be undertaken (for approximately 9 months). At this site only a single Grey heron was recorded, on one occasion in 2014/2015 and one in the 2022/2023 surveys. Grey herons were recorded scattered around the general area of WB05 over the 2022/2023 and 2023/2024 surveys.

Given that many of the positive sites only recorded single individuals and that most of the sites at which the species was recorded will not be affected in any way by construction or operational disturbance, the abundance of alternative suitable habitat locally (i.e. the species was recorded from wide range of habitat types including lakes, wetland habitats, upland habitats, and managed grasslands), and the transient usage by Grey heron of the majority of the surveyed sites used the Project will not have any effect on the local population.

Ballindooley Lough, however, is an important local site for wintering birds. Blasting at Ballindooley and Castlegar has the potential to disturb and displace wintering birds from the majority of the habitat at Ballindooley Lough and mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects.

Light-bellied brent goose

Only one individual Light-bellied brent goose was recorded during the 2023/2024 surveys along the coastal area outside the western extent of the Assessment Boundary. Light-bellied brent goose were recorded at three winter bird sites surveyed in 2014/15: Galway Golf Course (WB19), Claddagh/Nimmo's Pier (WB38) and along the north shore of Oranmore Bay (WB71) (2014/2015 surveys). All these sites are removed from the Project by distances of (approximately) 470m, 2.5km, and 1.1km respectively (2014/2015 records), and in all cases there is a belt of urban development present in the respective buffer zones. The 2023/2024 record is closer to the Project at c.300m from the edge of the Assessment Boundary and the bird was flying over the sea. At these distances / locations, disturbance or displacement effects associated with either construction or operation of the Project would not affect usage of these areas by Light-bellied brent geese.

There is also a single record for the species along the River Corrib corridor (Appendix G) but given the rare occurrence of the species on the River Corrib any construction related disturbance will not affect usage of the River Corrib in the long-term. The operation of the Project, particularly given the elevation of the proposed N6 GCRR above the river (c.10m), will not displace birds from the area.

Therefore, disturbance or displacement of Light-bellied brent goose from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35).

Wigeon

The 2023/2024 survey had several flocks (maximum of 14 birds) at WB02 and a single record (2 birds) at WB14 and the 2022/2023 survey had a single flock (8 birds) at WB02. Wigeon were recorded at WB02, WB22, WB31, WB70 and WB71 in 2014/15. The coastal survey sites at Lough Atalia (WB22), Renmore (WB31), and along the north shore of Oranmore Bay (WB70 and WB71) are buffered from any disturbance associated with construction or operation by a distance of at least 800m of urban development and the Project would not affect usage of these areas by Wigeon. Wigeon were also recorded on one occasion at Ballindooley Lough (WB02); 28 birds (the largest group) were recorded in February 2015 which corresponds with what could be 2.4% of the SPA's baseline winter population of 1,168 (NPWS, 2013c).

Ballindooley Lough is an important local site for wintering birds. Blasting at Ballindooley and Castlegar has the potential to disturb and displace wintering birds using Ballindooley Lough and mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects.

Teal

During the 2022-2024 surveys, all records were from Ballindooley Lough (WB02) and Coolagh Lakes (WB04) an its immediate surrounds. Teal were recorded from WB02, WB04, WB08, WB10, WB14 and WB71 in 2014/15. Only four of these are within 300m of the Project and likely to be subject to some level of disturbance during construction and/or operation: WB02, WB04, WB08 and WB10.

The numbers recorded at WB04, WB08 and WB10 were generally low (<6 birds, or <1% of the SPA's baseline winter population of 700 (NWPS, 2013c)) and Teal were not present regularly throughout the winter period (recorded on 2, 4 and 1 occasions respectively). Four records with a max count of seven individuals were recorded in 2022/2023 (1% of SPA population) and one record of 9 birds recorded in the 2023/2024 surveys (<1.3% of SPA population) at WB04

Considering the low numbers and infrequent use of sites WB04, WB08 and WB10, the potential for significant disturbance/displacement effects is further reduced by virtue of the fact that the Project only passes through small areas of habitat at the margins of each site, leaving the majority of these sites, and many alternative areas of similar suitable habitat in the locality, unaffected.

Teal were recorded on, or flying into, Ballindooley Lough (WB02) during all survey visits in numbers ranging from 3 in October 2014, to 146 in January 2015 (corresponding with between 0.4% and 20.9% of the SPA's baseline winter population). Three records with a max count of seven individuals were recorded in 2022/2023 (1% of SPA population) and five records with a max count of 14 birds in the 2023/2024 surveys (2% of SPA population) around the Ballindooley Lough.

Although on occasion Teal were observed in the drainage ditches surrounding the lough in 2014/2015, the principle habitat used by the species in this site was the main body of the lake.

As discussed in Section 9.3.4.3 (Lough Corrib SPA) in relation to construction related disturbance to water birds at Ballindooley Lough, mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects which could affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35).

Red-breasted merganser

Red-breasted merganser were not recorded during 2022-2024, not the earlier 2014/2015 surveys at any of the winter bird survey sites. There is a single record for the species along the River Corrib corridor recorded during the 2005/2006 surveys undertaken for the 2006 N6 Galway City Outer Bypass project (Appendix G) but given the rare occurrence of the species on the River Corrib any construction related disturbance associated with the proposed River Corrib Bridge would not result in any significant disturbance or displacement effect in relation to this species.

Therefore, disturbance or displacement of Red-breasted merganser from potential *ex-situ* sites, during the construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35).

Ringed plover

Ringed plover were not recorded during 2023/2024 or 2014/2015 at any of the winter bird survey sites. Two individuals (<1% of the 335 SPA population (NWPS, 2013c)) were recorded along the coast in the extreme western extent of the Project (c. >300m from the Assessment Boundary) along the coastline in the 2022/2023. The location is just outside the ZoI and therefore, disturbance or displacement of the species from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35).

Golden plover

The potential disturbance/displacement effects of the Project on potential *ex-situ* sites for this species has been assessed under Lough Corrib SPA above in Section 9.3.4.3. The mean wintering population for Inner Galway Bay SPA of 2430 (NPWS, 2013c) is larger than the 1727 wintering population of Lough Corrib SPA, reducing the representation of the flocks observed in the wintering birds survey area in relation to Inner Galway Bay SPA population.

Based on the assessment in Section 9.3.4.3, disturbance or displacement of Golden plover from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35)

Lapwing

Lapwing were only recorded at three sites during the 2022-2024 surveys: three birds were recorded at Ardaun in the east (WB01 over 2023/2024), a single individual at Ballindooley Lough (WB02 over 2022/2023) and a single individual at Coolagh Lakes (WB04 over 2022/2023).

Lapwing were recorded at four winter bird survey sites in 2014/2015: Ballindooley Lough (WB02), Na Foraí Maola/West of Lough Inch (WB08), Lough Atalia (WB22) and Oranmore Bay (WB71). Only two of these are within the construction or operational disturbance ZoI and likely to be subject to some level of disturbance effect: Ballindooley Lough and the area at Na Foraí Maola/West of Lough Inch. At Ballindooley Lough a flock of 16 and a single individual were recorded on January and March 2015 respectively; at Na Foraí Maola/West of Lough Inch, 17 were recorded in October 2014. Lapwing were also recorded along the River Corrib corridor during the surveys carried out in 2006 for the 2006 N6 Galway City Outer Bypass project (Appendix G); however, there was only one large flock recorded on one occasion (123 birds).

Low numbers of Lapwing were generally recorded at affected sites (a count of 17 corresponds with what could be 0.4% of the SPA's baseline population of 3,969 (NWPS, 2013c)), with low frequency of occurrence along the River Corrib corridor (in terms of the species presence and numbers) and transient usage by Lapwing of the other two sites. The proposed N6 GCRR only affects the margins of Na Foraí Maola/West of Lough Inch winter bird survey sites and development at Ardaun is along the existing N6; minimising the potential for disturbance and avoiding material habitat loss, habitat severance or displacement.

Ballindooley Lough is an important local site for wintering birds. Blasting at Ballindooley and Castlegar has the potential to disturb and displace wintering birds from the majority of the habitat at Ballindooley Lough and mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects.

Dunlin

Dunlin were not recorded during 2022-2024 or 2014/2015 surveys at any of the winter bird survey sites. There is a single record for the species along the River Corrib corridor during the 2005/2006 surveys undertaken for the 2006 N6 Galway City Outer Bypass project (Appendix G) but given the rare occurrence of the species on the River Corrib any construction related disturbance associated with the proposed River Corrib Bridge would not result in any significant disturbance or displacement effect in relation to this species.

Therefore, disturbance or displacement of Dunlin from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35).

Bar-tailed godwit

Nine Bar-tailed godwit were recorded only at one winter bird survey site, Ballindooley Lough, on a single occasion in February 2015; corresponding with what could be 2% of the SPA's baseline population of 447 (NWPS, 2013c). No species were recorded during the 2022-2024 bird surveys.

Despite the low numbers and infrequent use of this site by Bar-tailed godwit, Ballindooley Lough is an important local site for wintering birds. Blasting at Ballindooley and Castlegar has the potential to disturb and displace wintering birds from the majority of the habitat at Ballindooley Lough and mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects.

Curlew

The 2023/2024 wintering bird surveys showed concentration of records between WB07 and WB50 with a maximum count of 36 birds (5.2% of the 697 base population for the SPA (NPWS, 2013c)), between WB10 and WB55 with a maximum flock size of 10 birds (1.4% of the 697 base population for the SPA (NPWS, 2013c)) and scattered records around WB03. In addition, concentration of records were also along the coastline outside the western extent of the Assessment Boundary (1-4 birds) and one record from the River Corrib (WB12).

During the 2022/2023 wintering bird surveys, all but one record (two individuals flying over WB01, Ardaun) were west of the River Corrib, with concentration of records between WB07 and WB50 with a maximum flock size of 26 birds (3.7% of the 697 base population for the SPA (NPWS, 2013c)), between WB10 and WB55 with a maximum flock size of 16 birds (2.3% of the 697 base population for the SPA (NPWS, 2013c)). Three records were also scattered around WB03.

Curlew were recorded at 24 of the 60 winter bird sites surveyed in 2014/15 and were also recorded along the River Corrib as part of the 2006 surveys undertaken for the 2006 N6 Galway City Outer Bypass project (Appendix G). Only six of these sites are within 300m of the Project and likely to be subject to some level of disturbance during construction and/or operation: Ballindooley Lough (WB02), Na Foraí Maola/West of Lough Inch (WB08), Moycullen Bog NHA at Ballagh (WB10), River Corrib (WB12), Castle Park (WB24) and Galway Racecourse (WB23).

Ballindooley Lough was the only winter bird survey site regularly used by Curlew (recorded in five out of the seven survey visits in 2014/2015); although, with the exception of a record of eight from September 2014 (<1.2% of the 697 base population for the SPA (NPWS, 2013c)) the numbers recorded were single, or on one occasion two, individuals; no Curlew records at this location during the 2022-2024 surveys. Blasting at Ballindooley and Castlegar has the potential to disturb and displace wintering birds from the majority of the habitat at Ballindooley Lough and mitigation is required to minimise the potential for disturbance/displacement from blasting and to prevent any long-term disturbance or displacement effects.

Curlew were only recorded on two out of seven survey visits to each of the Na Foraí Maola/West of Lough Inch and Moycullen Bog NHA at Ballagh sites in 2014/2015; with two individuals in November 2014 at the latter the maximum count. Only the margins of these sites are within the ZoI of disturbance effects.

Along the River Corrib, whilst there was a record of a larger number of Curlew from October 2014 (16, which corresponds with what could be 2.3% of the SPA's baseline winter population of 697 (NPWS, 2013c)), the species was only recorded here on one occasion in 2014/2015 (in wetlands more than 500m

from the Project) and once in 2023/2024 (about 75m from the proposed drainage outfall from the proposed N59 Link Road at Kentfield. Therefore, there will not be any significant disturbance/displacement effects at this site during construction or operation.

At Castlepark, nine Curlew were recorded on one occasion during the surveys (November 2014). However, this recreational area is separated from the Project by a buffer of c.250m of commercial and residential development and the existing N6 and construction works will not cause any displacement of birds at this site.

At the Galway Racecourse winter bird survey site, Curlew were recorded in 2014/2015 using the playing field amongst the industrial/commercial buildings in Ballybrit Business Park, in the southwest corner of the winter bird survey site. On one of the three survey visits on which the species was present, 37 Curlew were recorded (5.3% of the SPA's baseline winter population). No Curlew were recorded in the 2022/2023 surveys at or around Galway Racecourse. In 2023/2024 Curlew records were concentrated at the Galway Racecourse (WB23) with a maximum flock size of 15 (2.2% of the 697 base population for the SPA (NPWS, 2013c)) and in and around WB01 and WB24 (all but one record of 7 birds were composed of individual birds).

Given the low numbers generally recorded at affected sites, the majority of sites only had records of one or two birds present (<0.3% of the SPA's baseline winter population) with the larger flock sizes discussed above The use by Curlew of specific wintering sites was generally infrequent, and Curlew activity was distributed along the extent of the wintering bird survey area, indicating tolerance to the urban setting of Galway and its surrounds. Given this, and the abundance of suitable alternative habitat locally, disturbance is unlikely to affect usage of most sites in the long-term.

Blasting in the vicinity of Ballindooley Lough requires mitigation to prevent any long-term disturbance or displacement effects that might affect the conservation objectives of Inner Galway Bay SPA.

The Galway Racecourse is targeted for development, including some greenfield areas which will be lost for the duration of the temporary stableyard development (until decommissioning). There may be displacement of the species from the area for the duration of operation of the temporary stableyard, but likely significant effects to the SCI population is considered unlikely due to the infrequency of records and low numbers of this species within WB23 (only recorded in one of three winter surveys), its tolerance to the urban setting in and around Galway (supported by its records across the extent of the wintering birds survey area) coupled with the abundance of more suitable foraging habitat for this species in the wider locality.

Redshank

Only one record of one individual was observed in the 2022/2023 surveys and seven records (each only single individuals) in the 2023/2024 surveys; all were along the coastline outside the western extent of the Assessment Boundary, with the nearest observation just short of 200m from the proposed fenceline for the proposed N6 GCRR at the proposed Bearna West Roundabout. At this location the species are exposed to existing traffic along the R336.

Redshank were recorded at WB08, WB12, WB30, WB52, WB70 and WB71 in 2014/15: The numbers present were generally low (<9) with the exception of a flock of 47 Redshank recorded in WB71 in January 2015.

Only Na Foraí Maola/West of Lough Inch (WB08) and the River Corrib (WB12) sites, from the 2014/2015 surveys, are within the disturbance ZoI.

However, at these sites birds were only recorded on one and two of the seven survey visits, respectively, with two the maximum number of birds recorded (at WB08 in March 2015); this corresponds with what could be 0.4% of the SPA's baseline winter population of 505 (NPWS, 2013c). As disturbance would only affect relatively low numbers of Redshank in the context of the SPA population, both the construction and operational disturbance ZoI covers a relatively small area in the context of suitable alternative habitat available for the species locally, and only affects the margins of the site, and that disturbance will be temporary (limited to the construction period expected to be of 3 years), the Project will not affect usage of this site in the long-term.

Therefore, disturbance or displacement of Redshank from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35).

Turnstone

No Turnstone were observed during the 2022/2023 surveys. Only one record of seven individual was observed in the 2023/2024 surveys, along the coastline outside the western extent of, and more than 300m from, the proposed fenceline for proposed N6 GCRR at proposed Bearna West Roundabout. At this location the species are exposed to existing traffic along the R336.

Turnstone were recorded at one winter bird survey site; an area of coastal grasslands at Ballyloughaun (WB30) where five birds were recorded in October 2014 (2.7% of the 182 population of the SPA baseline (NPWS, 2013c)). This location is more than 1.9km from the Project and buffered from it by urban development and Merlin Park Woods. At this distance, disturbance or displacement effects associated with either construction or operation of the Project would not affect usage of this area by Turnstone.

Therefore, disturbance or displacement of Turnstone from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35).

Black-headed gull

The potential disturbance/displacement effects of the Project on potential *ex-situ* sites for this species has been assessed under Lough Corrib SPA above in Section 9.3.4.3. The mean wintering population for Inner Galway Bay SPA of 1941 (NPWS, 2013c) is larger than the 197 wintering population of Lough Corrib SPA, reducing the representation of the flocks in relation to Inner Galway Bay SPA population.

As concluded in Section 9.3.4.3, disturbance or displacement of Black-headed gull from potential *ex-situ* sites during construction or operation of the Project will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35).

Common gull

The potential disturbance/displacement effects of the Project on potential *ex-situ* sites for this species has been assessed under Lough Corrib SPA above in Section 9.3.4.3. The mean wintering population for Inner Galway Bay SPA of 1066 (NPWS, 2013c) is larger than the 48 wintering population of Lough Corrib SPA, reducing the representation of the flocks in relation to Inner Galway Bay SPA population.

As concluded in Section 9.3.4.3, disturbance or displacement of Common gull from potential *ex-situ* sites, during construction or operation of the Project, will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Inner Galway Bay SPA (see Table 9.35)

Sandwich tern

Galway Bay supports important breeding colonies of Sandwich tern (81 pairs (NPWS, 2013c) in the SPA) on many of its islands (Galway Harbour Company, 2014; and, NPWS, 2005). This species was not recorded as part of the breeding bird surveys carried out in 2023 or previously in 2015, nor was it recorded along the River Corrib corridor in the 2006 surveys undertaken for the 2006 N6 Galway City Outer Bypass project (Appendix G). As there are no potential *ex-situ* sites used by this species that will be affected by disturbance during construction or operation of the Project, there will be no effects on the conservation objective attributes and targets supporting the conservation condition of this species in the SPA (see Table 9.35).

Common tern

The potential disturbance/displacement effects of the Project at potential *ex-situ* sites for this species has been assessed under Lough Corrib SPA above in Section 9.3.4.3.

As concluded in Section 9.3.4.3, disturbance or displacement of Common tern from potential *ex-situ* sites during construction or operation of the Project will not affect the conservation objective attributes and targets supporting the conservation condition of this species in the SPA (see Table 9.35).

Summary

A summary of the potential disturbance/displacement impacts at potential *ex-situ* sites associated with the Project are presented in Table 9.32 below

Table 9.32 Summary of Disturbance/Displacement Impacts at Potential Ex-situ Sites

Potential Direct or Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
Construction		
General construction works disturbing/displacing SCI bird species at potential ex-situ sites outside of Inner Galway Bay SPA	No Construction related disturbance will not restrict the extent of habitat available to any SCI species such that any population level effects would occur	No
Long-term blasting at Lackagh Quarry and Castlegar disturbing displacing bird species listed as SCIs of Inner Galway Bay SPA at Ballindooley Lough	Yes Long-term blasting could displace SCI listed bird species from Ballindooley Lough for one or more winter seasons; potentially negatively affecting the wintering SPA population	Yes Seasonal restriction to blasting works in the vicinity of Ballindooley Lough to ensure no long-term disturbance or displacement (Section 10.9)
Operation		
Disturbing/displacing SCI bird species at potential ex-situ sites outside of Inner Galway Bay SPA during operation	No Operational disturbance will not restrict the extent of habitat available to any SCI species such that any population level effects would occur	No

9.4.4.4 Habitat loss/fragmentation – at potential ex-situ sites

The Project will result in varying degrees of habitat loss in eight of the winter bird sites where bird species listed as SCIs of Inner Galway Bay SPA were recorded: WB01, WB02, WB03, WB07, WB08, WB10, WB23 and WB45.

Overall, the areas of habitat loss are small relative to the extent of each affected winter bird survey site. The habitat types being lost are also common and widespread in the wider locality – in particular the peat/heathland habitats between Bearna and the N59 Moycullen Road, which extend to the northwest into Connemara. Similarly, for birds (as highly mobile species), habitat fragmentation is only likely to be an issue where it would result in the fragmented habitat patches being unviable in the long-term due to their reduced size, and consequently limit the availability of large areas of a given habitat type locally. In most cases the Project clips these winter bird sites along their southern boundary (WB01, WB02, WB03, WB07, WB08, WB10 and WB23) and the effects of habitat fragmentation are minimal, particularly given that, for some winter bird sites (e.g. WB01 and WB23) the habitats represented are only a small proportion of those same habitats in the locality.

Loss of habitat, and any associated habitat fragmentation, at the winter bird sites will not result in a decline in the number and range of habitat areas available locally to bird species listed as SCIs of Inner Galway Bay SPA and will not therefore, affect the ability of the SCI populations to maintain themselves in the long-term.

Summary

A summary of the potential habitat loss and fragmentation impacts at potential *ex-situ* sites associated with the Project are presented in Table 9.33 below.

Table 9.33 Summary of Habitat Loss/Fragmentation Impacts at Potential Ex-situ Sites

Potential Direct or Indirect Impacts	Could the Project Affect the SCIs?	Are Mitigation Measures Required?
Construction/Operation		
Habitat loss and fragmentation at potential ex-situ sites outside of Inner Galway Bay SPA affecting habitat area available to SCI bird species	No As the scale of habitat loss and fragmentation will not restrict the extent of habitat available to any SCI species such that any population level effects would occur	No

9.4.4.5 Summary

This section presents a summary of the potential impacts on the SCI bird populations of Inner Galway Bay SPA as a result of the Project and how these impacts relate to affecting the site's conservation objectives.

Table 9.34 (NPWS, 2013b[72]) below, lists the SCIs of Inner Galway Bay SPA and how the impacts discussed below relate to each. Those highlighted in green are those SCIs which are present within the ZoI of the Project.

Table 9.34 SCIs of Inner Galway Bay SPA and Potential Impacts

Special Conservation Interests (SCIs)	Impact
Black-throated Diver *Gavia arctica* [A002] – Wintering	Habitat degradation – hydrology within the SPA
Great northern diver *Gavia immer* [A003] – Wintering	
Light-bellied brent goose Branta *bernicla hrota* [A046] – Wintering	
Red-breasted merganser *Mergus serrator* [A069] – Wintering	Habitat degradation – hydrology within the SPA and at potential ex-situ sites
Ringed plover *Charadrius hiaticula* [A137] – Wintering	
Golden plover *Pluvialis apricaria* [A140] – Wintering	
Dunlin *Calidris alpina* [A149] – Wintering	
Redshank *Tringa totanus* [A162] – Wintering	
Turnstone *Arenaria interpres* [A169] – Wintering	Habitat degradation – hydrology within the SPA
Common gull *Larus canus* [A182] – Wintering	
Sandwich tern *Sterna sandvicensis* [A191] – Breeding	
Common tern *Sterna hirundo* [A193] – Breeding	
Wigeon *Anas penelope* [A050] – Wintering	Habitat degradation – hydrology within the SPA and at potential ex-situ sites Disturbance/displacement at potential ex-situ sites
Lapwing *Vanellus vanellus* [A142] – Wintering	
Bar-tailed godwit *Limosa lapponica* [A157] – Wintering	
Curlew *Numenius arquata* [A160] – Wintering	
Cormorant *Phalacrocorax carbo* [A017] – Breeding/Wintering	

[72] Supplemented by QIs listed at https://www.npws.ie/protected-sites/spa/004031

Special Conservation Interests (SCIs)	Impact
Grey heron *Ardea cinerea* [A028] – Wintering	Habitat degradation – hydrogeology at potential ex-situ sites (Coolagh Lakes) Habitat degradation – hydrology within the SPA and at potential ex-situ sites Disturbance/displacement at potential ex-situ sites
Teal *Anas crecca* [A052] – Wintering	
Black-headed gull *Chroicocephalus ridibundus* [A179] – Wintering	
Wetlands [A999]	Habitat degradation – hydrogeology at potential ex-situ sites Habitat degradation – hydrology within the SPA and at potential ex-situ sites

The relationship between, and potential influence of, these impacts with respect to the SCI listed bird species within the ZoI of the Project and the attributes/targets upon which their favourable conservation condition is considered and measured, is considered further below and also presented in Table 9.35.

Black-throated diver [A002] and Great northern diver [A003]

The Project could affect water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) which could affect the type, quality and/or extent of marine habitat available for these two species and potentially their prey species. These impacts could potentially negatively affect the long-term population trends of the Inner Galway Bay SPA SCI populations through reducing the number and range of areas available to the species within the SPA.

Light-bellied brent goose [A046]

The Project could affect water quality in Galway Bay during construction (even though the risk of any perceptible effect is low) which could affect the type, quality and/or extent of intertidal habitat available for this species. These impacts could potentially negatively affect the long-term population trends of the Inner Galway Bay SPA SCI populations through reducing the number and range of areas available to the species within the SPA.

Red-breasted merganser [A069], Ringed plover [A137], Golden plover [A140], Dunlin [A149], Redshank [A162], Turnstone [A169], Common gull [A182], Sandwich tern [A191] and Common tern [A193]

The Project could affect water quality in Galway Bay and at potential *ex-situ* sites used by these species during construction (even though the risk of any perceptible effect is low). This impact could affect the type, quality and/or extent of wetland/intertidal/marine habitat available for this species. These impacts could potentially negatively affect the long-term population trends of the Inner Galway Bay SPA SCI populations through reducing the number and range of areas available to the species within the SPA.

Wigeon [A050], Lapwing [A142], Bar-tailed godwit [A157] and Curlew [A160]

The Project could affect water quality in Galway Bay and at potential *ex-situ* sites used by these species during construction (even though the risk of any perceptible effect is low). This impact could affect the type, quality and/or extent of wetland/intertidal/marine habitat available for these species. These impacts could potentially negatively affect the long-term population trends of the Inner Galway Bay SPA SCI populations through reducing the number and range of areas available to the species within the SPA.

Long-term blasting in the vicinity of Ballindooley Lough could displace these SCI listed species from this site for one or more winter seasons. This impact could potentially negatively affect the long-term population trends of the Inner Galway Bay SPA populations through reducing the number and range of areas available to them.

Cormorant [A017], Grey heron [A028], Teal [A052] and Black-headed gull [A179]

The Project could affect the existing hydrogeological regime supporting wetland habitats at the Coolagh Lakes which could affect the type, quality and extent of wetland habitat available. These impacts could potentially negatively affect the long-term population trends of the Inner Galway Bay SPA population through reducing the number and range of areas available to the SPAs SCI bird populations.

The Project could affect water quality in Galway Bay and at potential *ex-situ* sites used by these species during construction (even though the risk of any perceptible effect is low). This impact could affect the type, quality and/or extent of wetland/intertidal/marine habitat available for this species. These impacts could potentially negatively affect the long-term population trends of the Inner Galway Bay SPA SCI populations through reducing the number and range of areas available to the species within the SPA.

Long-term blasting in the vicinity of Ballindooley Lough could displace these SCI listed species from this site for one or more winter seasons. This impact could potentially negatively affect the long-term population trends of the Inner Galway Bay SPA populations through reducing the number and range of areas available to them.

Wetlands [A999]

The permanent area of wetland habitat could be negatively affected as a result of hydrogeological impacts and/or hydrological impacts.

The Project could affect the groundwater quality at potential *ex-situ* sites used by wintering bird species listed as SCIs for Inner Galway Bay SPA. Groundwater quality impacts could affect the type, quality and extent of wetland habitat available to SCI bird species at those *ex-situ* sites which lie within the hydrogeological ZoI. The design of the Project avoids any long-term impacts to the existing groundwater regime that would affect any of the potential *ex-situ* sites used by SCI listed wintering birds. However, mitigation measures are required in the event that any groundwater conduits are encountered during construction and to ensure that karst features do not affect the functioning of the infiltration basins during operation.

The Project could affect the quality of surface water in the receiving environment which supports the intertidal/marine/wetland habitat available, within Inner Galway Bay SPA or at potential *ex-situ* sites used by the SCI populations (Ballindooley Lough in particular).

Table 9.35 Potential Impacts on the Conservation Objectives for SCIs of Inner Galway Bay SPA (Those rows highlighted in green are the attributes potentially affected by the Project)

Attribute and Measure (NPWS, 2013b)	Target (NPWS, 2013b)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Black-throated diver (Attributes replicated from Great northern diver)			
Population trend - Percentage change	Long term population trend stable or increasing	No As the species has not been recorded within the ZoI of the Project, there will be no effects on these attributes/targets	No
Distribution - Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by the Great northern diver, other than that occurring from natural patterns of variation	No As the species has not been recorded within the ZoI of the Project, there will be no effects on these attributes/targets	No
Great northern diver **To maintain the favourable conservation condition of these bird species in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:**			
Population trend - Percentage change	Long term population trend stable or increasing	Construction/operational impacts on the existing hydrological regime within the SPA	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Distribution - Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by the Great northern diver, other than that occurring from natural patterns of variation	Construction/operational impacts on the existing hydrological regime within the SPA	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Cormorant **To maintain the favourable conservation condition of Cormorant in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:**			
Breeding population abundance: apparently occupied nests (AONs) – Number	No significant decline	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No

Attribute and Measure (NPWS, 2013b)	Target (NPWS, 2013b)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Productivity rate - Mean number	No significant decline	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, and foraging areas will not be restricted, there will be no effects on this attribute/target	No
Distribution: breeding colonies - Number; location; area (hectares)	No significant decline	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Prey biomass available - Kilogrammes	No significant decline	No None of the impacts associated with the Project will affect prey availability for this species in Lough Corrib and there will be no effects on this attribute/target	No
Barriers to connectivity - Number; location; shape; area (hectares)	No significant increase	No The proposed River Corrib Bridge will not pose a barrier to connectivity along the River Corrib Corridor and therefore there will be no effects on this attribute/target	No
Disturbance at breeding site - Level of impact	Human activities should occur at levels that do not adversely affect the breeding Cormorant population	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, and any disturbance along the River Corrib during construction will be temporary and restricted to the immediate vicinity of the construction works, there will be no effects on this attribute/target	No
Population trend - Percentage change	Long term population trend stable or increasing	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

Attribute and Measure (NPWS, 2013b)	Target (NPWS, 2013b)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
			Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Distribution: Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by cormorant, other than that occurring from natural patterns of variation	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Grey heron, Light-bellied brent goose, Teal, Red-breasted merganser, Ringed plover, Black-headed gull, Common Gull **To maintain the favourable conservation condition of these bird species in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:**			
Population trend - Percentage change	Long term population trend stable or increasing	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Distribution - Number and range of areas used by waterbirds	No significant decrease in the range, timing and intensity of use of areas used by the listed SCIs, other than that occurring from natural patterns of variation	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4

Attribute and Measure (NPWS, 2013b)	Target (NPWS, 2013b)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
			Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Wigeon, Golden plover, Lapwing, Dunlin, Bar-tailed godwit, Curlew, Redshank, Turnstone **To maintain the favourable conservation condition of these bird species in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:**			
Population trend - Percentage change	Long term population trend stable or increasing	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9
Distribution - Number, range, timing and intensity of areas used by waterbirds	No significant decrease in the range, timing or intensity of use of areas by the listed SCIs, other than that occurring from natural patterns of variation	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites Disturbance/displacement of birds at Ballindooley Lough during construction	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5 Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9

Attribute and Measure (NPWS, 2013b)	Target (NPWS, 2013b)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Sandwich tern **To maintain the favourable conservation condition of Sandwich Tern in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:**			
Breeding population abundance: apparently occupied nests (AONs) – Number	No significant decline	No As the species has not been recorded within the ZoI of the Project, and the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on these attributes/targets	No
Productivity rate: fledged young per breeding pair - Mean number	No significant decline		
Distribution: breeding colonies - Number; location; area (hectares)	No significant decline		
Prey biomass available - Kilogrammes	No significant decline		
Barriers to connectivity - Number; location; shape; area (hectares)	No significant increase		
Disturbance at breeding site - Level of impact	Human activities should occur at levels that do not adversely affect the breeding Sandwich tern population		
Common tern **To maintain the favourable conservation condition of Common Tern in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:**			
Breeding population abundance: apparently occupied nests (AONs) – Number	No significant decline	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No

Attribute and Measure (NPWS, 2013b)	Target (NPWS, 2013b)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Productivity rate: fledged young per breeding pair - Mean number	No significant decline	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, and foraging areas will not be restricted, there will be no effects on this attribute/target	No
Distribution: breeding colonies - Number; location; area (hectares)	No significant decline	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, there will be no effects on this attribute/target	No
Prey biomass available - Kilogrammes	No significant decline	No None of the impacts associated with the Project will affect prey availability for this species in Lough Corrib and there will be no effects on this attribute/target	No
Barriers to connectivity - Number; location; shape; area (hectares)	No significant increase	No The proposed River Corrib Bridge will not pose a barrier to connectivity along the River Corrib Corridor and therefore there will be no effects on this attribute/target	No
Disturbance at breeding site - Level of impact	Human activities should occur at levels that do not adversely affect the breeding Common tern population	No As the breeding colonies are beyond the ZoI of any of the impacts associated with the Project, and any disturbance along the River Corrib during construction will be temporary and restricted to the immediate vicinity of the construction works, there will be no effects on this attribute/target	No
Wetlands **To maintain the favourable conservation condition of wetland habitat in Inner Galway Bay SPA as a resource for the regularly occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:**			
Habitat area - Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 13,267ha, other	Construction/operational impacts on the existing hydrogeological/hydrological regime supporting wetland habitats at potential ex-situ sites	Measures to avoid habitat degradation as a result of potential hydrogeological impacts during construction and operation

Attribute and Measure (NPWS, 2013b)	Target (NPWS, 2013b)	Potential Direct or Indirect Impacts Requiring Mitigation?	Are Mitigation Measures Required?
	than that occurring from natural patterns of variation		Section 10.4 Measures to maintain water quality in receiving watercourses during construction Section 10.5

9.5 Inishmore Island SAC / Kilkieran Bay and Island SAC

9.5.1 Special Conservation Interests and Conservation Objectives of Inishmore Island SAC / Kilkieran Bay and Island SAC

In March 2024, since the 2018 NIS, the oral hearing in 2020 and the assessment undertaken by the Inspector appointed by An Bord Pleanála (ABP) documented in ABP's Inspector's Report dated 22 June 2021, two cetacean species (Bottlenose dolphin *Tursiops truncatus* and Harbour porpoise *Phocoena phocoena*) were added as QIs at 16 existing marine and coastal SAC sites around the Irish marine waters. Due to foraging ranges, cetacean species from nearby European sites could use habitat within Galway Bay and possibly be affected by impacts to water quality within the receiving environment.

Site-specific conservation objectives for the newly listed species have been published for Inishmore Island SAC. Site-specific conservation objectives have not been defined for Kilkieran Bay and Island SAC. The attributes and targets that define the favourable conservation condition of the species in Kilkieran Bay and Island SAC have been derived from other SAC sites (NPWS, 2011, NPWS, 2012, NPWS, 2014c and NPWS, 2015b), also designated for cetaceans, which have attributes and targets defined (Table 9.36).

Table 9.36 Qualifying Interests that may utilise Galway Bay and Conservation Objectives

Qualifying Interests	Conservation Objective
Annex II Species	
[1351] *Phocoena phocoena* (Harbour porpoise)	To restore the favourable conservation condition
[1349] *Tursiops truncates* (Bottlenose dolphin)	To restore the favourable conservation condition

Two SAC sites, both now designated for Harbour porpoise[73], are in proximity to Galway Bay, a coastal waterbody within the ZoI of the proposed N6 GCRR and as such the Project:

- Inishmore Island SAC *c.*53.2km southwest of the Assessment Boundary for the proposed N6 GCRR
- Kilkieran Bay and Islands SAC *c.*41.7km west of the Assessment Boundary for the proposed N6 GCRR

9.5.2 Ecological Baseline

Both the Bottlenose dolphin and the Harbour porpoise have extensive global ranges; 620,000 km² and 400,000 km², respectively (NPWS, 2019a and NPWS, 2019c). Therefore, individuals from qualifying interest populations around the Irish coast could use habitat within Galway Bay.

The natural range of Bottlenose dolphins in Irish waters, and marine waters covered by the Directive, is a small component of the species' wider North Atlantic range (Hammond *et al.*, 2012; Wells & Scott, 2009; DEHLG, 2009; Hammond *et al.*, 2017; Rogan *et al.*, 2018a), while ongoing evidence from repeated high quality surveys (Berrow *et al.*, 2018; Rogan *et al.*, 2018a) continues to confirm the species' occurrence in Irish waters in all seasons.

The natural range of Harbour porpoises in Irish waters, and marine waters covered by the Directive, is a small component of the species' wider North Atlantic range (Hammond *et al.*, 2008; Bjørge & Tolley (2009); DEHLG, 2009; Hammond *et al.*, 2017; Rogan *et al.*, 2018), while ongoing evidence from repeated high quality surveys (Rogan *et al.*, 2018) continues to confirm the species' occurrence in Irish waters in all seasons.

[73] As Kilkieran Bay and Islands SAC does not currently have site-specific conservation objectives defined for Harbour porpoise, the attributes and targets that define the favourable conservation condition of the species in those European sites have been derived from other SAC sites, also designated for Harbour porpoise, which have attributes and targets defined

9.5.3 Potential Direct and Indirect Impacts

Although there is no direct impact within any marine or coastal areas supporting cetacean species and potential QI populations, one indirect impact by which the Project could (in the absence of mitigation measures) potentially affect the cetacean QIs using Galway Bay is:

- Habitat degradation as a result of the Project affecting water quality in receiving watercourses and Galway Bay during construction

9.5.4 Examination and Analysis of Potential Direct and Indirect Impacts

9.5.4.1 Habitat degradation – hydrology

As noted above, the Project, in the absence of mitigation measures, could affect water quality in Galway Bay (and, therefore, there is a risk that any harbour porpoise from the qualifying interest populations of Inishmore Island SAC or Kilkieran Bay and Islands SAC that might use habitat in Galway Bay could be negatively affected. The Project does not pose any risk of undermining the conservation objectives for any of the other qualifying interests of Inishmore Island SAC or Kilkieran Bay and Islands SAC.

However, the risk of the Project negatively affecting water quality in Galway Bay has been fully mitigated in the 2018 NIS and An Bord Pleanála's Inspector's Report dated 22 June 2021 to ensure there are no residual water quality effects. Equally, the Project does not pose a risk to the receiving marine environment in Galway Bay.

Therefore, there is no potential for the Project to undermine the conservation objectives supporting the favourable conservation condition, or adversely affect the integrity, of Inishmore Island SAC or Kilkieran Bay and Islands SAC as a result of impact to their qualifying interest Harbour porpoise populations.

The other European sites in Ireland that are designated for either the Bottlenose dolphin or Harbour porpoise are:

- Belgica Mound Province SAC (bottlenose dolphin and harbour porpoise)
- Blackwater Bank SAC (harbour porpoise)
- Blasket Islands SAC (harbour porpoise)
- Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (harbour porpoise)
- Carnsore Point SAC (harbour porpoise)
- Codling Fault Zone SAC (harbour porpoise)
- Duvillaun Islands SAC (bottlenose dolphin)
- Gweedore Bay and Islands SAC (harbour porpoise)
- Hook Head SAC (bottlenose dolphin and harbour porpoise)
- Kenmare River SAC (harbour porpoise)
- Lambay Island SAC (harbour porpoise)
- Lough Swilly SAC (harbour porpoise)
- Lower River Shannon SAC (bottlenose dolphin)
- Porcupine Bank Canyon SAC (bottlenose dolphin)
- Roaringwater Bay and Islands SAC (harbour porpoise)
- Rockabill to Dalkey Island SAC (harbour porpoise)
- Slyne Head Islands SAC (bottlenose dolphin)

- Slyne Head Peninsula SAC (bottlenose dolphin)
- Southwest Porcupine Bank SAC (bottlenose dolphin)
- St. John's Point SAC (bottlenose dolphin)
- West Connacht Coast SAC (bottlenose dolphin and harbour porpoise)

These other European sites are further away from the Project than either Inishmore Island SAC or Kilkieran Bay and Islands SAC and, based on the absence of effects of the mitigated Project on the receiving marine environment in Galway Bay, are equally at no risk of their conservation objectives being undermined should individuals from their qualifying interest Bottlenose dolphin or Harbour porpoise populations use habitat areas within Galway Bay.

Summary

The Project, considering the mitigation measures, will not affect the receiving environment in Galway Bay and its marine environment, and there is no potential for the Project alone to undermine the conservation objectives, or adversely affect the integrity, of European sites designated for Harbour porpoise or Bottlenose dolphin.

A summary of the potential hydrological impacts associated with the Project are presented in Table 9.37 below.

Table 9.37 Summary of Hydrological Impacts

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction		
Construction works affecting the hydrological regime	No Construction of the Project will not affect the functioning of any rivers which flow into or lie within Galway Bay, either in terms of flow or flooding regime, and will not affect the tidal regime or hydrological functioning of Galway Bay	No
Construction works affecting surface water quality	Yes Affecting the quality of surface water discharging to the marine environment could affect the associated aquatic/coastal/marine habitats and species	Yes To ensure that water quality in the receiving environment is not affected during construction (as outlined in Section 10.5)
Operation		
The hydrological regime being affected during operation	No The design of the Project will not affect the functioning of any rivers which flow into or lie within Galway Bay, either in terms of flow or flooding regime, and will not affect the tidal regime or hydrological functioning of Galway Bay	No
Surface water quality being affected during operation	No The drainage design (as described in Section 2, and Appendix B and Appendix C) will ensure that surface water quality will be maintained during operation	No

9.5.4.2 Summary

Overall, the combination of the mitigation measures in this updated NIS, which includes the relevant project-related additional mitigation measures (see Section 10 from the ABP's Inspector's Report dated 22 June 2021 for the Project, along with absence of any effect of the Project on the receiving marine environment in Galway Bay, will ensure the Project does not adversely affect the integrity of any European sites designated with cetacean QIs utilising Galway Bay.

Table 9.38 below, lists the main cetacean QIs that may utilise Galway Bay and how the impacts discussed relate to each.

Table 9.38 Qualifying Interests that may utilise Galway Bay and Potential Impacts

Qualifying Interests	Impact
Annex II Species	
[1351] Phocoena phocoena (Harbour porpoise)	Habitat degradation – hydrology
[1349] Tursiops truncates (Bottlenose dolphin)	Habitat degradation – hydrology

The relationship between, and potential influence of, the impact with respect to the QI species within the ZoI of the Project and the attributes/targets upon which their favourable conservation condition is considered and measured is considered further below and also presented in Table 9.39 (NPWS, 2011; NPWS, 2012; NPWS, 2014c and NPWS, 2015b).

[1351] Harbour porpoise

Affecting water quality in the Galway Bay marine environment during construction (even though the risk of any perceptible effect is low) could affect the quality, extent and availability of habitat to Harbour porpoise which, in a worst case scenario, could also have a population level effect on European sites designated with Harbour porpoise as QIs.

[1349] Bottlenose dolphin

Affecting water quality in the Galway Bay marine environment during construction (even though the risk of any perceptible effect is low) could affect the quality, extent and availability of habitat to Bottlenose dolphin which, in a worst case scenario, could also have a population level effect on European sites designated with Harbour porpoise as QIs.

Table 9.39 Potential Impacts on the Conservation Objectives for cetacean QIs as derived from European sites designated for these species (Those rows highlighted in green are the attributes potentially affected by the Project)

Attributes and measures	Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
1351 Harbour porpoise *Phocoena Phocoena* **To restore the favourable conservation condition of Harbour porpoise, which is defined by the following list of attributes and targets (NPWS, 2024b, NPWS, 2011 and NPWS, 2014):**			
Access to suitable Habitat – Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.	No The Project will not pose any artificial barrier that would restrict the movement of the species to use the site	No
Disturbance – Level of impact	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site	No The Project does not propose any direct activities within the Galway Bay nor human-related disturbances to the marine or coastal environment.	No
1349 Common Bottlenose Dolphin *Tursiops truncatu* **To restore the favourable conservation condition of Common Bottlenose Dolphin, which is defined by the following list of attributes and targets (NPWS, 2012 and NPWS, 2015b):**			
Access to suitable Habitat – Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.	No The Project will not pose any artificial barrier that would restrict the movement of the species to use the site	No
Habitat use: critical areas – Location and hectares	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition.	A reduction in water quality in Galway Bay during construction could affect the use of the Galway Bay marine environment by the Bottlenose dolphin.	Measures to maintain water quality in receiving watercourses during construction Section 10.5
Disturbance – Level of impact	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site	No The Project does not propose any direct activities within the Galway Bay nor human-related disturbances to the marine or coastal environment.	No

9.6 European Sites and Construction-related Traffic

Upon review of the assessment undertaken by the Inspector appointed by An Bord Pleanála (ABP) documented in ABP's Inspector's Report dated 22 June 2021, the potential for construction-related traffic to affect European sites associated with the wider existing road network, which, on a precautionary basis, extend south of Galway along the M18, R458 and N67, has been included in the assessment for this updated NIS and includes the following European sites:

- Lough Corrib SAC
- Galway Bay Complex SAC
- Lough Corrib SPA
- Inner Galway Bay SPA
- Ardrahan Grassland SAC
- Castletaylor Complex SAC
- Cregganna Marsh SPA
- Kiltiernan Turlough SAC
- Lough Fingall Complex SAC
- Rahasane Turlough SPA
- Rahasane Turlough SAC

The European sites linked to the Project by way of the M18, R458 and N67 during its construction have been assessed in terms of the potentially significant risks associated with construction-related traffic as follows:

- Increased spills and leaks which could contaminate groundwater and surface water:

  Hydrogeology: The ZoI includes habitat areas within Lough Corrib SAC, and wetland sites supporting SCIs of Lough Corrib SPA and Inner Galway Bay SPA (Section 7.3)

  Hydrology: The ZoI is any wetland, coastal or marine habitat downstream of any watercourse crossings or drainage outfalls, and any aquatic/marine species therein and includes Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC and Inner Galway Bay SPA (Section 7.4)

- Increased generation and deposition of dust and emissions:

  Air quality: The ZoI is the immediate vicinity of the construction works for dust deposition and within 200m of the construction works and proposed haul roads during construction, and the footprint of the proposed N6 GCRR during operation, and only includes Lough Corrib SAC (Section 7.5)

- The introduction and spread of invasive species:

  The ZoI of this impact is potentially any habitats crossed by, immediately adjacent to, or downstream of the Project or along any of the proposed haul routes that are at risk from contaminated soil/material and includes Lough Corrib SAC and Galway Bay Complex SAC. Lough Corrib SPA is excluded from the ZoI being upstream of the Project and Inner Galway Bay SPA will not support terrestrial non-native species in its marine / coastal habitat (Section 7.7)

9.6.1 Special Conservation Interests and Conservation Objectives

The qualifying interests of Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Cregganna Marsh SPA, Rahasane Turlough SAC, Rahasane Turlough SPA, are listed below in Table 9.40.

Table 9.40 Qualifying Interests and Conservation Objectives for the listed European Sites

Qualifying Interests	Conservation Objective
Lough Corrib SAC	Refer to Table 9.1
Galway Bay Complex SAC	Refer to Table 9.14
Lough Corrib SPA	Refer to Table 9.22
Inner Galway Bay SPA	Refer to Table 9.29
Ardrahan Grassland SAC [002244]	
4060 Alpine and Boreal heaths	To maintain the favourable conservation condition
5130 *Juniperus communis* formations on heaths or calcareous grasslands	To restore the favourable conservation condition
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates	To restore the Favourable conservation condition
8240 Limestone pavements*	To maintain the favourable conservation condition
Castletaylor Complex SAC [000242]	
3180 Turloughs*	To restore the favourable conservation condition
4060 Alpine and Boreal heaths	To restore the favourable conservation condition
5130 *Juniperus communis* formations on heaths or calcareous grasslands	To maintain the favourable conservation condition
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	To restore the favourable conservation condition
8240 Limestone pavements*	To restore the favourable conservation condition
Cregganna Marsh SPA [004142]	
A395 Greenland White-fronted Goose *Anser albifrons flavirostris*	To restore the favourable conservation condition
Kiltiernan Turlough SAC [001285]	
3180 Turloughs*	To restore the favourable conservation condition
Lough Fingall Complex SAC [000606]	
3180 Turloughs	To restore the favourable conservation condition
4060 Alpine and Boreal heaths	To maintain the favourable conservation condition
5130 *Juniperus Communis* formations on heaths or calcareous grasslands	To maintain the favourable conservation condition
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	To restore the favourable conservation condition
7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	To maintain the favourable conservation condition
8240 Limestone pavements*	To maintain the favourable conservation condition
1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*	To maintain the favourable conservation condition

Qualifying Interests	Conservation Objective
Rahasane Turlough SAC [000322]	
3180 Turloughs*	To maintain the favourable conservation condition
Rahasane Turlough SPA [004089]	
A038 Whooper Swan *Cygnus cygnus*	To restore the favourable conservation condition
A050 Wigeon *Anas penelope*	To maintain the favourable conservation condition
A140 Golden Plover *Pluvialis apricaria*	To restore the favourable conservation condition
A156 Black-tailed Godwit *Limosa limosa*	To maintain the favourable conservation condition
A395 Greenland White-fronted Goose *Anser albifrons flavirostris*	To restore the favourable conservation condition
A999 Wetlands and Waterbirds	To maintain the favourable conservation condition

9.6.2 Ecological Baseline

Sections 9.1.2, Section 9.2.2, Section 9.3.2 and Sections 9.4.2 provide baseline descriptions for Lough Corrib and Galway Bay and European sites.

Ardrahan Grassland SAC

The Site Synopsis[74] describes the site as "*dominated by a large flat limestone area with a mosaic of calcareous habitats including limestone pavement, alpine heath, Juniper scrub and species rich dry grasslands. … [The] south-west of the site consists of a small marl lake and adjoining fens and marshes, with Juniper heath frequent on the higher ground. Soils associated with limestone pavement are generally thin rendzina; deeper pockets are more mineral rich and support limestone grassland and scrub in places. … The site contains a good example of limestone pavement, a priority habitat listed on Annex I of the E.U. Habitats Directive, a small though excellent example of the Annex I habitat alpine heath, areas of the Annex I priority habitat orchid - rich calcareous grassland, along with one other Annex I habitat, Juniper scrub. … Bird species recorded from the site include Snipe, Mute Swan and Curlew".*

Castletaylor Complex SAC

The Site Synopsis [75] describes the site as containing a diverse range of habitats, including five habitats that are listed on Annex I of the E.U. Habitats Directive, Alpine and Subalpine Heaths, Juniper Scrub, Turloughs, Orchid-rich Calcareous Grassland, and Limestone Pavement. "*Caranavoodaun turlough dominates the north-western half of the site. It occupies a shallow basin set among ridges of limestone outcrop and thin glacial drift and is an excellent example of a calcareous and extremely oligotrophic (nutrient-poor) turlough. … The limestone pavement occurs mainly as scattered boulders with no extensive areas of flat pavement. … Limestone pavement breaks through the turlough floor in places, and supports scrub vegetation…. Limestone outcrops also occur within the wooded area of the site. The dry calcareous grassland that occurs amongst the limestone pavement and heath is species-rich, particularly with orchids…. The heath at this site is characterised by the presence of Juniper (Juniperus communis) and Mountain Avens. The presence of Bearberry (Arctostaphylos uva-ursi) indicates that some of the heath is similar to the Arctostaphylos-Dryas vegetation of the Burren limestone area, a rare lowland alpine type heath. The eastern and much of the southern parts of the site are dominated by dry broadleaved woodland. … The turlough does not hold any significant wintering populations of birds, owing to the extreme oligotrophic conditions. Three pairs of Lapwing bred at the site in 1996*".

[74]NPWS (2019f) *Ardrahan Grassland SAC [002244] Site Synopsis* - Version date: 28.08.2019

[75]NPWS (2013e) *Castletaylor Complex SAC [000242] Site Synopsis* - Version date: 16.08.2013

Cregganna Marsh SPA

The Site Synopsis [76] describes the predominant habitats on the site as *"lowland wet grassland and improved grassland, but areas of limestone pavement and other exposed rock, Hazel (Corylus avellana) scrub, freshwater marsh, drainage ditches and dry grassland also represented. …. The site is of major conservation importance as a feeding site for a nationally important flock of Greenland White-fronted Goose (157 – 5 year mean peak between 1994/95 and 1998/99[)]. The birds using this site form part of the Rahasane flock".*

Kiltiernan Turlough SAC

The Site Synopsis [77] describes the site as an *"example of a partly modified, relatively dry turlough, without any accumulation of peat. [This Annex I habitat]… includes a variety of typical dry turlough vegetation types and is notable for the presence of the rare plant species, Alder Buckthorn and Fen Violet". Furthermore "Lapwing, Pochard, Teal and Wigeon have been recorded at the site, and other bird species may visit from the nearby Tullaghnafrankagh Lough".*

Lough Fingall Complex SAC

The Site Synopsis [78] describes the site as comprising of a complex of E.U. Habitats Directive habitats, including four priority habitats, the dominant being turloughs and Limestone pavement. "*The turloughs at this site are oligotrophic (nutrient-poor) and calcareous in character. Their catchment areas are relatively small and water tends to remain in them for considerable periods of time. ... Limestone pavement occurs throughout the site. It varies from the classic bare open pavement, with little vegetation, to pavement and shattered limestone blocks interspersed with calcareous grassland, heath, turlough and scrub. …*". *Cloghballymore House provides a summer breeding site for the Lesser Horseshoe Bat, a species listed on Annex II of the E.U. Habitats Directive. ... The surrounding mixed woods provide suitable foraging habitat within a short radius of the day roost site. In 1993, more than 200 bats were counted at this site, which makes it of international importance. The site is of local importance for wintering waterfowl, particularly Lapwing (max. count 381 in 1995/96), with 6 breeding pairs recorded in 1996. Some scarce invertebrate species have been recorded from the Lough Fingall area*".

Rahasane Turlough SAC

The Site Synopsis [79] describes the site to be *"of major ecological significance as one of only two large turloughs in the country which still function naturally".* Rahasane Turlough (EU Annex I priority habitat) *was "formerly the natural sink of the Dunkellin River, but now an artificial channel takes some of the water further downstream".* It is the *"most important turlough in Ireland for birdlife. In a relatively recent national survey, it was also rated very highly for its vegetation, and supports two rare species listed in the Irish Red Data Book". Rahasane Turlough is "renowned for its wintering wildfowl populations, but it also supports nesting waders in summer, which include Lapwing, Redshank, Snipe and Dunlin… Internationally important numbers of Whooper Swan 179, Golden Plover 17680, Wigeon 7760 and Shoveler 498 are found. The first two species, together with Bewick's Swan, below, are listed on Annex I of the E.U. Birds Directive. Species recorded in nationally important numbers are Bewick's Swan 132, Mute Swan 125, Teal 3005, Mallard 777, Pintail 102, Pochard 356, Tufted Duck 381, Coot 1289, Lapwing 3995, Dunlin 3569 (5653), Black-tailed Godwit 170 and Curlew 1205. Small numbers of the internationally important Greenland White-fronted Goose regularly overwinter at Rahasane (average count, as above, 59)".*

Rahasane Turlough SPA

The Site Synopsis [80] describes the site to be *"of special conservation importance for the following species: Whooper Swan, Greenland White-fronted Goose, Wigeon, Golden Plover and Black-tailed Godwit. ... [T]he*

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[76]NPWS (2015c) *Cregganna Marsh SPA [004142] Site Synopsis* – Dated 30.5.2015

[77]NPWS (2013f) *Kiltiernan Turlough SAC [001285] Site Synopsis* - Version date: 1.10.2013

[78]NPWS (2013g) *Lough Fingall Complex SAC [000606] Site Synopsis* - Version date: 4.09.2013

[79]NPWS (2013h) *Rahasane Turlough SAC [000322] Site Synopsis* - Version date: 19.08.2013

[80]NPWS (2014d) *Rahasane Turlough SPA [004089] Site Synopsis* – Dated 9.7.2014

site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds. Rahasane is a traditional site for Greenland White-fronted Goose, and supports a population of national importance (157 individuals - five year mean peak for the period 1994/95 to 1998/99). It is of international importance for Black-tailed Godwit (437 - all figures are five year mean peaks for the period 1995/96 to 1999/2000). It also has nationally important populations of Whooper Swan (165), Wigeon (3,430), and Golden Plover (6,613). The site has the largest inland population of Dunlin (864) in the country and also supports Mute Swan (57), Teal (307), Mallard (142), Pintail (19), Shoveler (28), Tufted Duck (32), Grey Heron (31), Lapwing (2,220), Curlew (197), Redshank (134) and Black-headed Gull (280). Little Egret, a species which has recently colonised Ireland, also occurs at this site".

9.6.3 Potential Direct and Indirect Impacts

The direct and/or indirect impacts by which the Project could (in the absence of mitigation measures) potentially affect the conservation objective attributes and targets supporting the conservation condition of the qualifying interests of Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Cregganna Marsh SPA, Rahasane Turlough SAC, Rahasane Turlough SPA are:

- Habitat degradation as a result of the Project affecting the functioning and quality of the existing hydrogeological regime
- Habitat degradation as a result of the Project affecting water quality in receiving watercourses during construction
- Habitat degradation as a result of air quality impacts
- Habitat degradation as a result of introducing/spreading non-native invasive plant species to surrounding areas

9.6.4 Examination and Analysis of Potential Direct and Indirect Impacts

9.6.4.1 Habitat degradation – hydrogeology / hydrology / air quality / non-native invasive species

The main area of concern, as raised in the appropriate assessment undertaken by the Inspector appointed by An Bord Pleanála (ABP) and appended to ABP's Inspector's Report dated 22 June 2021 was the additional construction related traffic coming from the south of Galway that would cause increase in traffic along the M18, R458 and N67. Also stated in the report is the "*M18 is a modern road … likely to include modern standards of pollution control which would deal with spillages either from leaking vehicles or in the event of an accident. However, the R458 and N67 are older roads which do not/may not reach the same standards of pollution control potentially leaving the Natura 2000 sites alongside at risk from pollution, albeit a very small risk that any pollution arising specifically from construction traffic would have any appreciable effect on the qualifying interest of these Natura 2000 sites*". The potential impact pathway and ZoI is discussed below and a summary presented in Table 9.41.

Hydrology (EPA Mapping)

Construction related traffic utilising the M18, R458 and N67 could have accidental spills and leaks which could, through surface runoff, affect the nearby European sites.

The ZoI is considered the immediate vicinity and downstream of the R458 and N67, and considered to be fully mitigated along the M18, which includes drainage control measures within its design. In terms of the European sites under evaluation, three sites are downgradient of the R458 and one site is downgradient of the N67 and can be considered within the ZoI for run-off related impacts from these roads:

- Ardrahan Grassland SAC is adjacent to (<50m), and downgradient of, the R458 for most of its northeastern border
- Kiltiernan Turlough SAC is adjacent to (<20m) the R458 for most of its northeastern border (distance of c.0.17km), with an old disused gravel road between this SAC and the R458. The turlough, however, is a natural lower lying area in its immediate vicinity and on a precautionary basis is considered at risk from runoff from the R458

- Lough Fingall Complex SAC is adjacent to (a distance of c.0.35km) and within 200m of (a distance of c.1km) of the R458. There is variation in the topography in this SAC with the hills and turloughs, but the turlough is a natural lower lying area in its immediate vicinity and on a precautionary basis is considered at risk from run-off from the R458

- Cregganna Marsh SPA is within 200m of the N67 for a distance of c.0.9km, lying east and downgradient of the N67

- Rahasane Turlough SAC and SPA are located 15km to the southeast and are outside of the ZoI of run-off related impacts themselves, however are interconnected with Cregganna Marsh SPA (due to the use of all three sites by the same flocks of winter bird species) and therefore considered for this impact for that reason

- The remaining site (Castletaylor Complex SAC) is upgradient of these roads, or downgradient of the mitigated M18, and outside the ZoI of run-off related impacts

Hydrogeology (EPA Mapping)

Construction-related traffic utilising the M18, R458 and N67 could have accidental spills and leaks which could, through surface runoff, reach un-tarred surface and cause deterioration of the groundwater which could affect nearby European sites. Potential for these impacts is considered fully mitigated along the M18, which has designed drainage control measures.

The ZoI would be primarily delimited by the boundary of the local GWB, the proximity of the sites to the road in relation to the aquifer characteristics and the direction of flow within the aquifer.

Rahasane Turlough SPA and Rahasane Turlough SAC lie within a separate GWB and do not share the GWB with the road network in the area. These European sites are considered outside the ZoI.

The remaining sites share Karstic GWB with the road network in the area.

- Ardrahan Grassland SAC straddles the Kinvara-Gort, Clarinbridge and the GWDTE-Kiltiernan Turlough GWB, and shares GWBs with the R458 and N67. The SAC is not listed for any QIs related to GWDTE/wetland or aquatic habitats and the conservation objectives of the QIs will not be impacted by construction related traffic

- Castletaylor Complex SAC straddles the Clarinbridge and the GWDTE-Kiltiernan Turlough GWB, and shares GWBs with the R458 and N67

- Kiltiernan Turlough SAC straddles the Clarinbridge and the GWDTE-Kiltiernan Turlough GWB, and shares GWBs with the R458 and N67

- Lough Fingall Complex SAC straddles the Clarinbridge and the GWDTE-Kiltiernan Turlough GWB, and shares GWBs with the M18, R458 and N67

- Cregganna Marsh SPA straddles the Clarinbridge and the GWDTE-Kiltiernan Turlough GWB, and shares GWBs with the M18, R458 and N67

Air Quality

The roads are all tarred surfaces that will not generate dust and there will be no dust impact to any of the European sites due to construction-related traffic utilising the M18, R458 and N67.

The ZoI for air quality emission is expected to be less than the 200m for dust (with the exception of Rahasane Turlough SPA and Rahasane Turlough SAC which are more than 200m from the M18, R458 and N67). The following are considered:

- Ardrahan Grassland SAC is within 200m of the M18 and R458

- Castletaylor Complex SAC's nearest location is *c.*150m from the M18, with its second nearest location c.300m from the M18, and therefore has very little overlap with the 200m ZoI

- Kiltiernan Turlough SAC is within 200m of the R458

- Lough Fingall Complex SAC is within 200m of the R458 and N67
- Cregganna Marsh SPA is within 200m of the N67
- Rahasane Turlough SAC and SPA are located 15km to the southeast and are outside of the ZoI of air related impacts themselves, however are interconnected with Cregganna Marsh SPA (due to the use of all three sites by the same flocks of winter bird species) and therefore considered for this impact for that reason.

Non-native Invasive Species

The ZoI is defined as any habitats directly traversed by, immediately adjacent to, or downstream of the activity and the following European sites are considered with the potential ZoI:

- Ardrahan Grassland SAC is adjacent to the R458, with only limited connectivity to the M18
- Kiltiernan Turlough SAC is adjacent to the R458 for a limited section of its eastern boundary
- Lough Fingall Complex SAC is traversed at one limited location at its far western border by the N67 and is also adjacent to the R458 and N67

Table 9.41 Summary of Impacts from construction related traffic

Potential Direct or Indirect Impacts	Could the Project Affect the QIs?	Are Mitigation Measures Required?
Construction		
Construction works affecting the groundwater quality	Yes Increase in construction related traffic on the wider, existing road network could indirectly impact nearby European sites through water-quality related impacts by way of surface run-off to non-tarred areas	Yes To ensure the construction fleet is well maintained and utilises the designated roads responsibly in line with Section 10.12
Construction works affecting surface water quality	Yes Increase in construction related traffic on the wider, existing road network could indirectly impact nearby European sites through water-quality related impacts by way of surface runoff	Yes To ensure the construction fleet is well maintained and utilises the designated roads responsibly in line with Section 10.5 and Section 10.12
Construction works affecting air quality	Yes Increase in construction related traffic on the wider, existing road network could indirectly impact nearby European sites through additional emissions	Yes To ensure the construction fleet is well maintained in line with Section 10.6 and Section 10.12
Construction works affecting air quality	Yes Increase in construction related traffic on the wider, existing road network could result in the introduction and spread of non-native invasive species to nearby European sites	Yes To ensure the construction fleet is well maintained and kept clear of debris in line with Section 10.8 and Section 10.12

9.6.4.2 Summary

Table 9.42 lists the QIs of Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Cregganna Marsh SPA, Rahasane Turlough SPA, Rahasane Turlough SAC and provides a summary of the potential impacts of the Project on theses QIs.

Table 9.42 Qualifying Interests and Impacts

Qualifying Interests	Impact
Ardrahan Grassland SAC [002244]	
4060 Alpine and Boreal heaths	Habitat degradation – hydrology Habitat degradation – air quality Habitat degradation – non-native invasive species
5130 *Juniperus communis* formations on heaths or calcareous grasslands	
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates	
8240 Limestone pavements*	
Castletaylor Complex SAC [000242]	
3180 Turloughs*	Habitat degradation – hydrogeology Habitat degradation – air quality
4060 Alpine and Boreal heaths	
5130 *Juniperus communis* formations on heaths or calcareous grasslands	
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	
8240 Limestone pavements*	
Cregganna Marsh SPA [004142]	
A395 Greenland White-fronted Goose *Anser albifrons flavirostris*	Habitat degradation – hydrology Habitat degradation – hydrogeology Habitat degradation – air quality Habitat degradation – non-native invasive species
Kiltiernan Turlough SAC [001285]	
3180 Turloughs*	Habitat degradation – hydrology Habitat degradation – hydrogeology Habitat degradation – air quality Habitat degradation – non-native invasive species
Lough Fingall Complex SAC [000606]	
3180 Turloughs	Habitat degradation – hydrology Habitat degradation – hydrogeology Habitat degradation – air quality Habitat degradation – non-native invasive species
4060 Alpine and Boreal heaths	
5130 *Juniperus Communis* formations on heaths or calcareous grasslands	
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	
7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	
8240 Limestone pavements*	
1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*	

Qualifying Interests	Impact
Rahasane Turlough SAC [000322]	
3180 Turloughs*	Habitat degradation – hydrology Habitat degradation – air quality
Rahasane Turlough SPA [004089]	
A038 Whooper Swan *Cygnus cygnus*	Only as a shared population with Cregganna Marsh SPA above
A050 Wigeon *Anas penelope*	None – Outside the ZoI
A140 Golden Plover *Pluvialis apricaria*	None – Outside the ZoI
A156 Black-tailed Godwit *Limosa limosa*	None – Outside the ZoI
A395 Greenland White-fronted Goose *Anser albifrons flavirostris*	None – Outside the ZoI
A999 Wetlands and Waterbirds	None – Outside the ZoI

The relationship between, and potential influence of, these impacts with respect to the QI habitat and species within the ZoI of the Project and the attributes/targets upon which their favourable conservation condition is considered and measured is considered further below and also presented in Table 9.43 to Table 9.49.

Table 9.43 Potential Impacts/Effects on the Conservation Objectives of Ardrahan Grassland SAC

Conservation Objectives Attribute / Measure (NPWS, 2024a)	Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Alpine and Boreal heaths [4060] **To maintain the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares /	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Vegetation composition: positive indicator species / Number at a representative number of monitoring stops	At least seven positive indicator species present		
Vegetation composition: negative indicator species / Percentage cover at a representative number of monitoring stops	Negative indicator species collectively not more than 10% cover		
Vegetation composition: non-native species / Percentage cover at a representative number of monitoring stops	Non-native species not more than 1% cover		
Vegetation composition: native trees and shrubs / Percentage cover at a representative number of monitoring stops	Cover of native trees and shrubs (except juniper (Juniperus communis)) not more than 25% cover		
Physical structure: disturbance / Percentage cover at a representative number of monitoring stops	Less than 10% disturbed bare ground (excluding rocks/stones)		
Indicators of local distinctiveness / Occurrence	Indicators of local distinctiveness are maintained		
Juniperus communis formations on heaths or calcareous grasslands [5130] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes; at least 74.4ha for the surveyed sub-site Caherateige (site code GY16)	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction
Habitat distribution / Occurrence	No decline, subject to natural processes		

Conservation Objectives Attribute / Measure (NPWS, 2024a)	Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Juniper formation size / Number and proximity of juniper plants	At least 50 juniper plants present with each plant separated by no more than 20m	and fauna communities due to habitat degradation from potential impacts to hydrology, air quality and non-native invasive species	Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Vegetation structure: female fruiting plants / Percentage in a representative number of 5m x 5m monitoring stops or in an ad hoc count of 50 plants	Fruiting females comprise at least 10% of juniper plants rooted in plot in at least 50% of stops or in an ad hoc count of 50 plants		
Vegetation structure: seedling recruitment / Presence in a representative number of 5m x 5m monitoring stops	At least one seedling recorded in at least one monitoring stop		
Vegetation structure: live juniper / Percentage in a representative number of 5m x 5m monitoring stops or across the site as a whole	At least 90% of juniper plants rooted in plot alive in at least 75% of stops or across the site as a whole		
Vegetation composition: negative indicator species / Percentage in a representative number of 5m x 5m monitoring stops	Total cover of negative indicator species to be less than 10% in at least 50% of stops		
Physical structure: germination niches / Percentage in a representative number of 5m x 5m monitoring stops	At least 5% bare soil and/or at least 5% bare rock in at least 50% of stops		
Formation structure: browning/die-back of plants / Percentage of juniper cover in a representative number of 5m x 5m monitoring stops	Browning or dead juniper branches (excluding fully dead plants) comprise no more than 20% of total juniper cover in plot in at least 75% of stops		
Formation structure: evidence of browsing and bark stripping / Occurrence across a representative number of 5m x 5m monitoring stops	Recent browsing of juniper plants and bark stripping and trampling due to browsers evident in no more than 50% of stops		
Indicators of local distinctiveness / Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat		
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes	Yes

Conservation Objectives Attribute / Measure (NPWS, 2024a)	Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Habitat distribution / Occurrence	No decline, subject to natural processes	Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, air quality and non-native invasive species	Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Vegetation composition: positive indicator species / Number at a representative number of 2m x 2m monitoring stops; within 20m surrounding area of monitoring stops	At least seven positive indicator species present in monitoring stop or, if five to six present in stop, additional species within 20m of stop; this includes at least two 'high quality' positive indicator species present in stop or within 20m of stop		
Vegetation composition: negative indicator species / Percentage cover at a representative number of 2m x 2m monitoring stops	Negative indicator species collectively not more than 20% cover, with cover of an individual species not more than 10%		
Vegetation composition: nonnative species / Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species not more than 1%		
Vegetation composition: woody species and bracken / Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of woody species (except certain listed species) and bracken (Pteridium aquilinum) not more than 5%		
Vegetation structure: broadleaf herb:grass ratio / Percentage at a representative number of 2m x 2m monitoring stops	Broadleaf herb component of vegetation between 40% and 90%		
Vegetation structure: sward height / Percentage at a representative number of 2m x 2m monitoring stops	At least 30% of sward between 5cm and 40cm tall		
Vegetation structure: litter / Percentage cover at a representative number of 2m x 2m monitoring stops	Litter cover not more than 25%		
Physical structure: bare soil / Percentage cover at a representative number of 2m x 2m monitoring stops	Not more than 10% bare soil		
Physical structure: grazing or disturbance / Area in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than 20m2		
Limestone pavements* [8240] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			

Conservation Objectives Attribute / Measure (NPWS, 2024a)	Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline		
Vegetation composition: positive indicator species / Number at a representative number of monitoring stops	At least seven positive indicator species present		
Vegetation composition: bryophyte layer / Percentage at a representative number of monitoring stops	Bryophyte cover at least 50% on wooded pavement		
Vegetation composition: negative indicator species / Percentage at a representative number of monitoring stops	Collective cover of negative indicator species on exposed pavement not more than 1%		
Vegetation composition: non-native species / Percentage at a representative number of monitoring stops			
Vegetation composition: scrub / Percentage at a representative number of monitoring stops / Scrub cover no more than 25% of exposed pavement	Cover of non-native species not more than 1% on exposed pavement; on wooded pavement not more than 10% with no regeneration		
Vegetation composition: bracken cover	Percentage at a representative number of monitoring stops / Bracken (Pteridium aquilinum) cover no more than 10% on exposed pavement		
Vegetation structure: woodland canopy / Percentage at a representative number of monitoring stops	Canopy cover on wooded pavement at least 30%		
Vegetation structure: dead wood / Occurrence in a representative number of monitoring stops	Sufficient quantity of dead wood on wooded pavement to provide habitat for saproxylic organisms		
Physical structure: disturbance / Occurrence in a representative number of monitoring stops	No evidence of grazing pressure on wooded pavement		
Indicators of local distinctiveness / Occurrence	Indicators of local distinctiveness are maintained		

Table 9.44 Potential Impacts/Effects on the Conservation Objectives of Castletaylor Complex SAC

Conservation Objectives (NPWS, 2021c)	Attribute/Measure/Target (NPWS, 2021c)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Turloughs* [3180] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Habitat area	Area stable at c.32ha or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Hydrological regime / Various	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat		
Soil type / Hectares	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota		
Soil nutrient status: nitrogen and phosphorus / N and P concentration in soil	Maintain/restore nutrient status appropriate to soil types and vegetation communities		
Physical structure: bare ground / Presence	Maintain sufficient wet bare ground, as appropriate		
Chemical processes: calcium carbonate deposition and concentration / Calcium carbonate deposition rate/soil concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil		
Active peat formation / Flood duration	Maintain active peat formation		
Water quality / Various	Restore appropriate water quality to support the natural structure and functioning of the habitat		
Vegetation composition: area of vegetation communities / Hectares	Maintain area of sensitive and high conservation value vegetation communities/units		
Vegetation composition: vegetation zonation / Distribution	Maintain vegetation zonation/mosaic characteristic of the turlough		

Conservation Objectives (NPWS, 2021c)	Attribute/Measure/Target (NPWS, 2021c)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation structure: sward height / Centimetres	Restore sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough		
Typical species / Presence	Maintain typical species within the turlough		
Fringing habitats: area / Hectares			
Vegetation structure: turlough woodland / Species diversity and woodland structure / Restore appropriate turlough woodland diversity and structure	Restore marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations		
Alpine and Boreal heaths [4060] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Vegetation composition: positive indicator species / Number at a representative number of monitoring stops	At least seven positive indicator species present		
Vegetation composition: negative indicator species / Percentage cover at a representative number of monitoring stops	Negative indicator species collectively not more than 10% cover		
Vegetation composition: nonnative species / Percentage cover at a representative number of monitoring stops	Non-native species not more than 1% cover		
Vegetation composition: native trees and shrubs / Percentage cover at a representative number of monitoring stops	Cover of native trees and shrubs (except juniper (Juniperus communis)) not more than 25% cover		
Physical structure: disturbance / Percentage cover at a representative number of monitoring stops	Less than 10% disturbed bare ground (excluding rocks/stones)		

Conservation Objectives (NPWS, 2021c)	Attribute/Measure/Target (NPWS, 2021c)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Indicators of local distinctiveness / Occurrence	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural process		
Juniperus communis formations on heaths or calcareous grasslands [5130] **To maintain the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectare	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Juniper formation size / Number and proximity of juniper plants	At least 50 juniper plants present with each plant separated by no more than 20m		
Vegetation structure: female fruiting plants / Percentage in a representative number of 5m x 5m monitoring stops or in an ad hoc count of 50 plants	Fruiting females comprise at least 10% of juniper plants rooted in plot in at least 50% of stops or in an ad hoc count of 50 plants		
Vegetation structure: seedling recruitment	Presence in a representative number of 5m x 5m monitoring stops / At least one seedling recorded in at least one monitoring stop		
Vegetation structure: live juniper / Percentage in a representative number of 5m x 5m monitoring stops or across the site as a whole	At least 90% of juniper plants rooted in plot alive in at least 75% of stops or across the site as a whole		
Vegetation composition: negative indicator species / Percentage in a representative number of 5m x 5m monitoring stops	Total cover of negative indicator species to be less than 10% in at least 50% of stops		
Physical structure: germination niches / Percentage in a representative number of 5m x 5m monitoring stops	At least 5% bare soil and/or at least 5% bare rock in at least 25% of stops		
Formation structure: browning/die-back of plants / Percentage of juniper cover in a representative number of 5m x 5m monitoring stops	Browning or dead juniper branches (excluding fully dead plants) comprise no more than 20% of total juniper cover in plot in at least 75% of stops		

Conservation Objectives (NPWS, 2021c)	Attribute/Measure/Target (NPWS, 2021c)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Formation structure: evidence of browsing and bark stripping / Occurrence across a representative number of 5m x 5m monitoring stops	No browsing of juniper shoot tips, and trunk bark stripping evident in no more than 10% of juniper shrubs in at least 75% of stops		
Indicators of local distinctiveness / Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat		
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Vegetation composition: positive indicator species / Number at a representative number of 2m x 2m monitoring stops; within 20m surrounding area of monitoring stops			
Vegetation composition: negative indicator species / Percentage cover at a representative number of 2m x 2m monitoring stops / Negative indicator species collectively not more than 20% cover, with cover of an individual species not more than 10%	At least 7 positive indicator species present in monitoring stop or, if 5–6 present in stop, additional species within 20m of stop; this includes at least two 'high quality' positive indicator species present in stop or within 20m of stop		
Vegetation composition: nonnative species / Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species not more than 1%		
Vegetation composition: woody species and bracken / Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of woody species (except certain listed species) and bracken (Pteridium aquilinum) not more than 5%		
Vegetation structure: broadleaf herb:grass ratio / Percentage at a representative number of 2m x 2m monitoring stops	Broadleaf herb component of vegetation between 40% and 90%		
Vegetation structure: sward height / Percentage at a representative number of 2m x 2m monitoring stops	At least 30% of sward between 5cm and 40cm tall		

Conservation Objectives (NPWS, 2021c)	Attribute/Measure/Target (NPWS, 2021c)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation structure: litter / Percentage cover at a representative number of 2m x 2m monitoring stops	Litter cover not more than 25%		
Physical structure: bare soil / Percentage cover at a representative number of 2m x 2m monitoring stops	Not more than 10% bare soil		
Physical structure: grazing or disturbance / Area in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than 20m²		
Limestone pavements* [8240] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Vegetation composition: positive indicator species / Number at a representative number of monitoring stops	At least seven positive indicator species present		
Vegetation composition: bryophyte layer / Percentage at a representative number of monitoring stops	Bryophyte cover at least 50% on wooded pavement		
Vegetation composition: negative indicator species / Percentage at a representative number of monitoring stops	Collective cover of negative indicator species on exposed pavement not more than 1%		
Vegetation composition: nonnative species / Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1% on exposed pavement; on wooded pavement not more than 10% with no regeneration		
Vegetation composition: scrub / Percentage at a representative number of monitoring stops	Scrub cover no more than 25% of exposed pavement		
Vegetation composition: bracken cover / Percentage at a representative number of monitoring stops	Bracken (Pteridium aquilinum) cover no more than 10% on exposed pavement		
Vegetation structure: woodland canopy / Percentage at a representative number of monitoring stops	Canopy cover on wooded pavement at least 30%		

Conservation Objectives (NPWS, 2021c)	Attribute/Measure/Target (NPWS, 2021c)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation structure: dead wood / Occurrence in a representative number of monitoring stops	Sufficient quantity of dead wood on wooded pavement to provide habitat for saproxylic organisms		
Physical structure: disturbance / Occurrence in a representative number of monitoring stops	No evidence of grazing pressure on wooded pavement		
Indicators of local distinctiveness / Occurrence	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes		

Table 9.45 Potential Impacts/Effects on the Conservation Objectives of Cregganna Marsh SPA

Conservation Objectives (NPWS, 2023c)	Attribute/Measure/Target (NPWS, 2023c)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Greenland White-fronted Goose Anser albifrons flavirostris [A395] **To restore the favourable conservation condition of the species in the SPA, which is defined as follows:**			
Winter population trend / Percentage change in number of individuals	Long term winter population trend is stable or increasing	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12.
Winter spatial distribution / Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target		
Disturbance at wintering site / Intensity, frequency, timing and duration	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution		
Barriers to connectivity and site use / Number, location, shape and hectares	The number, location, shape and area of barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA		
Forage spatial distribution, extent and abundance / Location and hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target		
Roost spatial distribution and extent / Location and hectares of roosting habitat	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target		
Supporting habitat: area and quality / Hectares and quality	Sufficient area of utilisable habitat available in ecologically important sites outside the SPA		

Table 9.46 Potential Impacts/Effects on the Conservation Objectives of Kiltiernan Turlough SAC

Conservation Objectives (NPWS, 2021b)	Attribute/Measure/Target (NPWS, 2021b)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Turloughs* [3180] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Habitat area	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Hydrological regime / Various	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat		
Soil type / Hectares	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota		
Soil nutrient status: nitrogen and phosphorus / N and P concentration in soil	Maintain nutrient status appropriate to soil types and vegetation communities		
Physical structure: bare ground / Presence	Maintain sufficient wet bare ground, as appropriate		
Chemical processes: calcium carbonate deposition and concentration / Calcium carbonate deposition rate/soil concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil		
Active peat formation / Flood duration	Maintain active peat formation		
Water quality / Various	Restore appropriate water quality to support the natural structure and functioning of the habitat		
Vegetation composition: area of vegetation communities / Hectares /	Maintain area of sensitive and high conservation value vegetation communities/units		
Vegetation composition: vegetation zonation / Distribution	Maintain/restore vegetation zonation/mosaic characteristic of the turlough		

Conservation Objectives (NPWS, 2021b)	Attribute/Measure/Target (NPWS, 2021b)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation structure: sward height / Centimetres	Maintain/restore sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough		
Typical species / Presence	Maintain typical species within the turlough		
Fringing habitats: area / Hectares	Maintain/restore marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations		
Vegetation structure: turlough woodland	Species diversity and woodland structure / Maintain/restore appropriate turlough woodland diversity and structure		

Table 9.47 Potential Impacts/Effects on the Conservation Objectives of Lough Fingall Complex SAC

Conservation Objectives (NPWS, 2019d)	Attribute/Measure/Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Turloughs* [3180] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Habitat area	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12.
Habitat distribution / Occurrence	No decline, subject to natural processes		
Hydrological regime / Various	Restore appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat		
Soil type / Hectares	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota		
Soil nutrient status: nitrogen and phosphorus / N and P concentration in soil	Maintain nutrient status appropriate to soil types and vegetation communities		
Physical structure: bare ground / Presence	Maintain sufficient wet bare ground, as appropriate		
Chemical processes: calcium carbonate deposition and concentration / Calcium carbonate deposition rate/soil concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil		
Water quality / Various	Restore appropriate water quality to support the natural structure and functioning of the habitat		
Active peat formation / Flood duration	Maintain active peat formation		
Vegetation composition: area of vegetation communities / Hectares	Maintain/restore area of sensitive and high conservation value vegetation communities/units		
Vegetation composition: vegetation zonation / Distribution	Maintain/restore vegetation zonation/mosaic characteristic of the site		

Conservation Objectives (NPWS, 2019d)	Attribute/Measure/Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation structure: sward height / Centimetres	Maintain/restore sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough		
Typical species (terrestrial, wetland and aquatic plants, invertebrates and birds) / Presence	Maintain/restore typical species within and across the turlough		
Fringing habitats: area / Hectares	Maintain/restore marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations		
Vegetation structure: turlough woodland / Species diversity and woodland structure	Maintain appropriate turlough woodland diversity and structure		
Alpine and Boreal heaths [4060] **To maintain the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Vegetation composition: positive indicator species / Number at a representative number of monitoring stops	At least seven positive indicator species present		
Vegetation composition: negative indicator species / Percentage cover at a representative number of monitoring stops	Negative indicator species collectively not more than 10% cover		
Vegetation composition: nonnative species / Percentage cover at a representative number of monitoring stops	Non-native species not more than 1% cover		
Vegetation composition: native trees and shrubs	Percentage cover at a representative number of monitoring stops / Cover of native trees and shrubs (except juniper (Juniperus communis)) not more than 25% cover		
Physical structure: disturbance / Percentage cover at a representative number of monitoring stops	Less than 10% disturbed bare ground (excluding rocks/stones)		

Conservation Objectives (NPWS, 2019d)	Attribute/Measure/Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Indicators of local distinctiveness / Occurrence	Indicators of local distinctiveness are maintained		
Juniperus communis formations on heaths or calcareous grasslands [5130] **To maintain the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Juniper formation size / Number and proximity of juniper plants	At least 50 juniper plants present with each plant separated by no more than 20m		
Vegetation structure: female fruiting plants / Percentage in a representative number of 5m x 5m monitoring stops or in an ad hoc count of 50 plants	Fruiting females comprise at least 10% of juniper plants rooted in plot in at least 50% of stops or in an ad hoc count of 50 plants		
Vegetation structure: seedling recruitment / Presence in a representative number of 5m x 5m monitoring stops	At least one seedling recorded in at least one monitoring stop		
Vegetation structure: live juniper / Percentage in a representative number of 5m x 5m monitoring stops or across the site as a whole	At least 90% of juniper plants rooted in plot alive in at least 75% of stops or across the site as a whole		
Vegetation composition: negative indicator species / Percentage in a representative number of 5m x 5m monitoring stops	Total cover of negative indicator species to be less than 10% in at least 50% of stops		
Physical structure: germination niches / Percentage in a representative number of 5m x 5m monitoring stops	At least 5% bare soil and/or at least 5% bare rock in at least 50% of stops		
Formation structure: browning/die-back of plants / Percentage of juniper cover in a representative number of 5m x 5m monitoring stops	Browning or dead juniper branches (excluding fully dead plants) comprise no more than 20% of total juniper cover in plot in at least 75% of stops		
Formation structure: evidence of browsing and bark stripping / Occurrence across a representative number of 5m x 5m monitoring stops	Recent browsing of juniper plants and bark stripping and trampling due to browsers evident in no more than 50% of stops		

Conservation Objectives (NPWS, 2019d)	Attribute/Measure/Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Indicators of local distinctiveness / Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat		
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210] **To restore the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Vegetation composition: positive indicator species / Number at a representative number of 2m x 2m monitoring stops; within 20m surrounding area of monitoring stops	At least 7 positive indicator species present in monitoring stop or, if 5–6 present in stop, additional species within 20m of stop; this includes at least two 'high quality' positive indicator species present in stop or within 20m of stop		
Vegetation composition: negative indicator species / Percentage cover at a representative number of 2m x 2m monitoring stops	Negative indicator species collectively not more than 20% cover, with cover of an individual species not more than 10%		
Vegetation composition: nonnative species / Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species not more than 1%		
Vegetation composition: woody species and bracken / Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of woody species (except certain listed species) and bracken (Pteridium aquilinum) not more than 5%		
Vegetation structure: broadleaf herb:grass ratio / Percentage at a representative number of 2m x 2m monitoring stops	Broadleaf herb component of vegetation between 40% and 90%		
Vegetation structure: sward height / Percentage at a representative number of 2m x 2m monitoring stops	At least 30% of sward between 5cm and 40cm tall		
Vegetation structure: litter / Percentage cover at a representative number of 2m x 2m monitoring stops	Litter cover not more than 25%		

Conservation Objectives (NPWS, 2019d)	Attribute/Measure/Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Physical structure: bare soil / Percentage cover at a representative number of 2m x 2m monitoring stops	Not more than 10% bare soil		
Physical structure: grazing or disturbance / Area in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than 20m2		
Calcareous fens with Cladium mariscus and species of the Caricion davallianae [7210] **To maintain the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline, subject to natural processes		
Ecosystem function: peat formation / Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate		
Ecosystem function: hydrology - groundwater levels / Water levels (centimetres); duration of levels; hydraulic gradients	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat		
Ecosystem function: hydrology - surface water flow	Drain density and form / Maintain, or where necessary restore, as close as possible to natural or semi-natural, drainage conditions		
Ecosystem function: water quality / Water chemistry measures	Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat		
Vegetation composition: typical species / Percentage cover at a representative number of 2m x 2m monitoring stops	Maintain adequate cover of typical species including brown mosses and vascular plants		
Vegetation composition: native negative indicator species / Percentage cover at a representative number of monitoring stops	Cover of native negative indicator species at insignificant levels		

Conservation Objectives (NPWS, 2019d)	Attribute/Measure/Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: nonnative species / Percentage cover at a representative number of monitoring stops	Cover of non-native species less than 1%		
Vegetation composition: trees and shrubs / Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%		
Physical structure: disturbed bare ground / Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground not more than 10%. Where tufa is present, disturbed bare ground not more than 1%		
Indicators of local distinctiveness / Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes		
Limestone pavements [8240] **To maintain the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Hectares	Area stable or increasing, subject to natural processes	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Habitat distribution / Occurrence	No decline		
Vegetation composition: positive indicator species / Number at a representative number of monitoring stops	At least seven positive indicator species present		
Vegetation composition: bryophyte layer / Percentage at a representative number of monitoring stops	Bryophyte cover at least 50% on wooded pavement		
Vegetation composition: negative indicator species / Percentage at a representative number of monitoring stops	Collective cover of negative indicator species on exposed pavement not more than 1%		
Vegetation composition: nonnative species / Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1% on exposed pavement; on wooded pavement not more than 10% with no regeneration		

Conservation Objectives (NPWS, 2019d)	Attribute/Measure/Target	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: scrub / Percentage at a representative number of monitoring stops	Scrub cover no more than 25% of exposed pavement		
Vegetation composition: bracken cover / Percentage at a representative number of monitoring stops	Bracken (Pteridium aquilinum) cover no more than 10% on exposed pavement		
Vegetation structure: woodland canopy / Percentage at a representative number of monitoring stops	Canopy cover on wooded pavement at least 30%		
Vegetation structure: dead wood / Occurrence in a representative number of monitoring stops	Sufficient quantity of dead wood on wooded pavement to provide habitat for saproxylic organisms		
Physical structure: disturbance / Occurrence in a representative number of monitoring stops	No evidence of grazing pressure on wooded pavement		
Indicators of local distinctiveness / Occurrence	Indicators of local distinctiveness are maintained		
Lesser Horseshoe Bat Rhinolophus hipposideros [1303] **To maintain the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Population per roost / Number	Minimum number of 180 bats for the summer roost (roost id. 244 in NPWS database)	Yes Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Summer roosts / Condition	No decline		
Auxiliary roosts / Number and condition	No decline		
Extent of potential foraging habitat / Hectares	No significant decline within 2.5km of qualifying roost		
Linear features / Kilometres	No significant loss within 2.5km of qualifying roost		
Light pollution / Lux	No significant increase in artificial light intensity adjacent to named roost or along commuting routes within 2.5km of the roost		

Table 9.48 Potential Impacts/Effects on the Conservation Objectives of Rahasane Turlough SAC

Conservation Objectives (NPWS, 2020)	Attribute/Measure/Target (NPWS, 2020)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Turloughs* [3180] **To maintain the favourable conservation condition of the habitat in the SAC, which is defined as follows:**			
Habitat area / Habitat area	Area stable or increasing, subject to natural processes	Yes. Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats due to habitat degradation from potential impacts to hydrology, air quality and non-native invasive species.	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12.
Habitat distribution / Occurrence	No decline, subject to natural processes		
Hydrological regime / Various	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat		
Soil type / Hectares	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota		
Soil nutrient status: nitrogen and phosphorus / N and P concentration in soil	Maintain nutrient status appropriate to soil types and vegetation communities. See O'Connor (2017) for information on this and all attributes and targets		
Physical structure: bare ground / Presence	Maintain sufficient wet bare ground, as appropriate		
Chemical processes: calcium carbonate deposition and concentration / Calcium carbonate deposition rate/soil concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil The areas with marl and shell deposits reported by Goodwillie (1992) will have a high calcium carbonate content		
Active peat formation / Flood duration	Maintain active peat formation		
Water quality / Various	Maintain appropriate water quality to support the natural structure and functioning of the habitat		
Vegetation composition: area of vegetation communities / Hectares	Maintain area of sensitive and high conservation value vegetation communities/units		

Conservation Objectives (NPWS, 2020)	Attribute/Measure/Target (NPWS, 2020)	Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Vegetation composition: vegetation zonation / Distribution	Maintain vegetation zonation/mosaic characteristic of the turlough		
Vegetation structure: sward height / Centimetres	Maintain sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough		
Typical species / Presence	Maintain typical species within the turlough		
Fringing habitats: area / Hectares	Maintain marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations		
Vegetation structure: turlough woodland / Species diversity and woodland structure	Maintain appropriate turlough woodland diversity and structure		

Table 9.49 Potential Impacts/Effects on the Conservation Objectives of Rahasane Turlough SPA

Conservation Objectives Attribute/Measure/Target (NPWS, 2023d)		Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Whooper Swan Cygnus cygnus [A038] ; Golden Plover Pluvialis apricaria [A140] ; Greenland White-fronted Goose Anser albifrons flavirostris [A395] **To restore the favourable conservation condition of the species in the SPA, which is defined as follows:**			
Winter population trend / Percentage change in number of individuals	Long term winter population trend is stable or increasing	Yes Only as a shared population with Cregganna Marsh SPA Construction related traffic on the surrounding road network has the potential to result in significant effects on the quality of the habitats and fauna communities due to habitat degradation from potential impacts to hydrology, hydrogeology, air quality and non-native invasive species	Yes Measures to avoid habitat degradation as a result of potential hydrogeological / hydrological impacts during construction Section 10.5 and Section 10.12 Measures to avoid habitat degradation as a result of potential air quality impacts during construction Section 10.6 and Section 10.12 Measures to avoid habitat degradation as a result of spread of non-native invasive species during construction Section 10.8 and Section 10.12
Winter spatial distribution / Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target		
Disturbance at wintering site / Intensity, frequency, timing and duration	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution		
Barriers to connectivity and site use / Number, location, shape and hectares	The number, location, shape and area of barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA		
Forage spatial distribution, extent and abundance / Location and hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target		
Roost spatial distribution and extent / Location and hectares of roosting habitat	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target		
Supporting habitat: area and quality / Hectares and quality	Sufficient area of utilisable habitat available in ecologically important sites outside the SPA		

Conservation Objectives Attribute/Measure/Target (NPWS, 2023d)		Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Wigeon Anas penelope [A050]; Black-tailed Godwit Limosa limosa [A156] **To maintain the favourable conservation condition of the species in the SPA, which is defined as follows:**			
Winter population trend / Percentage change in number of individuals	Long term winter population trend is stable or increasing	No – Site is outside ZoI	No
Winter spatial distribution / Hectares, time and intensity of use	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target		
Disturbance at wintering site / Intensity, frequency, timing and duration	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution		
Barriers to connectivity and site use / Number, location, shape and hectares	The number, location, shape and area of barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA		
Forage spatial distribution, extent and abundance / Location and hectares, and forage biomass	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target		
Roost spatial distribution and extent / Location and hectares of roosting habitat	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target		
Supporting habitat: area and quality / Hectares and quality	Sufficient area of utilisable habitat available in ecologically important sites outside the SPA		

Conservation Objectives Attribute/Measure/Target (NPWS, 2023d)		Potential Impacts Requiring Mitigation?	Are Mitigation Measures Required?
Wetlands and Waterbirds [A999] **To maintain the favourable conservation condition of the habitat in the SPA, which is defined as follows:**			
Wetland habitat area / Hectares	No significant loss to wetland habitat within the SPA, other than that occurring from natural patterns of variation	No – Site is outside ZoI	No
Wetland habitat quality and functioning / Quality and function of the wetland habitat	No significant impact on the quality or functioning of the wetland habitat within the SPA, other than that occurring from natural patterns of variation		

9.7 European Sites and Recreational Pressure

Upon review of the assessment undertaken by the Inspector appointed by An Bord Pleanála (ABP) and Dr Arnold in the Appropriate Assessment [appended (as Appendix 6) in ABP's Inspector's Report dated 22 June 2021], the potential impact pathway related to increased recreational pressure and the additional European sites in its zone of influence, has been included in the assessment for this updated NIS. Dr Arnold refers to the impact pathway arising as a result of "*increasing recreational pressure on certain … [European] sites due to increased mobility of an expanding human population*" if "*improvements to the road network bring in additional tourists or indirectly increase the resident population*."

The following European sites are assessed on a precautionary basis for recreational pressure:

- Lough Corrib SAC
- Galway Bay Complex SAC
- Lough Corrib SPA
- Inner Galway Bay SPA
- Ardrahan Grassland SAC
- Castletaylor Complex SAC
- Maumturk Mountains SAC
- The Twelve Bens/Garraun Complex SAC
- Connemara Bog Complex SAC
- Connemara Bog Complex SPA
- Ross Lake and Woods SAC

9.7.1 Special Conservation Interests and Conservation Objectives

Each of the European sites assessed for recreational pressure and the conservation objectives for their relevant QIs and SCIs are summarised in Table 9.50.

Table 9.50 Qualifying Interests and Conservation Objectives for the listed European Sites

Qualifying Interests	Conservation Objective
Lough Corrib SAC	Refer to Table 9.1
Galway Bay Complex SAC	Refer to Table 9.14
Lough Corrib SPA	Refer to Table 9.22
Inner Galway Bay SPA	Refer to Table 9.29
Ardrahan Grassland SAC	Refer to Table 9.40
Castletaylor Complex SAC	Refer to Table 9.40
Maumturk Mountains SAC	
3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	To maintain the favourable conservation condition
4010 Northern Atlantic wet heaths with *Erica tetralix*	To restore the favourable conservation condition
4060 Alpine and Boreal heaths	To restore the favourable conservation condition
7130 Blanket bogs (* if active bog)	To restore the favourable conservation condition

Qualifying Interests	Conservation Objective
7150 Depressions on peat substrates of the *Rhynchosporion*	To restore the favourable conservation condition
8220 Siliceous rocky slopes with chasmophytic vegetation	To restore the favourable conservation condition
Salmo salar (Salmon) [1106]	To maintain the favourable conservation condition
Najas flexilis (Slender Naiad) [1833]	To maintain the favourable conservation condition
The Twelve Bens/Garraun Complex SAC	
3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	To maintain the favourable conservation condition
3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or Isoeto-Nanojuncetea	To maintain the favourable conservation condition
4060 Alpine and Boreal heaths	To restore the favourable conservation condition
7130 Blanket bogs (* if active bog)	To restore the favourable conservation condition
7150 Depressions on peat substrates of the *Rhynchosporion*	To restore the favourable conservation condition
8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)	To restore the favourable conservation condition
8210 Calcareous rocky slopes with chasmophytic vegetation	To restore the favourable conservation condition
8220 Siliceous rocky slopes with chasmophytic vegetation	To restore the favourable conservation condition
91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	To maintain the favourable conservation condition
Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	To restore the favourable conservation condition
Salmo salar (Salmon) [1106]	To maintain the favourable conservation condition
Lutra lutra (Otter) [1355]	To maintain the favourable conservation condition
Najas flexilis (Slender Naiad) [1833]	To maintain the favourable conservation condition
Connemara Bog Complex SAC	
1150 Coastal lagoons	To maintain the favourable conservation condition
1170 Reefs	To maintain the favourable conservation condition
3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	To maintain the favourable conservation condition
3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or Isoeto-Nanojuncetea	To maintain the favourable conservation condition
3160 Natural dystrophic lakes and ponds	To maintain the favourable conservation condition
3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	To maintain the favourable conservation condition
4010 Northern Atlantic wet heaths with *Erica tetralix*	To restore the favourable conservation condition
4030 European dry heaths	To restore the favourable conservation condition

Qualifying Interests	Conservation Objective
6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	To maintain the favourable conservation condition
7130 Blanket bogs (* if active bog)	To restore the favourable conservation condition
7140 Transition mires and quaking bogs	To restore the favourable conservation condition
7150 Depressions on peat substrates of the *Rhynchosporion*	To restore the favourable conservation condition
7230 Alkaline fens	To restore the favourable conservation condition
91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles	To maintain the favourable conservation condition
Euphydryas aurinia (Marsh Fritillary) [1065]	To maintain the favourable conservation condition
Salmo salar (Salmon) [1106]	To restore the favourable conservation condition
Lutra lutra (Otter) [1355]	To maintain the favourable conservation condition
Najas flexilis (Slender Naiad) [1833]	To maintain the favourable conservation condition
Connemara Bog Complex SPA	
Cormorant (*Phalacrocorax carbo*) [A017]	To restore the favourable conservation condition
Merlin (*Falco columbarius*) [A098]	To restore the favourable conservation condition
Golden Plover (*Pluvialis apricaria*) [A140]	To restore the favourable conservation condition
Common Gull (*Larus canus*) [A182]	To maintain the favourable conservation condition
Ross Lake and Woods SAC	
3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp.*	To restore the favourable conservation condition
Rhinolophus hipposideros (Lesser Horseshoe Bat) [1303]	To restore the favourable conservation condition

9.7.2 Ecological Baseline

Sections 9.1.2, Section 9.2.2, Section 9.3.2 and Sections 9.4.2 provide baseline descriptions for Lough Corrib and Galway Bay European sites and Section 9.6.2 provides baseline descriptions for Ardrahan Grassland SAC and Castletaylor Complex SAC.

Maumturk Mountains SAC

The Site Synopsis[81] describes the site to be *"of conservation interest as it is a good example of an extensive mountain landscape, containing blanket bog, large areas of heath, siliceous rocky vegetation, oligotrophic lakes and upland grassland. The areas of blanket bog at Teernakill and Caher are largely unaffected by over-grazing and are in very good condition. The presence of rare and protected plant species and of the scarce Arctic Char adds to the interest of the site."*

The Twelve Bens/Garraun Complex SAC

The Site Synopsis[82] states that the *"Twelve Bens/Garraun Complex includes a wide variety of habitat types, nine of which are listed on Annex I of the E.U. Habitats Directive (including one with priority status), and*

[81]NPWS (2013i) *Maumturk Mountains SAC [002008] Site Synopsis* - Version date: 27.11.2013

[82]NPWS (2015d) *The Twelve Bens/Garraun Complex SAC [002031] Site Synopsis* - Version date: 08.12.2015

populations of many rare or scarce plant and animal species. It is one of the largest and most varied protected sites in Ireland and so is of high conservation interest."

Connemara Bog Complex SAC & SPA

The Site Synopsis for the SAC[83] summary states that *"the Connemara Bog Complex encompasses a large area of relatively undamaged lowland Atlantic blanket bog of high conservation significance both in Ireland and at a European level. The site also contains good examples of at least 13 other habitats listed on Annex I of the E.U. Habitats Directive, as well as four species listed in Annex II. Further, the site supports a number of threatened and protected plant species. The site is internationally important for Cormorant and nationally important for Greenland White-fronted Goose, and contains nesting sites for Golden Plover."*

The Site Synopsis for the SPA[84] summary states that the site *"is of high ornithological importance, in particular for its nationally important breeding populations of Cormorant, Merlin, Golden Plover and Common Gull."*

Ross Lake and Woods SAC

The Site Synopsis[85] states that the site *" is of importance because it contains a good example of a hard water lake, a habitat listed on Annex I of the E.U. Habitats Directive, and for the internationally important population of Lesser Horseshoe Bat [including a breeding colony of >155 individuals], a species listed on Annex II of this Directive, which occurs. The presence of Otter and breeding Common Gull is also of note."*

9.7.3 Examination and Analysis of Potential Direct and Indirect Impacts

The transport modelling for the proposed N6 GCRR was used to assess the potential increase in regional traffic and its associated potential to give rise to recreational pressures on European sites. This modelling is based on the National Transport Authority's (NTA) Western Regional Model (WRM), which covers the Connacht region, including Donegal, with Galway City being the primary area of focus. The WRM has 5 sub models which represent different times of an average work day (Monday – Friday): AM, Interpeak 1 (Lunchtime), Interpeak 2 (School Run), PM and Off-peak. These sub models are designed to represent an average workday across the year and are underpinned by Place of Work, School, College or Childcare Census of Anonymised Records (POWSCCAR) which gives a dataset for weekday travel. The model used this dataset to forecast traffic for a future scenario with and without the proposed N6 GCRR. The differences in traffic between both scenarios and each time period, were calculated and those figures were combined and expressed in terms of the annual average daily traffic (AADT). AADT is the average number of vehicles, calculated over a period of one calendar year, passing a point on a road each day.

As these AADT figures represent the differences in total traffic on any road i.e. it forms many travel purposes like Commuting, Education, Shopping etc, and travel to European sites would be considered as recreational, they were broken down to predict the split of recreational pressure differences on the road. The NTA's National Household Travel Survey (2022)[86] was used to predict this. The National Household Travel Survey states that 15% of travel is for recreational and other reasons. As such, 15% of the total AADT differences, representing all likely recreational travel, were calculated and used for this assessment. Traffic and Transport Assessment Guidelines (TII, 2014) use thresholds of 10% increases in traffic for determining whether an increase is significant and requires a Transport Assessment. These were also used here to determine potential recreational trip increases on roads.

This model highlighted a number of roads which will experience a 10% or greater increase in potential recreational trips as a result of the proposed N6 GCRR. These include:

[83] NPWS (2015e) *Connemara Bog Complex SAC [002034] Site Synopsis* - Version date: 08.12.2015

[84] NPWS (2010b) *Connemara Bog Complex SPA [004181] Site Synopsis* - Version date: 30.11.2010

[85] NPWS (2013j) *Ross Lake and Woods SAC [001312] Site Synopsis* - Version date: 01.10.2013

[86] https://www.nationaltransport.ie/publications/national-household-travel-survey-2022/

- An unnamed local road which forms the boundaries of the townlands of Shantallow, Furzypark, Ballyglass, Fiddaun, Monksfield and Lismoylan, in southern Co. Galway, which lies in proximity to Ardrahan Grassland SAC and Castletaylor Complex SAC.
- An unnamed local road in the townlands of Liss, Ballycolgan, Skeaghbeg, Ballybaun, Ballycasey, Kilcoona and Mausrevagh, in northern Co. Galway, which lies in proximity to Lough Corrib SAC and SPA.
- An unnamed local road on the eastern edge of Galway City and the townlands of Ardaun, Garraun North and Garraun South which lies in proximity to Inner Galway Bay SPA and Galway Bay Complex SAC
- An unnamed local road in the townlands of Forramoyle West and Forramoyle East which is in proximity to Galway Bay Complex SAC and Inner Galway Bay SPA.
- Multiple local roads in and around Galway City, its suburbs and the River Corrib, with Lough Corrib SAC and SPA, Galway Bay Complex SAC and Inner Galway Bay SPA being in close proximity to most of these

No other roads in proximity to European sites within the area of influence of the proposed N6 GCRR were modelled as having an increase of 10% or above in recreational pressure. These include Maumturk Mountains SAC, The Twelve Bens/Garraun Complex SAC, Connemara Bog Complex SAC, Connemara Bog Complex SPA and Ross Lake and Woods SAC, which are outside the zone of influence and are therefore not considered in the impact assessment evaluation to follow.

The proposed N6 GCRR and as such the Project are not proposing to increase the capacity of, or facilitate direct access to, any recreational facilities in the vicinity of Galway City or County and their associated European sites (Galway Bay Complex SAC, Inner Galway Bay SPA and Lough Corrib SAC and SPA).

The increase in recreational pressure highlighted by the model will not pose any risk to the conservation objectives and, therefore, result in any likely significant effects on any European sites in the wider vicinity of Galway City, including those listed in the first three points above, due to the following:

- The unnamed local road which forms the boundaries of the townlands of Shantallow, Furzypark, Ballyglass, Fiddaun, Monksfield and Lismoylan, in southern Co. Galway is greater than 2.8km from the closest European site (Ardrahan Grassland SAC).
- All of the sites in proximity to the above mentioned local road in southern County Galway are privately owned lands and as such open access to the public is not available, thereby, there will be no increase in foot traffic on these sites associated with the Project.
- All of these European sites, barring the Galway Bay Complex SAC, Inner Galway Bay SPA and Lough Corrib SAC, are more than 300m from the roads where increased recreational pressure has been modelled, and as such are not at risk of air quality impacts from the increased traffic.

9.7.4 Summary

Although the Project will contribute to an increase in all recreational traffic in the surrounding supporting road network, the increase will not be significant enough (predicted to be less than10% increase), or where it is predicted to be greater than 10% increase the roads do not provide or facilitate direct access to European sites. It is also noted that not all recreational traffic is destined for a European site. The resultant potential for increase in recreational pressure will not pose any risk to the conservation objectives (Table 5.3) and will not, therefore, result in any likely significant effects on any European sites in the wider vicinity of Galway. In those circumstances no mitigation measures are required in respect of potential impacts from increased recreational pressure.

9.8 European Sites and Potential Deterioration due to Loss of Supporting Habitats/Populations

The additional potential impact pathway related to possible deterioration or decline in European site QIs/SCIs due to loss of supporting habitats/populations as identified by the appropriate assessment undertaken by the Inspector appointed by ABP and appended to ABP's Inspector's Report dated 22 June 2021 is considered in this section of the updated NIS.

The European sites which are considered in the zone of influence as identified by the Inspector appointed by ABP include:

- Lough Corrib SAC
- Galway Bay Complex SAC
- Lough Corrib SPA
- Inner Galway Bay SPA
- Ardrahan Grassland SAC
- Castletaylor Complex SAC
- Kiltiernan Turlough SAC
- Lough Fingall Complex SAC
- Connemara Bog Complex SAC
- Connemara Bog Complex SPA
- Rahasane Turlough SAC
- East Burren Complex SAC
- Moneen Mountain SAC
- Black Head-Poulsallagh Complex SAC
- Gortnandarragh Limestone Pavement SAC
- Ross Lake and Woods SAC

9.8.1 Special Conservation Interests and Conservation Objectives

Each of the European sites assessed for deterioration due to loss of supporting habitats/populations and the conservation objectives for their relevant QIs and SCIs are summarised in Table 9.51.

Table 9.51 Qualifying Interests and Conservation Objectives for the listed European Sites

Qualifying Interests	Conservation Objective
Lough Corrib SAC	Refer to Table 9.1
Galway Bay Complex SAC	Refer to Table 9.14
Lough Corrib SPA	Refer to Table 9.22
Inner Galway Bay SPA	Refer to Table 9.29
Ardrahan Grassland SAC	Refer to Table 9.40
Castletaylor Complex SAC	Refer to Table 9.40
Kiltiernan Turlough SAC	Refer to Table 9.40

Qualifying Interests	Conservation Objective
Lough Fingall Complex SAC	Refer to Table 9.40
Connemara Bog Complex SAC	Refer to Table 9.50
Connemara Bog Complex SPA	Refer to Table 9.50
Rahasane Turlough SAC	Refer to Table 9.40
Ross Lake and Woods SAC	Refer to Table 9.50
East Burren Complex SAC	
3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp.*	To restore the favourable conservation condition
3180 Turloughs	To restore the favourable conservation condition
3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	To maintain the favourable conservation condition
4060 Alpine and Boreal heaths	To maintain the favourable conservation condition
5130 *Juniperus communis* formations on heaths or calcareous grasslands	To maintain the favourable conservation condition
6130 Calaminarian grasslands of the *Violetalia calaminariae*	To restore the favourable conservation condition
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	To restore the favourable conservation condition
6510 Lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis*)	To restore the favourable conservation condition
7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	To maintain the favourable conservation condition
7220 Petrifying springs with tufa formation (Cratoneurion)	To maintain the favourable conservation condition
7230 Alkaline fens	To maintain the favourable conservation condition
8240 Limestone pavements	To restore the favourable conservation condition
8310 Caves not open to the public	See Lesser horseshoe bat below
91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae, Salicion albae*)	To maintain the favourable conservation condition
Euphydryas aurinia (Marsh Fritillary) [1065]	To maintain the favourable conservation condition
Rhinolophus hipposideros (Lesser Horseshoe Bat) [1303]	To restore the favourable conservation condition
Lutra lutra (Otter) [1355]	To maintain the favourable conservation condition
Moneen Mountain SAC	
3180 Turloughs	To maintain the favourable conservation condition
4060 Alpine and Boreal heaths	To maintain the favourable conservation condition
5130 *Juniperus communis* formations on heaths or calcareous grasslands	To maintain the favourable conservation condition

Qualifying Interests	Conservation Objective
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	To restore the favourable conservation condition
7220 Petrifying springs with tufa formation (Cratoneurion)	To restore the favourable conservation condition
8240 Limestone pavements	To restore the favourable conservation condition
Euphydryas aurinia (Marsh Fritillary) [1065]	To maintain the favourable conservation condition
Rhinolophus hipposideros (Lesser Horseshoe Bat) [1303]	To maintain the favourable conservation condition
Black Head-Poulsallagh Complex SAC	
1170 Reefs	To maintain the favourable conservation condition
1220 Perennial vegetation of stony banks	To maintain the favourable conservation condition
2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)	To maintain the favourable conservation condition
3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	To maintain the favourable conservation condition
4060 Alpine and Boreal heaths	To maintain the favourable conservation condition
5130 *Juniperus communis* formations on heaths or calcareous grasslands	To maintain the favourable conservation condition
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	To maintain the favourable conservation condition
6510 Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	To maintain the favourable conservation condition
7220 Petrifying springs with tufa formation (Cratoneurion)	To maintain the favourable conservation condition
8240 Limestone pavements	To maintain the favourable conservation condition
8330 Submerged or partially submerged sea caves	To maintain the favourable conservation condition
Petalophyllum ralfsii (Petalwort) [1395]	To maintain the favourable conservation condition
Gortnandarragh Limestone Pavement SAC	
8240 Limestone pavements	To restore the favourable conservation condition

9.8.2 Ecological Baseline

Sections 9.1.2, Section 9.2.2, Section 9.3.2 and Sections 9.4.2 provide baseline descriptions for Lough Corrib and Galway Bay and European sites, Section 9.6.2 provides baseline descriptions for Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC and Rahasane Turlough SAC, and Section 9.7.2 provides baseline descriptions for Connemara Bog Complex SAC, Connemara Bog Complex SPA and Ross Lake and Woods SAC.

East Burren Complex SAC

The Site Synopsis[87] states that the site *"is of international scientific interest owing to the presence of fine examples of typical Burren habitats, together with an oligotrophic wetland complex of lakes, turloughs, fen, cut-over bog and calcareous marsh. The Ballyeighter complex represents an excellent example of a nutrient-poor calcareous lake and fen system, of European significance. Some of the only remaining woodland habitats to be found in the Burren occur within the site. The site contains fourteen habitats that are listed on Annex I of the E.U. Habitats Directive (six of which have priority status) and three species of animal listed on Annex II of this Directive and, as such, is of major conservation significance. The occurrence of many rare plants and animals within the site adds considerably to its scientific and conservation value. The site is of high ornithological interest too, for the internationally and nationally important numbers of waterfowl that use it."*

Moneen Mountain SAC

The Site Synopsis[88] sates that the site *"is of international scientific importance owing to the presence of fine examples of typical Burren habitats, including several habitats listed on Annex I of the E.U. Habitats Directive. The limestone pavement and heath are particularly noteworthy. The presence of a substantial summer colony of Lesser Horseshoe Bat is also of note and the site is, furthermore, of high amenity and scenic value."*

Black Head-Poulsallagh Complex SAC

The Site Synopsis[89] states that due *"to the presence of fine examples of Burren habitats, the site is of international scientific interest. The limestone pavement and heath and the marine component are particularly noteworthy, while the plant communities contain a high density of rare and interesting species."*

Gortnandarragh Limestone Pavement SAC

The Site Synopsis[90] states that the site *"is valuable as an example of limestone pavement, an internationally important habitat which is listed with priority status, on Annex I of the E.U. Habitats Directive. It is also notable because the bog on the site is the type locality and only known station for Entoloma jennyi. Furthermore, there are interesting and diverse areas of heath, grassland, scrub and woodland, all contributing to a valuable site of considerable conservation interest.."*

9.8.3 Examination and Analysis of Potential Direct and Indirect Impacts

As detailed under Section 6.1, the Project will cause a direct loss or fragmentation of habitat areas within the receiving ecological environment by traversing or cutting through habitat areas. Across the Assessment Boundary this includes a variety of habitat types from natural, semi-natural to improved/managed habitats and developed landscapes, including habitats that correspond with Annex I habitat types.

In terms of European sites, the Project only overlaps with Lough Corrib SAC, at four locations detailed in Section 2.2.2 and is therefore the only European site at risk of direct habitat loss or fragmentation effects. The Project will result in the loss of habitat area (and in places some level of habitat fragmentation) from that part of Lough Corrib SAC through which the Project traverses.

9.8.3.1 Direct Habitat Loss in Lough Corrib SAC

As detailed in Section 6.1.1, habitat loss has the potential to affect the conservation objectives of Lough Corrib SAC through the loss of QI habitat or the loss of habitat supporting the QI habitats or species (e.g. Otter habitat and/or breeding or resting sites). Section 9.1.4.1 identifies only the following construction phase impact as requiring mitigation: loss / fragmentation of QI habitat or loss of non-QI habitat types that

[87]NPWS (2016) *East Burren Complex SAC [001926] Site Synopsis* - Version date: 09.02.2016

[88]NPWS (2015f) *Moneen Mountain SAC [000054] Site Synopsis* - Version date: 08.12.2015

[89]NPWS (2015g) *Black Head-Poulsallagh Complex SAC [000020] Site Synopsis* - Version date: 10.12.2015

[90]NPWS (2013k) *Gortnandarragh Limestone Pavement SAC [001271] Site Synopsis* - Version date: 01.10.2013

have a supporting role in maintaining the conservation status of QI habitats. Section 11.1 reflects no residual impacts with application of mitigation measures in terms of habitat loss in the SAC.

As detailed in Section 6.1.1 tunnelling and deep excavations associated with the proposed Lackagh Tunnel have the potential to result in habitat losses, potentially beyond the immediate footprint of the proposed N6 GCRR. Section 9.1.4.2 identifies only the following construction phase impact as requiring mitigation: tunnelling and excavations at the proposed Lackagh Tunnel affecting the structural integrity of surface-level habitats: [*8240] & [6210]. Section 11.1.2 reflects no residual impacts with application of mitigation measures in terms of habitat loss in the SAC.

With successful mitigation of potential impacts within the Lough Corrib SAC, there can be no extended impact in terms of supporting habitats and therefore there will be no potential deterioration at neighbouring or local European sites due to a loss of supporting habitats/populations. This is specifically relevant to European sites that share similar habitats with Lough Corrib SAC, with focus on the Annex I habitats of Limestone Pavements, Calcareous grasslands, and Petrifying springs such as Lough Fingall Complex SAC, Ross Lake and Woods SAC, Black Head Poulsallagh SAC, Castletaylor Complex SAC, Gortnandarragh Limestone Pavement SAC, Ardrahan Grassland SAC, Moneen Mountain SAC and East Burren Complex.

9.8.3.2 Habitat Fragmentation

As detailed in Section 6.1.3 there are only two areas within Lough Corrib SAC that are traversed by the Project and are, therefore, at risk of habitat fragmentation or isolation effects. West of Lackagh Quarry the Project passes underneath Lough Corrib SAC and the habitats above are being protected and retained, and therefore ecological connectivity will be maintained and habitat areas within the SAC will not be fragmented or isolated. At the proposed River Corrib Bridge, the proposed N6 GCRR will be elevated as a clear span bridge structure across the river corridor, with limited area of beech-dominated mixed broadleaved woodland (not, and neither supporting, a qualifying interest habitat of Lough Corrib SAC) affected. The clear span bridge structure, along with the five large culvert structures in the immediate area, maintain the functioning of the ecological corridor within the River Corrib and Lough Corrib SAC.

Section 6.1 identified no significant impact related to fragmentation of habitat and loss of habitat that may have a role in supporting the conservation status of Otter, Sea lamprey, Brook lamprey and Atlantic salmon. Therefore there will be no potential deterioration at neighbouring or local European sites due to a loss of supporting habitats/populations. This is specifically relevant to European sites that share similar species with Lough Corrib SAC such as the nearby Connemara Bog Complex SAC and East Burren Complex SAC.

9.8.3.3 Habitat Loss Affecting SCI Bird Species

European sites are further considered in the context of whether the Project poses any risk of *ex-situ* impacts to the SCI species' conservation objectives. This is focussed on certain species where their foraging ranges, home ranges, nesting/roosting sites (and connections between same) may extend beyond the SPA boundaries, independent of the absence of any hydrological or hydrogeological pathways between the European sites and the Project.

As detailed in Section 6.1.2 the Project does pass through, and will result in habitat loss in, potential "*ex-situ*" sites where SCI listed bird species were recorded. This impact could result in the loss of important supporting habitat areas outside of the SPA boundary affecting the conservation objectives to maintain the distribution of areas used by SCI birds and those relating to population trends. As further detailed under Section 6.1.2 only Lough Corrib SPA and Inner Galway Bay SPA were considered in terms of potential impacts to their SCI populations. In terms of other nearby SPAs, either their relevant SCIs were not observed within the bird Survey Areas or SCIs observed in the bird Survey Areas could not be linked to SCI populations due known foraging distances being exceeded in terms of the distance to the Assessment boundary. Connemara Bog Complex SPA lies *c.*9km to the northwest of the Project and is only listed for breeding SCI populations. At this distance the Project poses no risk of affecting breeding sites and success at the nesting sites within the SPA which includes the lakes for Cormorant and Common gull, and upland habitats for Merlin and Golden plover.

Section 9.3.4.4 and Section 9.4.4.4 consider habitat loss and fragmentation at potential *ex-situ* sites outside of Lough Corrib SPA and Inner Galway Bay SPA respectively affecting habitat area available to SCI bird species and finds no significant impact due to the small scale of overall habitat loss relative to the extent of

each affected winter bird survey site, the fact that the habitat types being lost are also common and widespread in the wider locality, and coupled with the marginal populations observed in the bird Survey Areas in relation to the respective SPA populations.

There is no potential impacts within the Lough Corrib SPA or Galway Complex SPA and therefore there can be no extended impact on supporting habitats / populations and no potential deterioration at neighbouring or local European sites (Kiltiernan Turlough and Rahasane Turlough SAC) due to a loss of supporting habitats/populations.

9.8.3.4 Habitat Loss Affecting QI Fauna Species

European sites are further considered in the context of whether the Project poses any risk of *ex-situ* impacts to the QI species' conservation objectives. This is focussed on certain species where their foraging ranges, home ranges (and connections between same) may extend beyond the SAC boundaries, independent of the absence of any hydrological or hydrogeological pathways between the European sites and the Project.

The aquatic species and species limited to the riverine habitats are addressed under section 9.8.3.2 where the River Corrib has been discussed. This section will focus on the Lesser horseshoe bats and Marsh fritillary.

Lesser horseshoe bat

Ross Lake and Woods SAC, lies *c.*10km to the north of the Project and is the next closest European site selected for the Lesser horseshoe bat *Rhinolophus hipposideros*. The roost that forms the QI population for this European site (buildings at Ross House) is more than 13km from the Project. This distance is regarded as being beyond the normal core foraging range of the Ross House population and beyond the normal commuting range of this species, except on exceptional occasions or over long periods of time; for example, bats dispersing and moving between areas in the wider landscape over a period of many years/generations. Furthermore, radio-tracking surveys of the Menlough population of bats (which were located within the scheme study area) undertaken for this Project in 2014 and 2015 showed no evidence of linkage between that population and the Ross House roost. The absence of a supporting population link between the Menlough population and Ross Lake and Woods SAC is upheld by the lack of ringed bats (28 bats captured and ringed from Menlough Castle and Coopers Cave in May 2023 and August 2023) recorded during the four Summer inspections and two daytime Winter inspections at Eborhall House (Summer roost), Ballymaglancy cave (Summer/Winter roost), Kelly's Cave (Winter roost), Bunnadober Mill (Summer, Maternity roost), Ross Castle (Summer roost), and Cloonnabinnia Cave (Summer/Winter) by Scott Cawley during the 2023 season. Due to the lack of a linkage between the Project and the Ross House roost, the Project will not influence the existing population dynamic of Ross Lake and Woods SAC's Lesser horseshoe bat population in any way or affect the conservation objectives supporting its conservation condition in Ross Lake and Woods SAC. Given that conclusion, it follows that the Project will not have any impact on the Lesser horseshoe bat in any of the other SACs selected for this species (which are all further removed from the Project).

With no impact to the QI populations of the Lough Corrib SAC populations and the next nearest Ross Lake and Woods SAC, there will not be any potential deterioration at neighbouring or local European sites (Lough Fingall Complex SAC, Moneen Mountain SAC and East Burren Complex SAC) due to a loss of supporting populations.

Marsh fritillary

Connemara Bog Complex SAC lies *c.*6km to the northwest of the Project and is the nearest European site listed for the Marsh fritillary butterfly *Euphydryas aurinia*. The Marsh fritillary butterfly is a species that requires a network of suitable habitat patches within its range to maintain the local metapopulation. Although long distance movements have been recorded (i.e. up to 20km), the species is generally relatively sedentary and 6.5km would be beyond the normal dispersal range of the species (Lavery, 1993; Hula *et al.*2004; Betzholtz *et al*. 2007; Junker & Schmitt, 2010; Botham *et al*., 2011; and, Zimmermann *et al*., 2011). Therefore, the Project will not influence the existing population dynamic of the Connemara Bog Complex SAC's Marsh fritillary population in any way or affect the conservation objectives supporting its conservation condition in the Connemara Bog Complex SAC.

With no impact to the QI populations of the nearest Connemara Bog Complex SAC, there will not be any potential deterioration at neighbouring or local European sites (Moneen Mountain SAC and East Burren Complex SAC) due to a loss of supporting populations.

9.8.4 Summary

The only potential impact identified is the impact related to the loss of habitat with the Lough Corrib SAC. It is however a very discrete area and a limited area within the SAC which will be potentially affected, and none of this limited area is composed of QI Annex I habitat. Design measures, such as the Lackagh Tunnel and the River Corrib Bridge, ensure QI Annex I habitats are retained within the SAC. Therefore as much as there may be some loss of individual plants of typical and positive indicator species, these are outside the SAC and none are critically rare to result in significant effects on the QI habitats and population within the immediate Lough Corrib SAC or similar habitats/populations in the region.

Therefore there will be no deterioration as a result of loss in supporting habitats/populations that will effect the conservation objectives of European sites within the immediate and local vicinity of Galway and as such no mitigation measures are required in respect of potential impacts from loss of supporting habitats or species.

10. Design Requirements and Mitigation Measures

10.1 Introduction

10.1.1 Overview of Strategy and Updates Since 2018

This section presents the mitigation measures required in addition to the design measures which are set out in Section 2.5 of this updated NIS and are summarised again below. Any additional mitigation measures of relevance raised during the review of the 2018 NIS and the appropriate assessment undertaken by the Inspector appointed by An Bord Pleanála (ABP) and appended to ABP's Inspector's Report dated 22 June 2021 have been incorporated into this section of this updated NIS.

It is noted that Section 12.6 of the ABP's Inspector's Report did not dispute the mitigation measures proposed in the 2018 NIS and during the oral hearing in 2020, however they did include 'project-level' 'additional mitigation measures' which have been incorporated into this updated NIS as follows:

- *"The area fenced off from construction to include the River Corrib and its fringing vegetation, as this may also be Annex I habitat, with the fringing vegetation maintained"*
- *A commitment to "Install, the highest standard of treatment facilities specified in the TII guidelines, suitable for discharge directly into an SAC watercourse, for road run-off during the operation of the road, with regular maintenance of silt traps, including dredging and removal of trapped silt for disposal in sealed landfill"*
- *A commitment to ensure "mud is not allowed to build up on haul roads and public roads where it could wash in to the SAC including the River Corrib"*
- *"Dust control during blasting events and dust monitoring within the SAC during construction, especially following blasting events, and with revisions to working methods/frequency of blasting if required"*
- *"Reduction of lighting on the western approach to the Lackagh tunnel to the absolute legal minimum to maintain existing light levels within the Lough Corrib SAC"*
- *"The scope of the NISMP must be broadened to include species which are a potential threat to limestone pavement and other Annex I habitats, including, cotoneaster (all species), buddleia, red valerian and wild clematis"*
- *"The seed/planting mix not to include negative indicator species for limestone pavement or calcareous grassland within 250m of the SAC including perennial rye grass, white clover, sycamore, beech and conifers, plus control of other negative indicator species within 100m of the SAC as listed by Wilson and Fernandez (2013), such as creeping thistle and ragwort, while the vegetation is establishing on the soft estate (for two years post-seeding)"*
- *"Monitoring and management of non-native invasive species along the route corridor in proximity to Lough Corrib …SAC between Ch. 9+100 and Ch. 11+400 during the operation of the road, including the additional species listed above"*
- *"Ensure that safe passage exists for otters along all watercourses bisected by the proposed road during construction, to include mammal ledges within the culvert or two dry 600mm culverts parallel to the watercourse, one each side"*
- *"The area fenced off from construction to include the River Corrib and its fringing vegetation, as this may also be Annex I habitat, with the fringing vegetation maintained"*

The following 'additional mitigation measures' proposed by ABP's Inspector have not been incorporated into this updated NIS:

- *"The mitigation area 6210 R1 should be restored by management, using the existing seed bank, rather topsoil stripping or translocation of turves to reduce the risk of suspended solid pollution of the River Corrib from this location". This is a calcareous grassland area along the eastern bank of the River*

Corrib, c. 185m downstream of the proposed River Corrib bridge and will be managed as per mitigation measures included Section 9 of the CEMP to mitigate the risk of sedimentation, erosion and the pollution control measures already incorporated into the Project, which are applied at all such sites across the project area and are adequate.

- *"Construction traffic travelling to/from Galway to primarily use recently constructed roads with a modern drainage design (pollution control) or avoiding the R458, N67 and N84 where these pass Natura 2000 sites". The CEMP has comprehensively addressed mitigation measures for construction-related traffic impacts and restrictions on road use are not required to avoid impacts on European sites.*
- *"Add a pond within the barn owl/lesser horseshoe bat habitat enhancement area in proximity to Menlo Castle which will be suitable for breeding coot." There was no impact identified on breeding Coot that would compromise the supporting SPA populations, and no mitigation measures are required to mitigate any impact to Coot. Aside from the pond not being required to mitigate any population level effects on coot, the addition of the pond would compromise the functioning of the habitat enhancement and compensation measures for the Barn owl and Lesser horseshoe bat.*
- *"The population of Rhynchospora fusca should be identified, mapped and protected during the construction phase." There have been no populations of the species identified within the assessment boundary and the SAC.*

The minor updates made to the impact assessment resulting from the updated baseline results, and the conclusions of the updated impact assessment, have not altered the mitigation strategy or expected outcome significantly.

It should be clear that all relevant mitigation measures and commitments must apply, from the outset, to all parts of the development as permitted, including enabling works, site preparation and advance contracts, as well as at construction stage.

10.1.2 Design Measures

As detailed in the 2018 NIS, design measures that have either avoided or reduced the potential for the Project to affect the conservation objectives of the European sites within its ZoI include:

- The design of the Project does not include any permanent fencing within Annex I habitats that are located within Lough Corrib SAC
- The clear-span design of the proposed River Corrib Bridge avoids the loss of instream habitat in the River Corrib, minimises the potential for habitat degradation in the River Corrib (and downstream in Galway Bay) from construction works, and minimises the disturbance to the aquatic QI species of Lough Corrib SAC
- The drainage design includes attenuation, flow control and pollution treatment to ensure that the risk of affecting either groundwater or surface water quality is minimised as far as is possible
- The design of the Project also ensures that the existing hydrological regime and hydrogeological regime will not be affected (although for the latter, a level of operational inspection is included within the mitigation strategy in Section 10.4.1)
- The design includes a detailed construction methodology for the proposed Lackagh Tunnel which ensures that it will not affect the structural integrity[91] of the overlying limestone rock (some level of monitoring is included in the mitigation strategy), the existing hydrogeological regime, or have any impacts on Annex I habitats near the western approach to the tunnel as a consequence of the retaining wall specified there
- Lighting is not included along the length of the proposed River Corrib Bridge

[91] Structural Integrity of the mosaic of Limestone pavement and Calcareous grassland is the physical and mechanical geotechnical properties that control the behaviour of the geotechnical Limestone pavement environment

However, as explained in the 2018 NIS, despite these design measures, mitigation measures are also required, and will be implemented, under supervision of both the Project Ecologist (employed by the Galway County Council) and the Ecological Clerk of Works (employed by the Contractor) to ensure that the Project will not affect the conservation objectives of any of the European sites within its ZoI. Competent ecologists will need to be involved directly at all project stages.

Quarterly monitoring of the effectiveness of the environmental commitments will be undertaken in the first year after the completion of construction works.

10.1.3 Summary of Potential Impacts Requiring Mitigation

As set out in Section 9, the potential impacts associated with the Project that require mitigation are:

- Habitat loss/fragmentation: Measures to minimise habitat loss in Lough Corrib SAC and to avoid loss of QI habitats within Lough Corrib SAC during construction (Lough Corrib SAC)
- Habitat degradation – tunnelling/excavation: Measures to maintain the structural integrity of Limestone pavement during the construction of the proposed Lackagh Tunnel, and its western approach (Lough Corrib SAC)
- Habitat degradation – hydrogeology: Measures to avoid habitat degradation as a result of potential hydrogeological impacts (Lough Corrib SAC, Galway Bay Complex SAC, Lough Corrib SPA, Inner Galway Bay SPA)
- Habitat degradation – hydrology: Measures to Protect Water Quality in Receiving Watercourses (Lough Corrib SAC, Galway Bay Complex SAC, Lough Corrib SPA, Inner Galway Bay SPA)
- Habitat degradation – air quality: Measures to Control Dust Emissions During Construction to prevent impacts on vegetation in Lough Corrib SAC
- Habitat degradation – non-native invasive species: Mitigation measures to avoid the introduction or spread of non-native invasive species to European sites (Lough Corrib SAC, Galway Bay Complex SAC)
- Disturbance/displacement: Mitigation measures to avoid/reduce the disturbance/displacement effects of blasting on wintering birds using Ballindooley Lough (Lough Corrib SPA, Inner Galway Bay SPA)
- Barrier effect: Mitigation measures to ensure that the Project does not present a barrier to Otter movement within the Bearna Stream catchment (Galway Bay Complex SAC)
- Mortality risk: Mitigation measures to avoid mortality of QI species (Lough Corrib SAC, Galway Bay Complex SAC)
- Construction-related traffic: Mitigation measures to ensure that habitats are not degraded through impacts related to construction-related traffic on the wider, existing road network (Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC, Inner Galway Bay SPA, Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SPA, Rahasane Turlough SAC and Cregganna Marsh SPA).

10.1.4 Construction Environmental Management Plan

Integral to the mitigation strategy is the Construction Environmental Management Plan (CEMP) which is included in Appendix C.

The CEMP summarises the overall environmental management strategy that will be adopted and implemented during the construction phase of the Project. The purpose of the CEMP is to demonstrate how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature. The CEMP sets out the mechanism by which environmental protection is to be achieved during the construction phase of the Project. Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum. The CEMP has been prepared in accordance with many industry best practice guidance including:

- TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan

- Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 5th Edition (Kwan *et al*., 2023)

The CEMP included with the 2018 EIAR and 2018 NIS has been reviewed and updated in conjunction with the updated EIAR and this updated NIS, having regard to consultations with a range of specialists and environmental organisations, in particular, the NPWS and Inland Fisheries Ireland (IFI). The CEMP supports the information already provided in the updated EIAR and this updated NIS and must be read in conjunction with the information already provided in this updated NIS. The details relevant to European sites are already provided in this updated NIS.

The information included in the CEMP is presented below:

- General Project Details
- Contact Sheets
- Reference Documents
- Organisational Structure/Duties and Responsibilities
- Environmental Commitments
- Site Specific Method Statements/Management Plans
  - Construction and Demolition Waste Management Plan
  - Sediment, Erosion and Pollution Control Plan
  - Non-native Invasive Species Management Plan
  - Pest Control Plan
  - Incident Response Plan
  - Construction Traffic Management Plan
  - Environmental Awareness Training Strategy
  - Communications Strategy
  - Inspections, Auditing and Monitoring Compliance Strategy
  - Final Handover of CEMP to Contracting Authority

The CEMP is a working document and will be finalised by the Contractor following appointment and prior to commencing works on site. All of the content provided in this CEMP will be delivered in full by the Contractor and its finalisation by the Contractor will not affect the robustness and adequacy of the information presented and relied upon in this updated NIS.

In addition to the items listed above, the following information will also be provided by the Contractor when finalising the CEMP:

- Planning Consent - If planning permission is granted for the Project, the entire contents of the planning consent will be included in the CEMP
- Comprehensively incorporate all Environmental Commitments set out in the Contract documents (in particular the Works Requirements), those presented in the updated EIAR and this updated NIS and any additional commitments which may arise as part of the development consent process up to and including a further Oral Hearing if held and conditions attached to the planning consent. The CEMP will include the complete suite of Environmental Commitments together with the relevant specification, evidence and responsibilities of how each commitment will be met
- Relevant Environmental Performance Criteria prescribed in environmental legislation and in Contract documents

- Register of all applicable legislation, including relevant standards, Codes of Practice and Guidelines
- Description of the Environmental Management System of the Project, which shall be devised according to the criteria of ISO 14001:2004 – Environmental Management Systems. The CEMP will be complemented by General Procedures, Work Procedures and Operations Instructions. These documents will be in place within the site administration offices and appropriate site locations during works

The CEMP is a dynamic document and the Contractor will ensure that it remains valid for the duration of the construction period. The CEMP may need to be altered during the lifecycle of the construction period to take account of monitoring results, legislative changes, outcomes of third-party consultations etc. Additional appendices may be added to the CEMP to accommodate monitoring results, permits etc. However, the finalisation of the CEMP by the Contractor will not affect the robustness and adequacy of the information presented here and relied upon in this updated NIS.

In order to help ensure the successful development, implementation and maintenance of the CEMP, the Contractor will appoint an Environmental Manager (EM). The EM will possess sufficient training, experience and knowledge appropriate to the nature of the task to be undertaken, a Level Eight qualification recognised by the Higher Education and Training Awards Council (HETAC), or a University equivalent, or other qualifications acceptable to the Employer, in Environmental Science or Environmental Management, or other subjects acceptable to the Employer. In particular, the EM will require suitably qualified ecological experts, the Project Ecologist (employed by the Employer) and the Ecological Clerk of Works (employed by the Contractor), to oversee ecologically sensitive elements of the construction works, ecological derogation licensing requirements and ecological monitoring. Further details on the roles and responsibilities of the EM are provided throughout the CEMP document in Appendix C.

The key Site Specific Method Statements/Management Plans of relevance to this updated NIS are described below.

A Construction & Demolition (C&D) Waste Management Plan (WMP) has been prepared as part of the CEMP to ensure that waste arising during the construction and demolition phase of the Project on site will be managed and disposed of in a way that ensures compliance with the provisions of the Waste Management Act, 1996, as amended and associated Regulations to ensure that optimum levels of reduction, re-use and recycling are achieved and to ensure that waste management does not impact on any European sites.

The Sediment, Erosion and Pollution Control Plan (SEPCP) summarises the procedures and technical practices for implementing effective sediment, erosion and pollution control through a variety of delivery methods for the construction phase of the Project. The purpose of this SEPCP is to demonstrate at this stage, how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific sediment, erosion and pollution control measures relevant to construction works of this nature. This demonstrates that run-off from the construction site will not impact on any European sites.

A Non-native Invasive Species Management Plan (NISMP) has been prepared to outline the strategy that will be adopted during the construction and operation of the Project in order to manage and prevent the spread of the non-native invasive species to any European sites. Additional species identified on site (Zebra mussel) as well as unconfirmed species “which are a potential threat to Limestone pavement and other Annex I habitats, including, cotoneaster (all species), buddleia, red valerian and wild clematis” as recommended by the Inspector appointed by An Bord Pleanála (ABP) and included in ABP’s Inspector’s Report dated 22 June 2021 are also incorporated into the NISMP. Refer to Section 10.8 for further details.

A Pest Control Plan (PCP) has been prepared to outline the strategy that will be adopted during construction to ensure that the construction site and surroundings will be maintained to a high standard of cleanliness. It has been prepared taking cognisance of the Environmental Health Service’s leaflet that details how to control rodents in the construction industry.

The focus of including all of the stringent measures in this CEMP is on prevention of the incident arising in the first place. However, an Incident Response Plan (IRP) has been prepared to ensure that in the unlikely event of an incident, response efforts are prompt, efficient, and suitable for particular circumstances. The IRP describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts are prompt, efficient, and suitable for particular circumstances. The IRP details the procedures to be undertaken in the event of the release of any sediment into a watercourse, serious spillage of

chemical, fuel or other hazardous wastes (e.g. concrete), non-compliance incident with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.

All of the Contractor's site staff will receive relevant and appropriate training to ensure that they have the appropriate knowledge to successfully implement the CEMP.

The CEMP also outlines the communications strategy which will be adopted during the construction phase which ensures that awareness, education and information sharing procedures are adopted and implemented. Finally, the CEMP outlines the inspections, auditing and monitoring compliance strategy that will be adopted by the Contractor.

In summary, the implementation of the CEMP ensures that any direct or indirect or *ex-situ* impacts to the conservation objectives supporting the QI habitats and QI/SCI species of Lough Corrib SAC, Galway Bay Complex SAC, Lough Corrib SPA or Inner Galway Bay SPA Inishmore Island SAC, Kilkieran Bay and Islands SAC, Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SPA, Rahasane Turlough SAC, or Cregganna Marsh SPA, .Maumturk Mountains SAC, The Twelve Bens/Garraun Complex SAC, Connemara Bog Complex SAC, Connemara Bog Complex SPA, Ross Lake and Woods SAC, East Burren Complex SAC, Moneen Mountain SAC, Black Head-Poulsallagh Complex SAC and Gortnandarragh Limestone Pavement SAC will not arise and will ensure that adverse effects on site integrity are avoided.

To allow the Project Ecologist to track the progress of construction and monitoring of the ecological mitigation measures, a GIS mapping system will be developed and accompanied by systematic digital recording of data, including:

- At the end of each month, any mapping relating to ecological mitigation measures, including results of pre-construction surveys (e.g. locations of badger setts) or design changes for mitigation measures (e.g. change in location of artificial Badger sett), will be uploaded to the dedicated project website
- In addition, at the end of each month any ecological monitoring reports will be uploaded to a dedicated project website
- Notwithstanding the point above ecological monitoring reports will be submitted to the Planning Authority and copied to the NPWS
- The Project Ecologist in conjunction with 'permits to work' will sign off the correct completion and functioning of the measures, where works are in ecologically sensitive locations and/or are ecologically sensitive activities
- Once ecological mitigation measures have been implemented and installed, GIS mapping files of their final as-built locations will be sent to the Project Ecologist to be uploaded into the Local Authority's GIS and planning systems

Galway County Council (GCoC) will ensure that the results of monitoring will be used to inform the long-term ecological mitigation programme and any necessary timely corrective action.

- During construction, monitoring and any required corrective action, will be GCoC's responsibility as outlined in the Schedule of Environmental Commitments that was initially prepared as part of the 2018 EIAR, updated during the 2020 oral hearing and further updated for the updated EIAR.
- During operation, GCoC will engage the services of a suitable contractor to monitor the ecological mitigation measures for the lifetime of the project. All the relevant requirements set out in the updated Schedule of Environmental Commitments, in relation to monitoring and maintenance of the ecological mitigation measures over the lifetime of the project, will be included as conditions in the contract(s) entered into with the appointed contractor. GCoC shall ensure that provision is made, in the contract(s) entered into with the appointed contractor, for corrective action to be undertaken if any aspects of the implementation of the ecological mitigation measures and monitoring commitments proposals are not effective. These provisions shall include a requirement for a suitably qualified ecologist/biodiversity expert to review the efficacy of any corrective actions required.

10.2 Habitat loss/fragmentation: Measures to minimise habitat loss in Lough Corrib SAC and to avoid loss of QI habitats within Lough Corrib SAC during construction

10.2.1 Mitigation Measures

The minimum working area necessary to facilitate the construction of the supporting structures associated with the proposed River Corrib Bridge will be used (Appendix D). This area will be clearly delineated and fenced off at the outset of works and maintained for the duration of the construction programme. No works within Lough Corrib SAC boundary will be undertaken outside of this zone.

This includes a set-back of 10m on the west bank of the River Corrib, and 5m on the east bank, where construction works will generally be limited to the clearance of woody vegetation (with the exception of installing the drainage outfalls to the river), if required to facilitate construction works.

As recommended by the Inspector appointed by An Bord Pleanála (ABP) and appended to ABP's Inspector's Report dated 22 June 2021, where possible, "the area fenced off from construction [is] to include the River Corrib and its fringing vegetation, …[which is now defined as 3260] Annex I habitat, with the fringing vegetation maintained", where not directly impacted by the proposed road alignment or drainage. These areas will be protected for the duration of construction works and fenced off at a distance of 5m from the stream/river bank.

There are some areas of QI Annex I terrestrial habitat within Lough Corrib SAC that lie within the Assessment Boundary (Limestone pavement and Calcareous grassland). To ensure that these habitat areas will not be affected by construction works they will be fenced off in advance of any construction commencing and will be a "no-construction zone" within which no works will take place. These areas are shown on Figures 17.1 to 17.5 and Figures 18.1 to 18.5.

The design of the Project does not include any permanent fencing within Annex I habitats that are located within Lough Corrib SAC. The current level of grazing associated with those areas of Calcareous grassland and exposed Limestone pavement that will be retained above the proposed Lackagh Tunnel, is limiting scrub encroachment which would affect the quality of those habitats (see Table 9.13, under the vegetation composition and structure attributes). The commitment to not erect permanent fencing in this area will also serve to allow the current grazing regime to continue and ensure that the Project will not result in habitat degradation in that regard.

As recommended by the Inspector appointed by An Bord Pleanála (ABP) and appended to ABP's Inspector's Report dated 22 June 2021, and where possible, the "reduction of lighting on the western approach to the Lackagh tunnel to the absolute legal minimum to maintain existing light levels [as far as possible] within the Lough Corrib …SAC" to reduce impact to habitats.

10.3 Habitat degradation – tunnelling/excavation: Measures to maintain the structural integrity of Limestone pavement during the construction of the proposed Lackagh Tunnel (and its western approach)

10.3.1 Mitigation Measures

A detailed construction methodology for the proposed Lackagh Tunnel is provided in Appendix F, which includes the following mitigation measures to ensure that construction works do not affect the structural integrity of the limestone bedrock supporting QI habitats on Lough Corrib SAC:

- The potential direct and indirect impacts to the geotechnical constraints during the construction and operation of Lackagh Tunnel are predominately addressed by the design. The mitigation measures outlined below provide an added factor of safety to ensure that there is no encroachment into the overlying Annex I habitat.
- During the construction of Section 1 (Stabilisation of the Lackagh Quarry face) and Section 3 (the western approach to the tunnel) a series of quarry face support works will be undertaken to ensure stability at the quarry face rock mass, required prior to and during tunnel excavation. The supported rock face and retaining walls will be monitored for movement. A geotechnical expert will be appointed, by the

contractor and will be present to monitor the rock mass stability during their construction period. In the unlikely event that instability within the rock mass is observed additional support measures will be installed to ensure that there is no impact to the structural integrity of the surface above and the mosaic of Limestone pavement and Calcareous grassland that is in close proximity to the Project. The additional rock support measures comprise ground anchors, rock bolts, rock dowels, steel mesh, shotcrete or a combination of these measures, designed to the relevant design standards and best practice guidance documents. However, based on the conservative design approach it is considered that the risk of instability will be avoided and additional support measures will not be required.

- During the operational phase, monitoring of the rock mass stability will continue, the rock and overburden retaining systems in Section 1 (Stabilisation of the Lackagh Quarry face) and Section 3 (the wester approach to the tunnel) will continue to be monitored as part of the TII (Transport Infrastructure Ireland) maintenance schedule. In the extremely unlikely event that instability within the rock mass is observed additional support measures outlined above for the construction phase will be installed to ensure that there is no impact to the structural integrity of the Limestone pavement and to the mosaic of Limestone pavement and Calcareous grassland. However, based on the conservative design approach, the installed composite support system and monitoring during construction it is considered that the risk of instability will be avoided and additional support measures will not be required.

- A geotechnical expert will be appointed by the contractor and will be present to monitor the Limestone pavement vibrations during blasting works for the construction of Section 1 (Stabilisation of the Lackagh Quarry face) and Section 3 (the wester approach to the tunnel). The blast target vibration limit is defined as 20% more conservative, than the conservative design approach vibration limit of 25mm/sec at the Limestone pavement surface which provides an added factor of safety to the construction works to ensure that blasting will not impact the structural integrity of the Limestone pavement environment. The maximum vibration limit of 25mm/sec will not be exceeded. In the unlikely event that monitoring indicates that the blast target vibration limit at the surface is exceeded, blasting works will cease on site until it is understood the basis for the increased vibration. The blast design will then be recalibrated and blasting works will proceed with continued monitoring.

10.4 Habitat degradation – hydrogeology: Measures to avoid habitat degradation as a result of potential hydrogeological impacts

10.4.1 Mitigation Measures

Specific construction mitigation measures are required to mitigate the potential construction impacts which are outlined below. CIRIA guidance on the control and management of water pollution from construction sites in their publication Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters – Williams *et al.*, 2001) will be followed.

Mitigation is detailed below and divided into those standard measures that apply to both the Galway Granite Batholith and the Visean Undifferentiated Limestone and those measures that are specifically designed for karst in the Visean Undifferentiated Limestone.

10.4.1.1 Standard Mitigation Measures

- Mitigation of potential construction impacts will be achieved through the stringent implementation of good construction practice procedures and environmental controls so as minimise the opportunity for contaminated releases of construction runoff as set out in the CEMP (Appendix C). Such practices will include adequate bunding for oil containers, wheel washers and dust suppression on site roads, and regular plant maintenance.

- The following measures included in the CEMP will be implemented to control the potential for pollution from accidental spillages on site:

  – Stockpiling of contaminated material is not permitted

  – Good housekeeping (daily site clean-ups, use of disposal bins, etc.) on the site during construction, and the proper use, storage and disposal of these substances and their containers will prevent groundwater contamination

  - For all activities involving the use of potential pollutants or hazardous materials, under the CEMP, the contractor will be required to ensure that material such as concrete, fuels, lubricants and hydraulic fluids will be carefully handled and stored to avoid spillages. Potential pollutants shall also be adequately secured against vandalism and will be provided with proper containment according to codes of practice. Any spillages will be immediately contained and contaminated soil removed from the site and properly disposed of
  - The contractor will be required to implement a contingency plan for pollution emergencies which will be developed by the appointed contractor prior to work commencing and regularly updated, which will identify the actions to be taken in the event of a pollution incident. As recommended in the CIRIA (2023) document, the contingency plan for pollution emergencies will include the following:
    - Containment measures
    - Emergency discharge routes
    - List of appropriate equipment and clean-up materials
    - Maintenance schedule for equipment
    - Details of trained staff, location and provision for 24-hour cover
    - Details of staff responsibilities
    - Notification procedures to inform the Environmental Protection Agency (EPA) or environmental department of the Galway County Council
    - Audit and review schedule
    - Telephone numbers of statutory water consultees
    - List of specialist pollution clean-up companies and their telephone numbers
- No direct untreated point discharge of construction runoff to groundwater will be permitted
- Where a pollution incident is detected, construction works will be stopped until the source of the construction pollution has been identified and remedied
- Pollution control facilities and procedures set out in the Sediment, Erosion and Pollution Control Construction Management Plan included in the CEMP will be implemented if required
- The pollution control and treatment facilities will be installed and the monitoring network including instrumentation and procedures established prior to construction activities taking place on the ground in the vicinity of watercourses and sensitive surface and groundwater receptors. It is envisaged that the pollution control facilities will be monitored daily to ensure their continued integrity and desired function

10.4.1.2 Karst Specific Mitigation Measures

In the event of karst being encountered the Karst Protocol shall be implemented. Karst specific mitigation measures are detailed in the Karst Protocol, which is documented in the CEMP (Appendix C). Application of the Karst Protocol are summarised below to detail where they will be implemented.

- Where karst features are encountered during construction works these will be assessed by a qualified hydrogeologist. These features will require their extent across the Project to be delineated. In the case of excavations (road cuttings, tunnels, bridge pier excavations) then the karst feature shall be excavated and backfilled with course fill and sealed. This will prevent runoff draining into the feature and therefore protect against accidental spillage. On this basis, construction runoff will not discharge to a karst pathway and will receive natural attenuation and dilution in the aquifer.
- With regard to karst features being intercepted in excavations for earthworks (including viaducts, bridges and tunnels) and infiltration basins, the Karst Protocol preserves the hydraulic connectivity of the feature

using granular material to fill but then seals the karst from the excavation using a liner (geotextile and/or cement depending on the site specifics) that will prevent linkage between excavation and the karst.

- As per the design, inspection and maintenance will occur during the operation phase to ensure that the appropriate thickness of subsoil remains across the basin surface area. If karst features and potential pathways are found to be present during inspection and maintenance in the infiltration basin, then the Karst Protocol will be implemented to ensure that there are no preferential pathways within the infiltration basin.

- Given the proximity of the Project to the Coolagh Lakes, which are groundwater dependant via karst springs, construction impacts represent a potential source of impact on the water quality of the lake from uncontrolled construction site runoff and potential contamination of the groundwater from construction spillages. There will be no surface water discharges to the Coolagh Lakes and all runoff will be treated before being discharged to ground at infiltration basins. Infiltration basins are designed to include settlement to remove sediment and have 2m of subsoil below invert level. All infiltration basins include containment to protect against spillages. Infiltration basins require regular inspection to confirm that no observable subsidence in the infiltration has occurred due to karst. There are no guidelines on the inspection frequency for infiltration basins, however, based on the mitigation measures implemented the risk of subsidence occurring is considered to be low and inspection is recommended on 5-year frequency.

- Pouring of the concrete in excavations (River Corrib Bridge, Menlough Viaduct and Lackagh Tunnel) will only be undertaken when the excavation has been inspected by a qualified hydrogeologist. Inspection of the full depth and extent of each excavation will be undertaken to identify if any significant flow paths, such as the karst enhancement of the bedrock permeability, are present. If no significant flow paths are present, then the hydrogeologist will document accordingly and confirm that there is no risk to groundwater from cement leakage. If significant pathways are present then mitigation against potential impacts which may arise from flow along these pathways shall be designed by the hydrogeologist based on the karst mitigation plan; these may comprise of installing a high permeability zone to replace the groundwater pathways which would be removed by the foundations and/or sealing the linkage from excavation to protect the karst. The design of the mitigation measures shall be approved by a qualified hydrogeologist to confirm that there will be no negative impacts to groundwater.

These above standard measures and karst measures will ensure that the risk of pollution of groundwater bodies is controlled and that there will be no impact to groundwater bodies that support GWDTE at European sites.

10.4.1.3 Lackagh Tunnel Mitigation Measures

- Dewatering of the bedrock aquifer will not be permitted during construction and operation phases so there is no reduction in groundwater flow transmitted by these pathways through the aquifer to the GWDTE. This will also maintain the boundary between Clare-Corrib GWB and Lough Corrib Fen 1 (Menlough).

- All construction works will remain above the groundwater table for the duration of the works to ensure the groundwater table is not intercepted and dewatering is not required. The construction schedule will be tailored so that the excavation of the lower section will occur only during the groundwater seasonal low when the water table is below the construction level.

- A hydrogeologist will be appointed for the construction phase by the contractor and will be present to monitor at all times when the construction activities have the potential to impact on groundwater. If karst is encountered during any excavation the karst feature will be examined by the hydrogeologist so that the extent and pathway can be assessed to advise on the granular material required to fill the feature and seal it from the excavation and it will be sealed from the excavation and will not be impacted by the construction.

- Temporary bund walls are included in the design at the eastern tunnel portal as a measure to be implemented if extreme high groundwater conditions occur (>15m OD) during construction. This measure will prevent water with potentially high suspended solids that is ponded in the quarry from entering the tunnel during construction.

- To ensure that groundwater is not impacted by pollution during the construction phase, the following mitigation measures will be implemented as detailed in the CEMP:
- A temporary barrier will be installed at the eastern portal when groundwater flooding occurs in the quarry to prevent runoff entering the tunnel from the quarry
- All runoff or discharges will be managed as detailed in the CEMP so as to not discharge without being first treated
- All liquid fuel or chemicals stored on site will be bunded within an area of sufficient capacity in order to contain 110% capacity

10.5 Habitat degradation – hydrology: Measures to Protect Water Quality in Receiving Watercourses

10.5.1 Mitigation Measures

As part of the design, the proposed N6 GCRR will be fitted with treatment facilities to standards specified in the TII guidelines, suitable for discharge to watercourse, for road run-off during the operation of the proposed N6 GCRR, with regular maintenance of silt traps, including dredging and removal of trapped silt for disposal in sealed landfill. This measure was further reinforced by the Inspector appointed by An Bord Pleanála (ABP) and documented in their report appended to ABP's Inspector's Report dated 22 June 2021, the proposed N6 GCRR will be fitted with "the highest standard of treatment facilities specified in the TII guidelines, suitable for discharge directly into an SAC watercourse, for road run-off during the operation of the road, with regular maintenance of silt traps, including dredging and removal of trapped silt for disposal in sealed landfill". Potential impacts arising from operation are therefore fully mitigated.

The mitigation measures described below and in the CEMP (Appendix C) will be implemented to ensure that construction of the Project will not affect water quality in receiving watercourses, including downstream marine environments or Annex I habitats associated with the River Corrib. These mitigation measures will be achieved through the stringent implementation of good construction practice procedures and environmental controls so as minimise the opportunity for contaminated releases of construction water. The mitigation measures are as follows:

- Potential construction impacts in the form of sediment impact and spillages to receiving watercourses and groundwater bodies will be mitigated through the use of temporary and the permanent proposed sedimentation ponds and wetland systems with all construction site runoff being passed through such facilities prior to discharge. The provision of continuous double silt fences and temporary settlement ponds in proximity to watercourses will mitigate the potential of construction site runoff pollution during the construction phase
- Wheel washing facilities will be provided for any vehicle exiting site in order to ensure that mud and other wastes are not tracked onto public roads where they may be a source of contamination / silt for water runoff; these will be located at least 50m away from Annex I habitats within a European site and the River Corrib which supports Annex I habitat. This was further reinforced by the Inspector appointed by An Bord Pleanála (ABP) and included in their report appended to ABP's Inspector's Report dated 22 June 2021, as a measure for "ensuring mud is not allowed to build up on haul roads and public roads where it could wash in to the …SAC including the River Corrib"
- No direct untreated point discharge of construction runoff to watercourses or groundwater bodies will be permitted
- Construction runoff post settlement treatment shall be discharged to an undisturbed vegetated buffer zone, as opposed to a direct discharge to a watercourse
- The regular monitoring of downstream receptor water quality for sediments and hydrocarbons and the inspection of the pollution control facilities will be carried out during construction works
- Where a pollution incident is detected, construction works will be stopped until the source of the construction pollution has been identified and remedied

- The pollution control and treatment facilities, set out in the Sediment, Erosion and Pollution Control Construction Management Plan section of the CEMP, will be installed and the monitoring network including instrumentation and procedures established prior to construction activities taking place on the ground in the vicinity of watercourses and sensitive surface and groundwater receptors. The pollution control facilities will be monitored daily to ensure their continued integrity and desired function
- Construction site runoff discharging to watercourses and in particular the sediment concentrations will meet the surface water regulations. Continuous monitoring of sediment concentrations in the receiving water, during construction activities near watercourses, will be carried out to ensure compliance and respond immediately to pollution events
- The Environmental Manager (EM) will be responsible for ensuring the successful finalisation, implementation and maintenance of the detailed Sediment, Erosion and Pollution Control Plan and the Incident Response Plan

Key elements of the Sediment, Erosion and Pollution Control Plan are described in the CEMP as follows:

- Section 9.1 describes the general control measures
- Section 9.2 describes sources of sediment erosion and pollution
- Section 9.3 outlines the requirements for and of the EM
- Section 9.4 describes the control measures associated with the main construction-related activities, including:
  - Section 9.4.5 control measures associated with watercourse crossings and in-stream works which includes main watercourses, minor watercourses and drains, and stream diversions and realignments
  - Section 9.4.6 the control measures associated with the protection of groundwater
  - Section 9.4.7 the control measures associated with construction compounds and machinery refuelling, lubrication and/or maintenance sites
- Section 9.5 describes out the monitoring and audit requirements for both pre-construction and construction
- Section 9.6 outlines the emergency procedures (which will link in with the Incident Response Plan)

These measures are based on the following best practice guidelines to ensure that water bodies are adequately protected during construction work:

- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016)
- Central Fisheries Board Channels and Challenges – The Enhancement of Salmonid Rivers (O'Grady, 2006)
- CIRIA – Guideline Document C648 Control of Water Pollution from Linear Construction Projects, technical guidance (Murnane *et al.*, 2006a)
- CIRIA (C753) The SuDS Manual (Woods-Ballard *et al.*, 2015)
- CIRIA – Guideline Document C624 Development and flood risk – guidance for the construction industry (Lancaster *et al.*, 2004)
- CIRIA (C649) Control of water pollution from linear construction projects, site guide (Murnane *et al.*, 2006b)
- CIRIA (C532) Control of water pollution from construction sites, guidance for consultants and contractors (Masters-Williams *et al.*, 2001)
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (National Road Authority, 2005)

10.6 Habitat degradation – air quality: Measures to Control Dust Emissions During Construction

10.6.1 Mitigation Measures

General

All the mitigation measures outlined below have been developed based on the following guidance:

- The Transport Infrastructure Ireland Air Quality Assessment of Proposed National Roads – Standard (TII PE-ENV-01107) (TII 2022)
- Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management (IAQM, 2024)

In order to ensure that any potential direct or indirect dust impacts will not affect vegetation within Lough Corrib SAC in the vicinity of the construction works, the contractor will implement the following measures during construction of the Project.

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only apart from the contractor's car park which will be hardcore
- Any road that has the potential to give rise to fugitive dust will be regularly watered, during dry and/or windy conditions
- Vehicles using site roads will have their speed restricted, and this speed restriction will be enforced rigidly. On any un-surfaced site road, this will be 20 km/h, and on hard surfaced roads as site management dictates
- Wheel washing facilities will be provided for any vehicle exiting site in order to ensure that mud and other wastes are not tracked onto public roads, these will be located at least 50m away from Annex I habitats within a European site
- Material handling systems and site stockpiling of materials will be located at least 50m away from Annex I habitats within a European site. Potentially dusty surfaces will be dampened during dry conditions
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to reduce the potential for dust emissions
- As recommended by the Inspector appointed by An Bord Pleanála (ABP) and documented in their report appended to ABP's Inspector's Report dated 22 June 2021, the following be implemented: "dust control during blasting events and dust monitoring within the [Lough Corrib] …SAC during construction, especially following blasting events, and with revisions to working methods/frequency of blasting if required. This should align with the demolition and construction guidelines (IAQM, 2024)

These procedures will be strictly monitored and assessed on a daily basis. In the event that elevated levels of dust are noted to occur outside the site boundary, satisfactory procedures will be implemented to rectify the problem before the resumption of construction operations.

Noise barriers in the form of hoarding will be provided around the construction sites. These will also have the effect of reducing off-site dust effects.

Specific to Lough Corrib SAC

A 2m high dust screen will surround construction works at all locations within or adjacent to Lough Corrib SAC to contain dust emissions generated during construction.

10.7 Habitat degradation – shading

10.7.1 Mitigation Measures

The Project will not significantly affect the QI or SCI species of any European sites as a result of any shading impacts and therefore, mitigation measures are not required.

10.8 Habitat degradation – non-native invasive species: Mitigation measures to avoid the introduction or spread of non-native invasive species to European sites

10.8.1 Mitigation Measures

A NISMP has been prepared for the Project which will ensure that the spread of non-native invasive species does not arise during construction and that non-native invasive species are not introduced to any European site during construction. The plan sets out the strategy for identifying, controlling and managing the spread of non-native plant species during construction. It has also included for pre-construction surveys for invasive species, including those not listed under Schedule 3 that may threaten Annex I habitats with European sites and as recommended by the Inspector appointed by ABP and documented in their report appended to the Inspector's Report dated 22 June 2021, "the scope of the NISMP must be broadened to include species which are a potential threat to Limestone pavement and other Annex I habitats, including, Cotoneaster (all species), Buddleia, Red valerian and Wild clematis".

The preparation and implementation of the management measures set out in this plan have been informed by legislation and by best practice guidance documents such as:

- Guidelines on the Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads (National Roads Authority, 2010)
- Managing Invasive Non-native Plants in or near Freshwater (Environment Agency, 2010)
- Good Practice Management Guide for Japanese knotweed (Fallopia japonica), Invasive Species Ireland (RAPID, 2018)

The NISMP will be updated by the Contractor in advance of construction works commencing. This will ensure that the baseline is up to date with respect to both the locations, extent and species types that must be removed from the construction site (and which may not be limited to those three that have been recorded to date) and controlled such that they are not introduced or spread within any European sites.

Non-native invasive species have been identified at a number of locations within the Assessment Boundary and Zebra mussels are confirmed in the River Corrib. The strategy to control and manage these specific plant-infested areas during construction is presented in the plan. Furthermore, mitigation measures to prevent the spread of all non-native invasive species in all areas within the Assessment Boundary during construction are detailed in the plan and include the following.

Advance treatment

Depending on the timescale for the construction of the Project it may be possible to contain the spread of some plant species prior to the onset of construction on the site via an advance treatment contract. The implementation of advance treatment will require permission from landowners to access and treat the infested areas.

As part of the advance works contract, the Contractor will be required to update and implement the recommendations of this management plan prior to advance treatment commencing. The purpose of the advance treatment plan will be to:

- Identify the extent of the infestation on the site
- Ensure further growth and spread of the plant on the site does not occur
- Ensure the plant is not spread to other sites either adjacent to the infested site or through transportation of contaminated soil to another site

- Identify the best method for managing and controlling the non-native invasive species on the site with regard to the future proposed site works and construction methods
- Communicate the plan to all site operatives to ensure success of the plan
- Document and record the treatment and management methods carried out on site for future reference (for use during main construction contract, future site owners, site users, avoid litigation etc.)
- The advance treatment plan shall be completed by a qualified ecologist

Pre-construction survey

As species may have spread, or their distribution may have changed, between the habitat surveys carried out in support of the updated EIAR and this updated NIS, the advance treatment contract, and the commencement of the main construction works, the implementation of this plan will require a pre-construction re-survey by a suitably qualified person within the Assessment Boundary. In accordance with the TII guidance this survey will produce accurate 1:5,000 scale mapping for the precise location of non-native invasive species. The pre-construction surveys will be undertaken by suitable experts with competence in identifying the species concerned having regard to any seasonal constraint.

Site hygiene

Maintaining site hygiene at all times in an area where non-native invasive species are present is essential to prevent further spread. It is also necessary on sites where non-native invasive species are not present but where there is risk of contaminated material being brought to site, for example, site machinery being used on multiple sites, construction staff travelling between infested and not infested sites. Preventative biosecurity control measures will be taken to ensure that further spread does not arise. These measures include:

- Identify, fence off and clearly signpost and mark out infested areas prior to and during construction works. Avoid using machinery with tracks in infested areas
- Although no work is scheduled to be undertaken in water bodies, any monitoring, mitigation or incident response activity requiring entry into a waterbody will follow strict biosecurity procedures due to the presence of Schedule 3 non-native aquatic invasive species
- Clearly identify and mark out areas where infested soil is to be stockpiled on site and cannot be within 50m of any watercourse or within a flood zone
- Create designated entry and exit points for operators on foot and for small mobile equipment
- Installation of a dedicated footwear and vehicular wheel wash down facility into a contained area within the site
- If soil is imported to the site for landscaping, infilling or embankments, the Contractor shall gain documentation from suppliers to confirm that it is free from non-native invasive species
- Ensure all site users are aware of measures to be taken and alert them to the presence of the plan

Treatment methods

Areas identified as requiring specific treatment will be demarcated and the designated control measures implemented at the earliest possible stage to reduce the risk of spread along the Project or beyond the landtake required for the Project.

There are a number of management options that may be implemented to control and prevent the spread of non-native invasive species. It is also noted that it may not be possible to completely remove the non-native invasive species before or during the construction phase. However, treatment methods can still be implemented (such as root barrier membranes) to ensure that further spread does not arise.

Those involved in the application of herbicides/pesticides must be competent to do so and, consequently, must have sufficient training, experience and knowledge in the area of herbicides/pesticides application. It is important that all staff involved in the application of herbicides/pesticides have received appropriate training, which may include achieving competency certification in the safe use of herbicides/pesticides through a

National Proficiency Tests Council registered assessment centre or achieving an appropriate FETAC award in this area.

The type of treatment chosen will depend on site conditions (such as proximity to a watercourse/surrounding habitats/proximity residential dwellings, health and safety and traffic concerns) and the type and extent of infestation. Rather a combined method of different treatments will be chosen on a site by site basis and with regard to sensitive receptors in immediate environs.

The implementation of the management measures set out in this plan ensures that any direct, indirect or *ex-situ* impacts to habitats and species within European sites will not arise and will ensure that adverse effects on the integrity of a European site are avoided.

Refer to Section 10 of the CEMP in Appendix C for further details.

Landscaping/Planting Proposals

As recommended by the Inspector appointed by An Bord Pleanála (ABP) and included in their report appended to ABP's Inspector's Report dated 22 June 2021"the seed/planting mix [should] not … include negative indicator species for Limestone pavement or calcareous grassland within 250m of the …SAC including perennial rye grass, white clover, sycamore, beech and conifers, plus control of other negative indicator species within 100m of the …SAC as listed by Wilson and Fernandez (2013), such as creeping thistle and ragwort, while the vegetation is establishing on the soft estate (for two years post-seeding)". The seed/planting mix will not include non-native invasive species at any location.

Monitoring and Management

As recommended by the Inspector appointed by An Bord Pleanála (ABP) and included in their report appended to ABP's Inspector's Report dated 22 June 2021, "*monitoring and management of non-native invasive species along the route corridor in proximity to Lough Corrib …SAC between Ch. 9+100 and Ch. 11+400 during the operation of the road, including the additional species listed above*" will be incorporated into invasive management at site.

10.9 Disturbance/displacement: Mitigation measures to avoid/reduce the disturbance/displacement effects of blasting on wintering birds using Ballindooley Lough

10.9.1 Mitigation Measures

Construction noise will be kept to a minimum in accordance with BS 5228 (2009).

The contract documents will specify that the contractor, undertaking the construction of the works, will be obliged to take specific noise abatement measures and will comply with the best practice outlined in British Standard BS 5228 – 1: 2009 +A1 2014: Code of practice for noise and vibration control on construction and open sites – Noise and the NRA (now TII) guidelines Good Practice Guideline for the Treatment of Noise during the planning of National Road Schemes (National Road Authority, 2014).

Blasting associated with the eastern approach to Lackagh Quarry (Ch. 11+800 to Ch. 12+100 of the proposed N6 GCRR) will be carried out between the months of April to September (inclusive) to minimise the exposure of wintering birds at Ballindooley Lough to blasting-related disturbance.

Blasting associated with the cutting at Castlegar (Ch. 12+550 to Ch. 13+650 of the proposed N6 GCRR) will take approximately nine months to complete, with an estimated five blast events per week. To minimise the exposure of wintering birds at Ballindooley Lough to blasting-related disturbance, all of those nine months must be in the April to September period (inclusive) within consecutive years.

In addition since the 2018 NIS, as recommended by the Inspector appointed by An Bord Pleanála (ABP) and included in their report appended to ABP's Inspector's Report dated 22 June 2021, lighting on the western approach to the Lackagh Tunnel will be reduced to the absolute legal minimum to maintain existing light levels within the Lough Corrib …SAC.

10.10 Barrier effect

10.10.1 Mitigation Measures

To avoid the culverts on the Bearna Stream (C04/01) and on the Tonabrocky Stream (C04/02) presenting a barrier to Otter movement, Otter passage facilities will be provided at culverts C04/01 (Ch. 4+100 of the proposed N6 GCRR) and C04/02 (Ch. 4+950 of the proposed N6 GCRR). These will consist of either raised ledges within structures, or separate dry 600mm pipes installed adjacent to the culverts on either side of the watercourse. Mammal underpasses and Otter passage facilities will be checked and fully inspected before the relevant sections of the proposed N6 GCRR become operational, to ensure they are constructed in accordance with the Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes (National Roads Authority, 2008b).

In addition to the 2018 NIS, as recommended by the Inspector appointed by An Bord Pleanála (ABP) and included in their report appended to ABP's Inspector's Report dated 22 June 2021, to "ensure that safe passage exists for otters along all watercourses bisected by the proposed …[N6 GCRR] during construction, to include mammal ledges within culvert[s] or two dry 600mm culverts parallel to the watercourse, one each side."

10.11 Mortality risk: Mitigation measures to avoid mortality of QI species

10.11.1 Mitigation Measures to ensure that construction materials are not introduced into the River Corrib

A detailed construction methodology has been prepared for the construction of the proposed River Corrib Bridge. The construction methodology ensures that the risk of accidentally introducing construction materials to the River Corrib during the bridge construction will be avoided, and the risk of accidental spillages into the River Corrib minimised. This ensures that construction works associated with the proposed River Corrib Bridge and any associated works within the drainage catchment of the River Corrib do not affect the conservation objectives of Lough Corrib SAC.

The following measures will be implemented:

- During construction of the bridge deck the platform of the travelling framework used for construction will have netting suspended beneath to contain the construction materials
- Mitigation measures to control and treat site run off to ensure that the conservation objectives of Lough Corrib SAC are not affected due to a reduction in water quality in the River Corrib are described in Section 10.5 above. These include:
  - Working areas in proximity to the River Corrib shall be set back a minimum of 5m from the edge of the river in accordance with the requirements of Inland Fisheries Ireland (IFI). Drainage ponds and interceptor ditches will be constructed in advance of embankment and bridge construction to collect, treat and discharge all surface water runoff during construction
  - Construction run-off will need to be considered for the construction area around the River Corrib Bridge due to its proximity to the River Corrib. Protection of this water body from construction runoff and silt load shall be carried out through the use of reserved grassed buffer areas, timber fencing with silt fences, earthen berms or similar approved to provide adequate treatments of site runoff waters before reaching the watercourse. Protection from silt load may also be carried out through the use of the wetlands and attenuation ponds adjacent to the River Corrib on either river bank. It is possible that a combination of these methods could be used. For further site sediment and pollution control refer to Section 9 Sediment, Erosion and Pollution Control Plan of the CEMP in Appendix C. This plan sets out the strategy for ensuring that sediment, erosion and pollution generation is minimised and controlled. In particular that plan sets out particular requirements in relation to the location of construction compounds, stockpiling, concreting activities, working in proximity to watercourses (including the River Corrib) to ensure that impacts are minimised

Site access for the western river bank will be provided by the haul route, HR 08/01, via N59 Moycullen Road, as shown in Figure 1.6 of this updated NIS and replicated below in Plate 10.1. The site compound, SC

08/01, for the River Corrib Bridge on the western river bank is located to the north of the Project adjacent to hockey pitch, as shown in in Plate 10.1 below. This site compound may only be used for storage of equipment and materials.

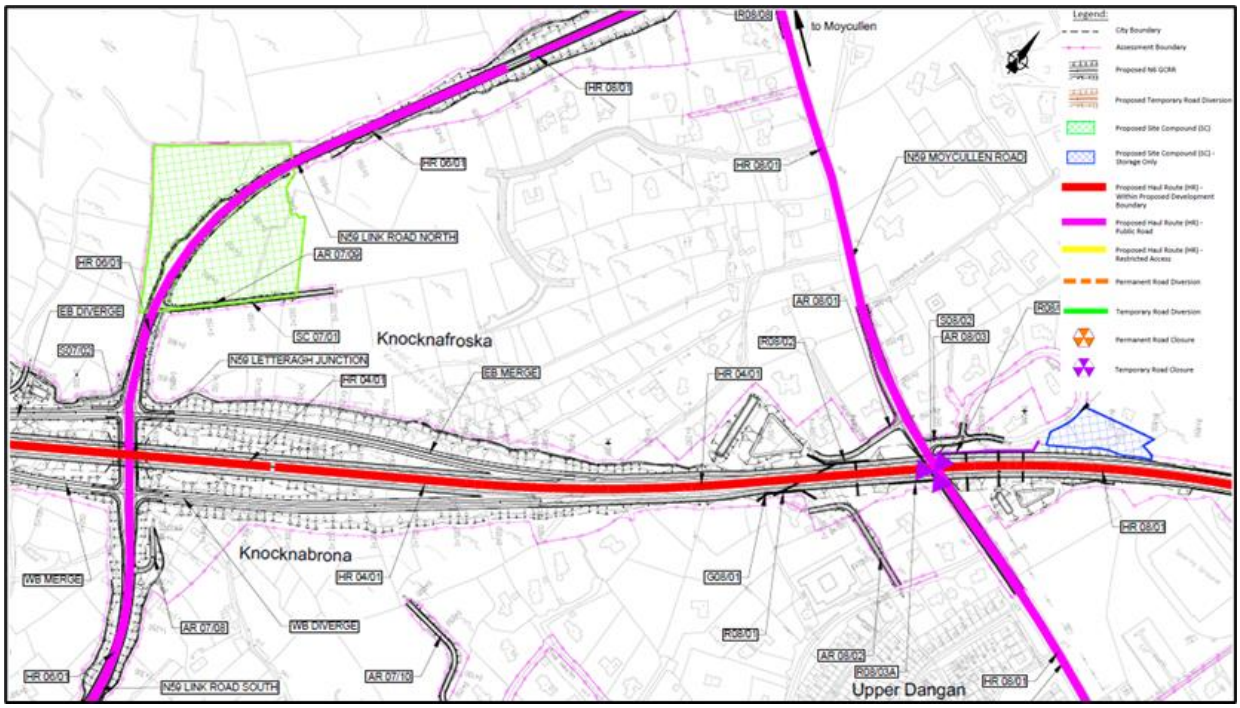

Plate 10.1 River Corrib Western Bank Access and Site Compound

Site access for the eastern river bank will be provided by the haul route, HR 09/01, via Bóthar Nua, as shown in Plate 10.2 below. The site compound, SC 09/01, for the River Corrib Bridge on the eastern river bank is located to the south of the Project, as shown in Plate 10.2 below. In addition, Lackagh Quarry site compound, SC 11/01, may also be used for storage and larger works requirements such as rock crushing etc.

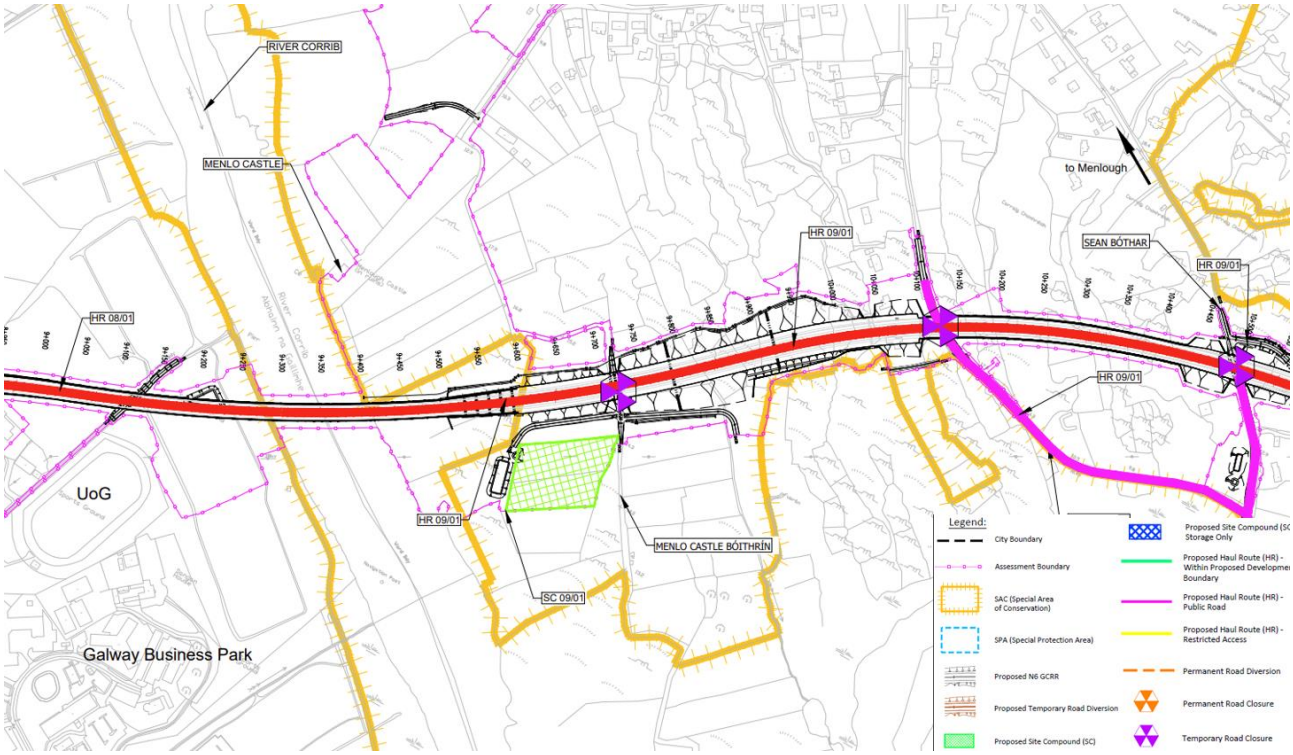

Plate 10.2 River Corrib Eastern Bank Access and Site Compound

Refer to Section 9 of the CEMP in Appendix C for further details in relation to the Sediment, Erosion and Pollution Control Plan. Refer to Appendix D for further details on the construction methodology for the River Corrib Bridge.

10.11.2 Mitigation measures to remove the risk of Otter being killed/injured due to collisions with road traffic

To avoid Otter road casualties on the Bearna Stream and the Tonabrocky Stream, Otter passage facilities will be provided at culverts C04/01 (Ch. 4+100 of the proposed N6 GCRR) and C04/02 (Ch. 4+950 of the proposed N6 GCRR). These will consist of either raised ledges within structures, or separate dry 600mm pipes installed adjacent to the culverts, on either side of the watercourse. Mammal underpasses and Otter passage facilities will be checked and fully inspected before the relevant sections of the proposed N6 GCRR become operational, to ensure they are constructed in accordance with the Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes (National Roads Authority, 2008b).

In addition to the 2018 NIS, as recommended by the Inspector appointed by An Bord Pleanála (ABP) and appended to ABP's Inspector's Report dated 22 June 2021, " to ensure that safe passage exists for otters along all watercourses bisected by the proposed …[N6 GCRR] during construction, to include mammal ledges within culvert[s] or two dry 600mm culverts parallel to the watercourse, one each side.

Mammal fencing will be installed along the Assessment Boundary between Ch. 4+050 and Ch. 4+200 of the proposed N6 GCRR, between Ch. 4+825 and Ch. 5+300 of the proposed N6 GCRR, and between Ch. 9+750 and Ch. 10+040 of the proposed N6 GCRR (Figure 6) to prevent Otter accessing the road carriageway and to guide Otters to the mammal underpasses. Between Ch. 9+750 and Ch. 10+040 of the proposed N6 GCRR, mammal fencing will not be required along the southeastern edge of the road carriageway where the proposed retaining wall is greater than 2m in height, as this will prevent Otter accessing the proposed road carriageway. Mammal-resistant fencing will be installed in accordance with the specification detailed in TII's Standard Construction Detail for mammal resistant fencing (CC-SCD-00320/00319).

The retaining wall next to the proposed attenuation/infiltration ponds between the River Corrib and Ch. 9+600 of the proposed N6 GCRR is also greater than 2m in height and will prevent Otter accessing the proposed road carriageway.

10.12 Construction-related traffic

Chapter 12 of the CEMP comprises all of the construction mitigation measures and management plan related to the construction-related traffic, and will be updated with any additional measures which are required by the conditions attached to the planning consent. Mitigation measures proposed for the three main impacts include:

- Mitigation measures to prevent habitat degradation in nearby European sites as a result of impacts to hydrogeology or hydrology are described under Section 10.4.1 (general measures) and Section 10.5.1
- Mitigation measures to prevent habitat degradation in nearby European sites as a result of impacts to air quality impacts from construction-related traffic are described under general mitigation measures under Section 10.6.1
- Mitigation measures to prevent habitat degradation in nearby European sites as a result of impacts from the introduction and spread on non-native invasive species by construction-related traffic are described under general mitigation measures under Section 10.8.1

10.13 Summary

This section presents a summary of how the mitigation measures proposed in relation to the Project relate back to protecting the conservation objectives of the European sites and their QIs/SCIs.

Table 10.1 below outlines which of the European sites QIs/SCIs the various mitigation measures are designed to protect. This links back to the tables in Section 9 which detail how the specific attributes and targets of the conservation objectives will be protected by the mitigation measures:

- Lough Corrib SAC – Table 9.13

- Galway Bay Complex SAC – Table 9.21
- Lough Corrib SPA – Table 9.28
- Inner Galway Bay SPA – Table 9.35
- Inishmore Island SAC / Kilkieran Bay and Island SAC – specifically target at cetacean QIs – Table 9.39
- Ardrahan Grassland SAC – Table 9.43
- Castletaylor Complex SAC – Table 9.44
- Cregganna Marsh SPA – Table 9.45
- Kiltiernan Turlough SAC – Table 9.46
- Lough Fingall Complex SAC – Table 9.47
- Rahasane Turlough SAC – Table 9.48
- Rahasane Turlough SPA – Table 9.49

Lough Corrib SAC

In relation to Lough Corrib SAC, the suite of mitigation measures relating to the protection of the receiving hydrological environment and the containment of construction materials during construction of the proposed River Corrib Bridge are designed to protect the aquatic QI habitats: Vegetation of flowing waters [3260] and species: the Freshwater pearl mussel, Sea lamprey, Brook lamprey, Atlantic salmon and Otter. The mammal fencing has also been provided to protect Otter from the mortality risk posed by the Project.

Hard water lakes, Molinia meadows, Cladium fen and Alkaline fen will be protected by the mitigation measures relating to the receiving hydrological and hydrogeological environments. The NISMP has been developed to protect Molinia meadows, Cladium fen and Alkaline fen from habitat degradation through the introduction/spread on non-native invasive species.

The areas of Calcareous grassland and Limestone pavement that surround the Project in the Menlough/Coolough area, and that lie above the proposed Lackagh Tunnel, will be protected through the implementation of the mitigation measures to minimise habitat loss and avoid direct impacts on these habitats within Lough Corrib SAC, measures to maintain the structural integrity of Limestone pavement during the construction of the proposed Lackagh Tunnel, measures to control dust during construction and to control non-native invasive species.

Galway Bay Complex SAC

The coastal and marine habitats in Galway Bay will be protected by the mitigation measures relating to the protection of the receiving hydrological environment. The control of non-native invasive species will protect any areas of Calcareous grassland [*6210/6210] and Limestone pavement habitat downstream of the Project. The Harbour seal and Otter will also be protected by the hydrological mitigation measures. Mitigation measures to ensure that the Project does not pose a barrier to Otter movement in the Bearna Stream catchment, or does not pose a mortality risk to Otter, are also included to protect Otter in Galway Bay Complex SAC.

Lough Corrib SPA & Inner Galway Bay SPA

The mitigation measures to protect the receiving hydrological and hydrogeological environment and to avoid/reduce the disturbance/displacement effects of blasting on wintering birds using Ballindooley Lough, are designed to protect the SCI bird populations of Lough Corrib SPA and Inner Galway Bay SPA (and the wetland habitat that support them).

Inishmore Island SAC & Kilkieran Bay and Islands SAC

The coastal and marine habitats in Galway Bay will be protected by the mitigation measures relating to the protection of the receiving hydrological environment. Harbour porpoise from the qualifying interest populations of Inishmore Island SAC or Kilkieran Bay and Islands SAC that might use habitat in Galway

Bay will be protected through the implementation of the mitigation measures as will any other Bottlenose dolphin or Harbour porpoise that utilise Galway Bay marine environment that form QI populations of other SACs around Ireland.

Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC, Inner Galway Bay SPA, Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Cregganna Marsh SPA, Rahasane Turlough SPA and Rahasane Turlough SAC

Mitigation and management of spills along public roads (Section 10.4.1, Section 10.5.1 and Section 10.6.1), ensuring the fleet is clean of vegetative and muddy debris (Section 10.6.1 and Section 10.8.1), trucks are appropriately sized and covered pending on the materials transported (Section 10.6.1) and respecting road rules and speed limits (Section 10.6.1) will in turn mitigate potential habitat degradation to QIs and SCIs of SPAs and SACs near the relevant existing, wider road network.

Table 10.1 Summary of Mitigation Measures and how they relate back to protecting the QIs/SCIs and conservation objectives of Lough Corrib SAC, Galway Bay Complex SAC, Lough Corrib SPA, Inner Galway bay SPA, Inishmore Island SAC & Kilkieran Bay and Islands SAC, Ardrahan Grassland SAC, Castletaylor Complex SAC, Cregganna Marsh SPA, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SAC and Rahasane Turlough SPA

	Mitigation Measures (Section References)										
European site and QIs/SCIs	**10.2**	**10.3**	**10.4**	**10.5**	**10.6**	**10.8**	**10.9**	**10.10**	**10.11.1**	**10.11.2**	**10.12**
Lough Corrib SAC											
[3140] Hard oligo - mesotrophic waters with benthic vegetation of *Chara spp.*			■	■							■
[3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho - Batrachion* vegetation (or Vegetation of flowing waters)				■							■
[6210] Semi - natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites)	■	■			■	■					■
[6410] *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*)			■	■		■					■
[*7210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*			■	■		■					■
[7230] Alkaline fens			■	■		■					■
[8240] Limestone pavements *	■	■			■	■					■
[1029] Freshwater Pearl Mussel - *Margaritifera margaritifera*				■					■		■
[1095] Sea Lamprey - *Petromyzon marinus*				■					■		■
[1096] Brook Lamprey - *Lampetra planeri*				■					■		■
[1106] Atlantic Salmon - *Salmo salar* (only in fresh water)				■					■		■
[1355] Otter *Lutra lutra*				■					■		■

	Mitigation Measures (Section References)										
European site and QIs/SCIs	**10.2**	**10.3**	**10.4**	**10.5**	**10.6**	**10.8**	**10.9**	**10.10**	**10.11.1**	**10.11.2**	**10.12**
Galway Bay Complex SAC											
[1140] Mudflats and sandflats not covered by seawater at low tide				■							■
[1150] Coastal lagoons*				■							■
[1160] Large shallow inlets and bays				■							■
[1170] Reefs				■							■
[1220] Perennial vegetation of stony banks				■							■
[1310] *Salicornia* and other annuals colonising mud and sand				■							■
[1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)				■							■
[1410] Mediterranean salt meadows (*Juncetalia maritimi*)				■							■
[6210] Semi - natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites)						■					■
[8240] Limestone Pavements						■					■
[1355] Otter *Lutra lutra*				■				■		■	■
[1365] Harbour seal *Phoca vitulina*				■							■
Lough Corrib SPA											
Gadwall							■				■
Shoveler, Tufted duck				■			■				■
Coot			■	■			■				■
Golden Plover				■							■
Black-headed gull			■	■			■				■

	Mitigation Measures (Section References)										
European site and QIs/SCIs	**10.2**	**10.3**	**10.4**	**10.5**	**10.6**	**10.8**	**10.9**	**10.10**	**10.11.1**	**10.11.2**	**10.12**
Common gull											
Common tern											
Wetlands											
Inner Galway Bay SPA											
Black-throated diver, Great northern diver, Grey heron, Light-bellied brent goose, Wigeon, Teal, Red-breasted merganser, Ringed plover, Golden plover, Lapwing, Dunlin, Bar-tailed godwit, Curlew, Redshank, Turnstone, Black-headed gull, Common Gull, Cormorant											
Wetlands											
Inishmore Island SAC											
Harbour porpoise											
Kilkieran Bay and Island SAC											
Harbour porpoise											
Ardrahan Grassland SAC [002244]											
[4060] Alpine and Boreal heaths											
[5130] *Juniperus communis* formations on heaths or calcareous grasslands											
[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)											
[8240] Limestone pavements*											
Castletaylor Complex SAC [000242]											
[3180] Turloughs*											

	Mitigation Measures (Section References)										
European site and QIs/SCIs	**10.2**	**10.3**	**10.4**	**10.5**	**10.6**	**10.8**	**10.9**	**10.10**	**10.11.1**	**10.11.2**	**10.12**
[4060] Alpine and Boreal heaths											
[5130] *Juniperus communis* formations on heaths or calcareous grasslands											
[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia)* (* important orchid sites)											
[8240] Limestone pavements*											
Cregganna Marsh SPA [004142]											
Greenland White-fronted Goose											
Kiltiernan Turlough SAC [001285]											
[3180] Turloughs*											
Lough Fingall Complex SAC [000606]											
[3180] Turloughs											
[4060] Alpine and Boreal heaths											
[5130] *Juniperus Communis* formations on heaths or calcareous grasslands											
[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)											
[7210] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*											
[8240] Limestone pavements*											
[1303] Lesser Horseshoe Bat *Rhinolophus hipposideros*											
Rahasane Turlough SAC											
[3180] Turloughs*											

	Mitigation Measures (Section References)										
European site and QIs/SCIs	**10.2**	**10.3**	**10.4**	**10.5**	**10.6**	**10.8**	**10.9**	**10.10**	**10.11.1**	**10.11.2**	**10.12**
Rahasane Turlough SPA											
Whooper Swan											
Wigeon											
Golden Plover											
Black-tailed Godwit											
Greenland White-fronted Goose											
Wetlands											

11. Residual Impacts

This section presents the residual impacts associated with the Project and discusses how the mitigation measures proposed in Section 10 will ensure that the potential impacts associated with the Project will not affect the conservation objectives of the European sites in question, and will not adversely affect the integrity of those sites.

As explained in Section 9.7.4 and 9.8.4, in respect of recreational pressure and loss of supporting habitats and species, there will be no effects on the conservation objectives of European sites as a result of these impact pathways. Therefore, there will not be any residual impacts associated with recreational pressure and loss of supporting habitats/species and they therefore do not need to be assessed within this section of this updated NIS.

In An Bord Pleanála's Inspector's Report dated 22 June 2021, the board's Inspector noted that "I have considered the mitigation measures identified in the applicant's NIS as well as the additional mitigation measures as proposed by Dr Arnold in the Appropriate Assessment Report. Taking into consideration the information presented, which I consider the best scientific information available, the measures detailed will be effective and reliable in avoiding and reducing any effects to a non-significant level. The timing of the application of measures has been considered and will be applied as detailed. The integration of all these measures including the additional measures (see conditions) into the CEMP and the ecological supervision of the project will ensure that they will be delivered as designed and achieve their objectives which is to ensure no adverse effects on the site integrity of the suite of European sites as detailed below".

Whilst this updated NIS includes an assessment of the new cetacean QIs and the additional potential impact pathways detailed in Section 1, as identified by the Inspector appointed by ABP, and the residual impacts assessment has been reviewed and updated to take account of these additional assessment, the findings in terms of residual impacts are unchanged from those presented in the 2018 NIS and the conclusions of the residual impact assessment with respect to the absence of adverse effects on the integrity of any European sites is unchanged.

For more details on the specifics of how the potential impacts associated with the Project relate to the QIs/SCIs and conservation objectives of each European site in question, the mitigation measures, and the specific attributes and targets relating to those conservation objectives, refer to the following Tables in Section 9:

- Lough Corrib SAC – Table 9.13 in Section 9.1.4.10
- Galway Bay Complex SAC – Table 9.21 in Section 9.2.4.6
- Lough Corrib SPA – Table 9.28 in Section 9.3.4.5
- Inner Galway Bay SPA – Table 9.35 in Section 9.4.4.5
- Inishmore Island SAC / Kilkieran Bay and Island SAC – Table 9.39in Section 9.5.4.2
- Ardrahan Grassland SAC – Table 9.43 in Section 9.6.4.2
- Castletaylor Complex SAC – Table 9.44 in Section 9.6.4.2
- Cregganna Marsh SPA – Table 9.45 in Section 9.6.4.2
- Kiltiernan Turlough SAC – Table 9.46 in Section 9.6.4.2
- Lough Fingall Complex SAC – Table 9.47 in Section 9.6.4.2
- Rahasane Turlough SAC – Table 9.48 in Section 9.6.4.2
- Rahasane Turlough SPA – Table 9.49 in Section 9.6.4.2

11.1 Lough Corrib SAC

11.1.1 Habitat loss/fragmentation

None of the c.2ha of habitat area lost within Lough Corrib SAC correspond with any Annex I habitat types; none are QIs of Lough Corrib SAC and they do not provide a supporting role to any QI habitats within Lough Corrib SAC, nor to the site's QI species. The loss of any habitat areas outside of Lough Corrib SAC will not have any indirect impacts on QI habitats, or habitats supporting QI species, due to the absence of any impact pathways (Section 9.1.4.1) – i.e. the habitats lost outside of the European site do not provide a supporting role to any QI habitats within Lough Corrib SAC, nor to QI species.

There are some areas of Annex I QI habitat within the Assessment Boundary but outside of the footprint of the proposed N6 GCRR (Limestone pavement [*8240] and Calcareous grassland [6210]), however, these will not be lost as the mitigation strategy prohibits construction works in these areas and, in the case of the Limestone pavement and Calcareous grassland above the proposed Lackagh Tunnel, the grazing regime will not be restricted (Section 10.2).

These mitigation measures will be implemented through the CEMP by the contractor during construction and will ensure that Annex I habitats within Lough Corrib SAC are not directly impacted.

Bankside and riparian habitat loss, or modification, associated with construction of the Project, will not impact upon aquatic regime supporting Annex I habitat, the breeding or resting places or affect the populations of Otter, Atlantic salmon, Sea lamprey or Brook lamprey in Lough Corrib SAC and no mitigation measures are required.

Therefore, any habitat loss associated with the Project will not affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats and species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

A summary of the residual habitat loss/fragmentation impacts associated with the Project is presented in Table 11.1 below.

Table 11.1 Summary of Residual Habitat Loss / Fragmentation Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.13 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC?
Construction			
Loss of QI habitat or loss of non-QI habitat types that have a supporting role in maintaining the conservation status of QI habitats	Yes Although the Project will not result in the loss of any area of QI Annex I habitats within Lough Corrib SAC, nor will it result in the loss of any habitats that support the QI habitats, there are areas of Limestone pavement [*8240] and Calcareous grassland [6210] habitat within Lough Corrib SAC that lie within the Assessment Boundary yet outside of the footprint of the proposed N6 GCRR which could be directly impacted. Restricting grazing from calcareous grassland habitat above the proposed Lackagh Tunnel could result in habitat area loss through scrub encroachment.	Yes Construction works will not be permitted within these areas to avoid any loss of Annex I habitat within Lough Corrib SAC. A permanent fence will also not be erected in areas of habitat to be retained. In terms of the areas of Calcareous grassland and Limestone pavement above the proposed Lackagh Tunnel, the absence of a permanent fenceline will not affect grazing access to these habitat areas. Section 10.2 (and Figures 17.1 to 17.5 and Figures 18.1 to 18.5 for locations of restricted areas)	No

11.1.2 Habitat degradation – tunnelling/excavation

Considering the construction methodology and mitigation measures described in Section 10.3, the construction of the Lackagh Tunnel, works in Lackagh Quarry, or any associated excavations along the Western Approach to the tunnel, will not affect the structural integrity[92] of the rock mass supporting the overlying or adjoining QI habitats within Lough Corrib SAC (i.e. namely Limestone pavement and Calcareous grassland) during the construction or operational phases of the Project.

These mitigation measures will be implemented through the final schedule of commitments by the contractor (which will be included within the CEMP) during construction and will ensure that structural impacts to the rock mass do not occur.

Therefore, neither the construction nor operation of the Lackagh Tunnel and approaches will affect the structural integrity of the rock mass supporting QI habitats in Lough Corrib SAC or affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats and species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

A summary of the residual impacts associated with construction of the proposed Lackagh Tunnel is presented in Table 11.2 below.

[92] Structural Integrity of the mosaic of Limestone pavement and Calcareous grassland is the physical and mechanical geotechnical properties that control the behaviour of the geotechnical Limestone pavement environment

Table 11.2 Summary of Residual Impacts associated with Constructing the Lackagh Tunnel

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.13 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC?
Construction			
Tunnelling and excavations at the proposed Lackagh Tunnel affecting the structural integrity of surface-level habitats: [*8240] [6210]	Yes, if construction works resulted in a collapse/subsidence of the rock mass above the tunnel resulting in the loss of QI Limestone pavement/Calcareous grassland habitat area within the SAC above	Yes Monitoring of rock slopes during tunnel construction and during operation, and monitoring of blasting locally to ensure there is no risk to the structural integrity of the rock mass supporting the QI habitats in the SAC above Section 10.3	No

11.1.3 Habitat degradation – hydrogeology

Considering the design measures associated with the Project, groundwater supply supporting groundwater dependant habitats in Lough Corrib SAC will not be affected during operation such that any effects on QI habitats, or habitats supporting QI species, would occur.

However, there is a risk of the Project affecting groundwater supply to the Coolagh Lakes during construction of the Menlough Viaduct, and affecting groundwater quality during construction and/or operation.

Mitigation measures will be implemented to control and treat site run-off during construction and to ensure that the drainage system and infiltration basins function as designed over the life of the Project (Section 10.4). The karst protocol set out in the CEMP will also be used in the event of karst being encountered.

These mitigation measures will be implemented through the CEMP by the contractor during construction (construction pollution risk) and by Galway County Council/TII over the operational lifespan of the Project (maintenance) and will ensure that hydrogeological impacts do not occur.

Therefore, habitat degradation as a result of impacts on the existing groundwater regime will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats and species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

A summary of the residual hydrogeological impacts associated with the Project is presented in Table 11.3 below.

Table 11.3 Summary of Residual Hydrogeological Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.13 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC?
Construction			
Construction works affecting groundwater quantity that supports QI wetland habitats: e.g. Coolagh Lakes	The installation of the supporting piers of the proposed Menlough Viaduct has the potential to interact with groundwater conduits and potentially affect groundwater flow locally with the Lough Corrib Fen 1 (Menlough) GWB – which in turn could affect groundwater supply to the Western Coolagh Spring that contributes to the Coolagh Lakes, supporting QI wetland habitats in the SAC	Yes To ensure that groundwater flow paths are not impacted by construction works Section 10.4	No
Construction works affecting groundwater quality	Yes Affecting the quality of groundwater supporting groundwater dependant habitats in Lough Corrib SAC could affect the distribution, extent, diversity and area of QI wetland habitats	Yes, to ensure that site runoff is controlled and treated during construction to avoid polluting groundwater bodies Section 10.4	No
Operation			
Groundwater quantity being affected during operation	Yes Although the design of the Project will not restrict or inhibit existing groundwater flow paths supporting groundwater dependant habitats in Lough Corrib SAC, it is important that the appropriate level of subsoil remains below the infiltration basins	Yes The karst protocol will be implemented, if karst features and potential pathways are found to be present during inspection and maintenance in the infiltration basin Section 10.4	No
Groundwater quality being affected during operation	Yes The drainage design (as described in Section 2, and Appendices A, B, C and F) will ensure that groundwater quality will be maintained during operation. However, it is important that the appropriate level of subsoil remains beneath the infiltration basins to ensure their continued functioning.	Yes The karst protocol will be implemented, if karst features and potential pathways are found to be present during inspection and maintenance in the infiltration basin Section 10.4	No

11.1.4 Habitat degradation – hydrology

Considering the design measures associated with the Project, it will not affect the functioning of the existing hydrological regime that supports QI habitats and species in Lough Corrib SAC, either during construction or operation of the Project.

However, there remains a risk of the Project affecting surface water quality during construction, due to accidental pollution, and/or during operation as the drainage system must be maintained to function correctly. Mitigation measures will be implemented to control and treat site run-off during construction and to ensure that the drainage system functions as designed over the life of the Project (Section 10.5).

These mitigation measures will be implemented through the CEMP by the contractor during construction (construction pollution risk) and by Galway County Council/TII over the operational lifespan of the Project (maintenance) and will ensure that hydrological impacts do not occur.

Therefore, habitat degradation as a result of impacts on the existing hydrological regime will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats or species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

A summary of the residual hydrological impacts associated with the Project is presented in Table 11.4 below.

Table 11.4 Summary of Residual Hydrological Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.13 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC?
Construction			
Construction works affecting surface water quality	Yes Affecting the quality of surface water supporting aquatic/wetland habitats and species could affect the quality and extent of those habitats and the aquatic species they support	Yes, to ensure that site runoff is controlled and treated during construction to avoid polluting the surface water drainage network Section 10.5	No

11.1.5 Habitat degradation – air quality

Considering the predicted levels of pollutants that will be generated during operation and their restricted ZoI, and despite the proximity of the carriageway for the proposed N6 GCRR to Lough Corrib SAC, there will be no air quality effects on QI habitats or species in Lough Corrib SAC during the operation of the Project that would undermine their conservation objectives.

However, dust generated during construction has the potential to negatively affect vegetation and habitats within Lough Corrib SAC where the Project crosses the SAC boundary, or lies in close proximity to it. Mitigation measures will be implemented to contain dust emissions during construction (Section 10.6).

These mitigation measures will be implemented through the CEMP by the contractor during construction and will ensure that dust related air quality impacts do not occur.

Therefore, habitat degradation as a result of air quality impacts will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats or species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

A summary of the residual air quality impacts associated with the Project is presented in Table 11.5 below.

Table 11.5 Summary of Residual Air Quality Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.13 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC?
Construction			
Dust generated during construction works within, or in close proximity to, Lough Corrib SAC affecting the extent, diversity or structure of habitats within Lough Corrib SAC in the vicinity of the Project	Yes, as dust deposition could affect the extent, diversity or structure of habitats within Lough Corrib SAC	Yes, to control dust levels generated by construction works Section 10.6	No

11.1.6 Habitat degradation – Shading

At the site of the proposed River Corrib Bridge where the elevated structure passes over habitats within the Lough Corrib, there is potential to cause some level of impacts from shading of habitats including the QI Annex I habitat, Vegetation of flowing waters [3260].

The shading effects predicted will be minor and localised and will also not have any significant effects on the site's QI habitats (Annex I habitat [3260] Vegetation of flowing waters) or QI species (Otter, Atlantic salmon, Brook lamprey and Sea lamprey); i.e. would not compromise any habitat used by these species within Lough Corrib SAC.

Therefore, habitat degradation as a result of shading impacts will not affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats or species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

11.1.7 Habitat degradation – non-native invasive species

Non-native invasive species have been recorded along, or in close proximity to the Project and construction works and/or operational maintenance works have the potential to accidentally cause their introduction/spread to habitat areas within Lough Corrib SAC; potentially affecting species composition, diversity and abundance in affected habitats.

Mitigation measures are included in the NISMP section of the CEMP to treat and control non-native invasive species within the Assessment Boundary (Section 10.8).

These mitigation measures will be implemented through the CEMP by the contractor during construction and by Galway County Council/TII over the operational lifespan of the Project and will ensure that non-native invasive species are not spread within or introduced to Lough Corrib SAC.

Therefore, habitat degradation as a result of introducing/spreading non-native species will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats or species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

A summary of the residual impacts associated with non-native invasive species is presented in Table 11.6 below.

Table 11.6 Summary of Residual Non-native Invasive Species Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.13 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC?
Construction / Operation			
Introducing or spreading non-native invasive species to habitats within Lough Corrib SAC	Yes. Introducing/spreading non-native invasive species could affect the distribution, extent, diversity and area of QI habitats or habitat areas supporting QI species	Yes, to ensure that non-native invasive species are not introduced to, or spread within, Lough Corrib SAC Section 10.8	No

11.1.8 Disturbance/displacement

The Project will not result in any long-term disturbance or displacement of Otter, Atlantic salmon, Brook lamprey or Sea lamprey during construction or operation.

Therefore, disturbance will not affect the conservation objective attributes and targets supporting the conservation condition of the QI species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

11.1.9 Barrier effect

Considering the design measures associated with the Project, it will not result in a barrier to the movement of aquatic species in Lough Corrib SAC, during construction or operational phases of the Project.

Therefore, a barrier effect impact will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QI species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

11.1.10 Mortality risk

The design of the Project limits the mortality risk to the QI species of Lough Corrib SAC (Otter, Atlantic salmon, Brook lamprey and Sea lamprey) by clear-spanning the River Corrib and its floodplain.

However, some level of mortality risk is posed by the possibility of accidentally dropping construction materials into the River Corrib during construction of the proposed River Corrib Bridge and by the possibility of Otter gaining access to the proposed road carriageway.

Mitigation measures will be implemented to contain construction materials during construction of the River Corrib Bridge and to install Otter resistant fencing in high risk areas to prevent Otter gaining access to the proposed road carriageway (Section 10.11).

These mitigation measures have been implemented through the design of the Project and by the implementation of the CEMP by the contractor during construction together will ensure that there is no mortality risk to the QI species of Lough Corrib SAC.

Therefore, the mortality of QI species will not occur or affect the conservation objective attributes and targets supporting the conservation condition of those QI species of Lough Corrib SAC (see Table 9.13). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC.

A summary of the residual impacts associated with the mortality risk posed by the Project is presented in Table 11.7 below.

Table 11.7 Summary of Residual Non-native Invasive Species Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.13 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SAC?
Construction			
Accidentally dropping construction materials into the River Corrib during construction of the proposed River Corrib Bridge could result in the mortality of aquatic QI species: Otter Atlantic salmon Sea lamprey Brook lamprey	Yes Mortality of QI species could affect populations numbers – although given the low risk and temporary nature of works above the river, this is unlikely to result in any population level effects	Yes, a detailed construction methodology which includes netting beneath the works area for the bridge deck to ensure that constructions materials are not accidentally dropped into the River Corrib Section 10.11.1	No
Operation			
Mortality/road traffic collision risk to Otter	Yes, operation of the Project presents a permanent risk of Otter mortality due to road traffic collisions and could have long-term effects on the Otter population of Lough Corrib SAC	Yes, the provision of mammal fencing to ensure that Otter cannot gain access to the proposed road carriageway Section 10.11.2	No

11.1.11 Conclusion of Assessment for Lough Corrib SAC

As per the 2018 NIS and unchanged in this updated NIS, none of the potential direct or indirect impacts associated with the Project will affect the conservation objectives of any of the QI habitats or species of Lough Corrib SAC. Mitigation measures are included to ensure the retention and protection of QI habitats (Section 10.2), to ensure that the structural integrity[93] of the rock mass supporting habitats within Lough Corrib SAC is not affected during construction of the Lackagh Tunnel (Section 10.3), to ensure the protection of the receiving hydrogeological and hydrological environments (Sections 10.4 and 10.5), to contain dust generated during construction (Section 10.6), to prevent the introduction/spread of non-native invasive species to Lough Corrib SAC (Section 10.8), and to ensure that the Project does not present a mortality risk to the Otter population of Lough Corrib SAC (Section 10.11.1 and Section 10.11.2, respectively). Refer to Table 9.13 and Table 10.1 for how these mitigation measures relate back to the QIs and conservation objectives of Lough Corrib SAC.

Following an examination, analysis and evaluation in light of best scientific knowledge of all relevant information in respect of the QI habitats and species of Lough Corrib SAC within the ZoI of the Project, the potential impacts and mitigation measures, and whether or not the predicted impacts would affect the conservation objectives that support the conservation condition for the QIs concerned, it has been concluded that the Project does not pose a risk of adversely affecting (either directly or indirectly) the integrity of Lough Corrib SAC and there is no reasonable scientific doubt with the conclusion.

[93] Structural Integrity of the rockmass that supports the mosaic of Limestone pavement and Calcareous grassland is the physical and mechanical geotechnical properties that control the behaviour of the geotechnical Limestone pavement environment

11.2 Galway Bay Complex SAC

11.2.1 Habitat degradation – hydrogeology

Considering the design measures associated with the Project, groundwater supply supporting groundwater dependant habitats in Galway Bay Complex SAC will not be affected during operation such that any effects on QI habitats, or habitats supporting QI species, would occur.

Mitigation measures will be implemented to control and treat site run-off during construction and to ensure that the drainage system and infiltration basins function as designed over the life of the Project (Section 10.1 and Section 10.4).

These mitigation measures will be implemented through the CEMP by the contractor during construction (construction pollution risk) and by Galway County Council/TII over the operational lifespan of the Project (maintenance) and will ensure that hydrogeological impacts do not occur.

Therefore, habitat degradation as a result of impacts on the existing groundwater regime will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats and species of Galway Bay Complex SAC (see Table 9.21). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC.

A summary of the residual hydrogeological impacts associated with the Project is presented in Table 11.8 below.

Table 11.8 Summary of Residual Hydrogeological Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.21 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC?
Construction			
Construction works affecting groundwater quality	Yes An accidental pollution event during construction could affect the groundwater inputting to Galway Bay and could affect the quality of the habitats and the fauna communities.	Yes, to ensure that site runoff is controlled and treated during construction to avoid polluting groundwater bodies Section 10.4	No
Operation			
Groundwater quality being affected during operation	Yes An accidental pollution event during operation could affect the groundwater inputting to Galway Bay and could affect the quality of the habitats and the fauna communities. It is important that drainage design features are inspected to ensure that they are operating as intended	Yes To ensure that the drainage-related mitigation measures and features are maintained for the life of operations Section 10.1 and Section 10.4	No

11.2.2 Habitat degradation – hydrology

The Project will not affect the functioning of the existing hydrological or tidal regime that supports QI habitats and species in Galway Bay SAC, either during construction or operation.

However, the risk of the Project affecting surface water quality during construction requires mitigation, to ensure that the drainage system continues to function as designed (Section 10.5).

These mitigation measures will be implemented through the CEMP by the contractor during construction and by Galway County Council/TII over the lifespan of the Project and will ensure that hydrogeological impacts do not occur.

Therefore, habitat degradation as a result of impacts on the existing hydrological regime will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats or species of Galway Bay Complex SAC (see Table 9.21). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC.

A summary of the residual hydrological impacts associated with the Project is presented in Table 11.9 below.

Table 11.9 Summary of Residual Hydrological Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.21 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC?
Construction			
Construction works affecting surface water quality	Yes Affecting the quality of surface water discharging to the marine environment could affect the associated aquatic/coastal/ marine habitats and species	Yes, to ensure that site runoff is controlled and treated during construction to avoid polluting the receiving surface water drainage network and marine environment Section 10.5	No

11.2.3 Habitat degradation – non-native invasive species

Non-native invasive species have been recorded along, or in close proximity to the Project and construction works and / or operational maintenance works have the potential to accidentally cause their introduction/spread to habitat areas within Galway Bay Complex SAC; potentially affecting plant species composition, diversity and abundance in affected habitats, including potential QI Annex I habitats.

Mitigation measures are included in the NISMP section of the CEMP to treat and control non-native invasive species within the Assessment Boundary (Section 10.8).

These mitigation measures will be implemented through the implementation of the CEMP by the contractor during construction and by Galway County Council over the operational lifespan of the Project and will ensure that non-native invasive species are not spread within or introduced to Galway Bay Complex SAC.

Therefore, habitat degradation as a result of introducing/spreading non-native plant species will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QI habitats or species of Galway Bay Complex SAC (see Table 9.21). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC.

A summary of the residual impacts associated with non-native invasive species is presented in Table 11.10 below.

Table 11.10 Summary of Residual Non-native Invasive Species Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.21 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC?
Construction / Operation			
Introducing or spreading non-native invasive species to habitats within Galway Bay Complex SAC	Yes. Introducing/spreading non-native invasive species could affect the distribution, extent, diversity and area of QI habitats or habitat areas supporting QI species	Yes, to ensure that non-native invasive species are not introduced to, or spread within, Galway Bay Complex SAC Section 10.8	No

11.2.4 Barrier effect

The potential for the Project to present a barrier to the movement of Otter throughout the Bearna Stream catchment requires mitigation to ensure that the culverts on the Bearna Stream and the Tonabrocky Stream remain passable by Otter at all times (Section 10.10).

The use of the mitigation measures will ensure a barrier effect impact will not occur or affect the conservation objective attributes and targets supporting the conservation condition of Galway Bay Complex SAC's Otter population (see Table 9.21). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC.

A summary of the residual barrier effect impacts associated with the Project is presented in Table 11.11 below.

Table 11.11 Summary of Residual Barrier Effect Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.21 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC?
Operation			
Barrier effect to Otter movement throughout the Bearna Stream catchment	Yes Operation of the Project may present barrier to Otter movement that could affect the Otter population of Galway Bay Complex SAC	Yes To ensure that Otter movements are not restricted in the Bearna Stream catchment (as outlined in Section 10.10)	No

11.2.5 Mortality risk

The Project presents a permanent risk of Otter mortality along the Bearna Stream and the Tonabrocky Stream due to road traffic collisions. Mitigation measures will be implemented to install Otter resistant fencing in the vicinity of the culverts on the Bearna Stream and the Tonabrocky Stream, at which Otter passage facilities are being provided (Section 10.11.2). These mitigation measures will ensure that there is no mortality risk to the Otter population of Galway Bay Complex SAC.

Therefore, the mortality of Otter will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the Otter population of Galway Bay Complex SAC (see Table

9.21). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC.

A summary of the residual impacts associated with the mortality risk posed by the Project is presented in Table 11.12 below.

Table 11.12 Summary of Residual Mortality Risk Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.21 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Galway Bay Complex SAC?
Operation			
Mortality/road traffic collision risk to Otter	Yes Operation of the Project presents a permanent risk of Otter mortality due to road traffic collisions and could have long-term effects on the Otter population of Galway Bay Complex SAC	Yes To ensure that Otter cannot gain access to the road carriageway (as outlined in Section 10.11.2)	No

11.2.6 Conclusion of Assessment for Galway Bay Complex SAC

As per the 2018 NIS, and unchanged in this updated NIS, none of the potential direct or indirect impacts associated with the Project will affect the conservation objectives of any of the QI habitats or species of Galway Bay Complex SAC. Mitigation measures are included to ensure that the Project does not affect hydrogeology (Section 10.4) and water quality in Galway Bay (Section 10.5), does not introduce non-native invasive species to Galway Bay Complex SAC (Section 10.8), and does not present a barrier to Otter movement or a mortality risk to the Otter population of Galway Bay Complex SAC (Section 10.10 and Section 10.11.2, respectively). Refer to Table 9.21 and Table 10.1 for how these mitigation measures relate back to the QIs and conservation objectives of Galway Bay Complex SAC.

Following an examination, analysis and evaluation, in light of best scientific knowledge of all relevant information in respect of the QI habitats and species of Galway Bay Complex SAC within the ZoI of the Project, the potential impacts and mitigation measures, and whether or not the predicted impacts would affect the conservation objectives that support the conservation condition for the QIs concerned, it has been concluded that the Project does not pose any risk (either directly or indirectly) of adversely affecting the integrity of Galway Bay Complex SAC and there is no reasonable scientific doubt with this conclusion.

11.3 Lough Corrib SPA

11.3.1 Habitat degradation – hydrogeology/hydrology

Groundwater supply to groundwater dependant habitats will not be affected during construction or operation such that any population level effects would occur as a consequence of the limited habitat effects associated with the Project.

However, the risk of the Project affecting groundwater quality during construction requires mitigation, as it does during operation, to ensure that the drainage system continues to function as designed (Section 10.4).

The Project will not affect the functioning of the existing hydrological regime that supports sites used by SCI listed bird species, either during construction or operation.

However, the risk of the Project affecting surface water quality during construction requires mitigation (Section 10.5).

These mitigation measures will be implemented through the CEMP by the contractor during construction (pollution control) and by Galway County Council/TII over the operational lifespan of the Project (maintenance) and will ensure that hydrogeological/hydrological impacts do not occur.

Therefore, habitat degradation as a result of potential impacts on the existing groundwater or surface water regimes will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the SCI species of Lough Corrib SPA (see Table 9.28). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SPA.

A summary of the residual hydrogeological/hydrological impacts associated with the Project is presented in Table 11.13 below.

Table 11.13 Summary of Residual Hydrogeological / Hydrological Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.28 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SPA?
Construction			
Construction works affecting groundwater quality	Affecting the quality of groundwater supporting groundwater dependant habitats could affect the type, quality and extent of suitable habitat available to SCI bird species	Yes Section 10.4	No
Construction works affecting surface water quality	Affecting the quality of surface water supporting aquatic/wetland/marine habitats and species could affect the quality and extent of those habitats and the aquatic species they support	Yes Section 10.5	No
Operation			
Groundwater quantity being affected during operation	The design of the Project will not restrict or inhibit existing groundwater flow paths supporting groundwater dependant habitats used by bird species listed as SCIs of Lough Corrib SPA. However, it is important that the appropriate level of subsoil remains beneath the infiltration basins to ensure their continued functioning	Yes The karst protocol will be implemented, if karst features and potential pathways are found to be present during inspection and maintenance in the infiltration basin Section 10.4	No
Groundwater quality being affected during operation	The drainage design (as described in Section 2, and Appendices A, B, C and F) will ensure that groundwater quality will be maintained during operation. However, it is important that the appropriate level of subsoil remains beneath the	Yes The karst protocol will be implemented, if karst features and potential pathways are found to be present during inspection and maintenance in the infiltration basin Section 10.5	No

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.28 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SPA?
	infiltration basins to ensure their continued functioning		

As the Project poses no risk of hydrogeological or hydrological effects to wetland habitats, either within the SPA or at potential *ex-situ* sites, it will not affect the conservation objective attributes and targets supporting the conservation condition of any of the SCI species of Lough Corrib SPA in that regard (see Table 9.28).

11.3.2 Disturbance/displacement – within SPA

Lough Corrib SPA is beyond the ZoI of any long-term construction or operation related disturbance associated with the Project. As a result, there is no potential for any impacts on the conservation objectives of Lough Corrib SPA to arise via this impact and no mitigation measures are required.

Therefore, to the limited extent that there may be disturbance of SCI birds from habitats within the SPA during construction or operation of the Project, this will not result in long-term displacement and will not affect the conservation objective attributes and targets supporting the conservation condition of this species in Lough Corrib SPA (see Table 9.28). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SPA.

11.3.3 Disturbance/displacement – potential *ex-situ* sites

In general, neither construction nor operational disturbance will restrict the extent of habitat available to any SCI species such that any population level effects would occur. However, at Ballindooley Lough prolonged blasting was assessed as having the potential to displace SCI listed bird species from Ballindooley Lough if frequent and prolonged blasting occurs over multiple winter seasons; potentially negatively affecting the wintering SPA population.

A seasonal restriction to prohibit/limit blasting here during the winter period will restrict and spread out blasting activity in the vicinity of Ballindooley Lough such that it will only occur in the vicinity of Ballindooley Lough for a short period over two winter seasons, at most. This will either result in the majority of blasting in this area being carried out in a single winter season (e.g. a single period of 12-16 weeks during one winter and a second, much shorter, 2-4 week period during the second) or more evenly spread over both winters. This will ensure that there are no long-term disturbance or displacement effects to wintering birds at Ballindooley Lough as a consequence of blasting (Section 10.9).

This mitigation measure will be implemented through the CEMP by the contractor during construction and will ensure that disturbance/displacement impacts do not occur.

Therefore, to the limited extent that there may be disturbance of SCI birds from habitats within the SPA during construction or operation of the Project, this will not result in long-term displacement and will not affect the conservation objective attributes and targets supporting the conservation condition of the SCI species of Lough Corrib SPA (see Table 9.28). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SPA.

A summary of the residual disturbance/displacement impacts at potential *ex-situ* sites associated with the Project is presented in Table 11.14 below.

Table 11.14 Summary of Residual Disturbance / Displacement Impacts at Potential Ex-situ Sites

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.28 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SPA?
Construction			
Long-term blasting at Lackagh Quarry and Castlegar disturbing displacing bird species listed as SCIs of Lough Corrib SPA at Ballindooley Lough	Yes, as long-term blasting could displace SCI listed bird species from Ballindooley Lough for one or more winter seasons; potentially negatively affecting the wintering SPA population	Yes Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9	No

11.3.4 Habitat loss/fragmentation – potential *ex-situ* sites

The scale of habitat loss and fragmentation will not restrict the extent of habitat available to any SCI species, such that any population level effects would occur. As a result, there is no potential for any impacts on the conservation objectives of Lough Corrib SPA to arise via this impact and no mitigation measures are required.

Therefore, any habitat loss associated with the Project will not affect the conservation objective attributes and targets supporting the conservation condition of the SCI species of Lough Corrib SPA (see Table 9.28). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Lough Corrib SPA.

11.3.5 Conclusion of Assessment for Lough Corrib SPA

As per the 2018 NIS, and unchanged in this updated NIS, none of the potential direct or indirect impacts associated with the Project will affect the conservation objectives of any SCI species. Mitigation measures are included to ensure that the Project does not affect the receiving hydrogeological or hydrological environments (Sections 10.4 and 10.5) and will not result in any long-term disturbance/displacement effects at Ballindooley Lough (Section 10.9). Refer to Table 9.28 and Table 10.1 for how these mitigation measures relate back to the SCIs and conservation objectives of Lough Corrib SPA.

Of the potential impacts to SCI bird species associated with the Project, effects on hydrogeology, disturbance and habitat loss all overlap spatially with respect to their ZoI and the potential *ex-situ* sites considered in this assessment. As above, under the relevant sections, the habitat areas within affected potential *ex-situ* sites are only a small proportion of available habitat locally and therefore habitat loss/degradation effects (where they occur) will not have any population level effects. With respect to disturbance/displacement, the construction ZoI is temporary and the operational ZoI is not predicted to have any long-term effects much beyond the Assessment Boundary. Therefore, even when combined, the overall effect on use of these potential *ex-situ* sites by bird species listed as SCIs of Lough Corrib SPA will not affect their range or reduce habitat area such that the local populations would not be able to sustain itself long-term.

The Project will also not inhibit any efforts to restore favourable conservation status, where this might form part of the conservation objectives in the future.

Following an examination, analysis and evaluation in light of the best scientific knowledge, of all relevant information in respect of all of the SCI bird species, and the supporting habitats, of Lough Corrib SPA within the ZoI of the Project, the potential impacts and mitigation measures, and whether or not the predicted impacts would affect the conservation objectives that support the conservation condition for the SCIs concerned, it has been concluded that the Project poses no risk (either directly or indirectly) of adversely affecting the integrity of Lough Corrib SPA and there is no reasonable scientific doubt about this conclusion.

11.4 Inner Galway Bay SPA

11.4.1 Habitat degradation – hydrogeology

Groundwater supply to groundwater dependant habitats will not be affected during construction or operation such that any population level effects would occur as a consequence of the limited habitat effects associated with the Project.

However, the risk of the Project affecting groundwater quality during construction requires mitigation, as it does during operation, to ensure that the drainage system continues to function as designed (Section 10.4).

These mitigation measures will be implemented through the implementation of the CEMP by the contractor during construction (pollution control) and by Galway County Council/TII over the operational lifespan of the Project (maintenance) and will ensure that hydrogeological impacts do not occur.

Therefore, in light of the best scientific knowledge, habitat degradation as a result of impacts on the existing groundwater regime will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the SCI species of Inner Galway Bay SPA (see Table 9.35). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Inner Galway Bay SPA.

A summary of the residual hydrogeological impacts associated with the Project is presented in Table 11.15 below.

Table 11.15 Summary of Residual Hydrogeological Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.35 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Inner Galway Bay SPA?
Construction			
Construction works affecting groundwater quality	Affecting the quality of groundwater supporting groundwater dependant habitats could affect the type, quality and extent of suitable habitat available to SCI bird species	Yes, to ensure that site runoff is controlled and treated during construction to avoid polluting groundwater bodies	No
Operation			
Groundwater quantity being affected during operation	The design of the Project will not restrict or inhibit existing groundwater flow paths supporting groundwater dependant habitats used by bird species listed as SCIs of Lough Corrib SPA. However, it is important that the appropriate level of subsoil remains beneath the infiltration basins to ensure their continued functioning.	Yes The karst protocol will be implemented, if karst features and potential pathways are found to be present during inspection and maintenance in the infiltration basin Section 10.4	No
Groundwater quality being affected during operation	The drainage design (as described in Section 2, and Appendices A, B, C and F) will ensure that groundwater quality will be maintained during operation.	Yes The karst protocol will be implemented, if karst features and potential pathways are found to be present during	No

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.35 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Inner Galway Bay SPA?
	However, it is important that the appropriate level of subsoil remains beneath the infiltration basins to ensure their continued functioning.	inspection and maintenance in the infiltration basin Section 10.4	

11.4.2 Habitat degradation – hydrology

The Project will not affect the functioning of the existing hydrological regime that supports sites used by SCI listed bird species, either during construction or operation.

However, the risk of the Project affecting surface water quality during construction requires mitigation, as it does during operation, to ensure that the drainage system continues to function as designed (Section 10.5).

These mitigation measures will be implemented through the implementation of the CEMP by the contractor during construction (pollution control) and by Galway County Council/TII over the operational lifespan of the Project (maintenance) and will ensure that hydrological impacts do not occur.

Therefore, habitat degradation as a result of impacts on the existing surface water regime will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the SCI species of Inner Galway Bay SPA (see Table 9.35). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Inner Galway Bay SPA.

A summary of the residual hydrological impacts associated with the Project is presented in Table 11.16 below.

Table 11.16 Summary of Residual Hydrological Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.35 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Inner Galway Bay SPA?
Construction			
Construction works affecting surface water quality	Affecting the quality of surface water in the receiving environment in Galway Bay (or at any important ex-situ sites) could potentially affect habitat quality and usage of important habitat areas by SCI species, which in turn could affect the conservation objective to maintain the distribution of areas used by SCI waterbirds	Yes, to ensure that site runoff is controlled and treated during construction to avoid polluting the surface water drainage network	No

11.4.3 Disturbance/displacement – potential *ex-situ* sites

In general, neither construction nor operational disturbance will restrict the extent of habitat available to any SCI species such that any population level effects would occur. However, at Ballindooley Lough prolonged blasting was assessed as having the potential to displace SCI listed bird species from Ballindooley Lough; potentially negatively affecting the wintering SPA population. A seasonal restriction to prohibit/limit blasting here during the winter period will be implemented to ensure that there are no long-term disturbance or displacement effects to wintering birds at Ballindooley Lough as a consequence of blasting (Section 10.9).

This mitigation measure will be implemented through the implementation of the CEMP by the contractor during construction and will ensure that disturbance/displacement impacts do not occur.

Therefore, to the limited extent that there may be disturbance of SCI birds from habitats within the SPA during construction or operation of the Project, this will not result in long-term displacement and will not affect the conservation objective attributes and targets supporting the conservation condition of the SCI species of Inner Galway Bay SPA (see Table 9.35). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Inner Galway Bay SPA.

A summary of the residual disturbance/displacement impacts at potential *ex-situ* sites associated with the Project is presented in Table 11.17 below.

Table 11.17 Summary of Residual Disturbance / Displacement Impacts at Potential Ex situ Sites

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.35 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Inner Galway Bay SPA?
Construction			
Long-term blasting at Lackagh Quarry and Castlegar disturbing displacing bird species listed as SCIs of Lough Corrib SPA at Ballindooley Lough	Yes, as long-term blasting could displace SCI listed bird species from Ballindooley Lough for one or more winter seasons; potentially negatively affecting the wintering SPA population	Yes Seasonal restriction to blasting works in the vicinity of Ballindooley Lough Section 10.9	No

11.4.4 Habitat loss/fragmentation – potential *ex-situ* sites

The scale of habitat loss and fragmentation will not restrict the extent of habitat available to any SCI species, such that any population level effects would occur. As a result, there is no potential for any impacts on the conservation objectives of Inner Galway Bay SPA to arise via this impact and no mitigation measures are required.

Therefore, any habitat loss associated with the Project will not affect the conservation objective attributes and targets supporting the conservation condition of the SCI species of Inner Galway Bay SPA (see Table 9.35). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Inner Galway Bay SPA.

11.4.5 Conclusion of Assessment for Inner Galway Bay SPA

As per the 2018 NIS, and unchanged in this updated NIS, none of the potential direct or indirect impacts associated with the Project will affect the conservation objectives of any SCI species. Mitigation measures are included to ensure that the Project does not affect the receiving hydrogeological or hydrological environments (Sections 10.4 and 10.5) and will not result in any long-term disturbance/displacement effects at Ballindooley Lough (Section 10.9). Refer to Table 9.35 and Table 10.1 for how these mitigation measures relate back to the SCIs and conservation objectives of Inner Galway Bay SPA.

Of the potential impacts to SCI bird species associated with the Project, effects on hydrogeology, disturbance and habitat loss all overlap spatially with respect to their ZoI and the potential *ex-situ* sites considered in this assessment. As above, under the relevant sections, the habitat areas within affected potential *ex-situ* sites are only a small proportion of available habitat locally and therefore habitat loss/degradation effects (where they occur) will not have any population level effects. With respect to disturbance/displacement, the construction ZoI is temporary and the operational ZoI is not predicted to have any long-term effects much beyond the Assessment Boundary. Therefore, even combined, the overall effect on use of these potential *ex-situ* sites by bird species listed as SCIs of Inner Galway Bay SPA will not affect their range or reduce habitat area such that the local populations would not be able to sustain itself long-term.

The Project will also not inhibit any efforts to restore favourable conservation status, where this might form part of the conservation objectives in the future.

Following an examination, analysis and evaluation in light of best scientific knowledge of all relevant information in respect of all of the SCI bird species and supporting habitats of Inner Galway Bay SPA within the ZoI of the Project, the potential impacts and mitigation measures, and whether or not the predicted impacts would affect the conservation objectives that support the conservation condition for the SCIs concerned, it has been concluded that the Project poses no risk (either directly or indirectly) of adversely affecting the integrity of Inner Galway Bay SPA and there is no reasonable scientific doubt about this conclusion.

11.5 Inishmore Island SAC / Kilkieran Bay and Island SAC

The assessment of residual impacts on SACs that support cetacean species as QIs is newly-added since the 2018 NIS, due to the inclusion of two cetacean species (Bottlenose dolphin *Tursiops truncatus* and Harbour porpoise *Phocoena phocoena*) added as QIs at 16 existing marine and coastal SAC sites around the Irish marine waters by the NPWS 20 March 2024.

11.5.1 Habitat degradation – hydrology

The Project will not affect the functioning of the existing hydrological regime or downstream marine environment of Galway Bay that may be used by QI cetacean species, either during construction or operation.

However, the risk of the Project affecting surface water quality during construction and operation requires mitigation and monitoring to ensure that the drainage system continues to function as designed (Section 10.5).

These mitigation measures will be implemented through the implementation of the CEMP by the contractor during construction (pollution control) and by Galway County Council/TII over the operational lifespan of the Project (maintenance) and will ensure that hydrological impacts do not occur.

Therefore, degradation of the marine environment of the Galway Bay, as a result of impacts on the existing surface water regime, will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QI cetacean species using Galway Bay (see Table 9.39). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of Inishmore Island SAC, Kilkieran Bay and Island SAC or any other European site whose QI cetacean species may utilise Galway Bay marine environment.

A summary of the residual hydrological impacts associated with the Project is presented in Table 11.18 below.

Table 11.18 Summary of Residual Hydrological Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.39 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Inishmore Island SAC / Kilkieran Bay and Island SAC?
Construction			
Construction works affecting surface water quality	Affecting the quality of surface water in the receiving environment in Galway Bay could potentially affect the marine habitat quality and usage of important habitat areas by SCI species, which in turn could affect the conservation objective to maintain the distribution of areas used by SCI waterbirds	Yes, to ensure that site runoff is controlled and treated during construction to avoid polluting the surface water drainage network Section 10.5	No

11.5.2 Conclusion of Assessment for SACs Supporting Cetacean Species as QIs

None of the potential direct or indirect impacts associated with the Project will affect the conservation objectives of any cetacean QI species. Mitigation measures are included to ensure that the Project does not affect the receiving hydrological environments (Sections 10.5) and will not result in any long-term degradation of marine environment associated with the Galway Bay which may be used by cetacean species. Refer to Table 9.39 and Table 10.1 for how these mitigation measures relate back to the QIs and conservation objectives of Inishmore Island SAC and Kilkieran Bay and Island SAC.

The Project will also not inhibit any efforts to restore favourable conservation status, where this might form part of the conservation objectives in the future.

Following an examination, analysis and evaluation in light of best scientific knowledge of all relevant information in respect of all of the QI cetacean species that may use the marine environments of Galway Bay within the ZoI of the Project, the potential impacts and mitigation measures, and whether or not the predicted impacts would affect the conservation objectives that support the conservation condition for the QIs concerned, it has been concluded that the Project poses no risk (either directly or indirectly) of adversely affecting the integrity of Inishmore Island SAC and Kilkieran Bay and Island SAC or any other European site with QI cetacean species and there is no reasonable scientific doubt about this conclusion.

11.6 Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Cregganna Marsh SPA, Rahasane Turlough SPA, Rahasane Turlough SAC

The assessment of residual impacts on these SACs due to the potential impact pathway of construction-related traffic is newly added since the 2018 NIS, due to the inclusion of this impact pathway by the Inspector appointed by ABP as detailed in Section 1 of this updated NIS.

As indicated in Section 9.6, the specific effects related to construction-related traffic in the wider existing, road network focusses on the additional sites adjacent and near to the M18, R458 and N67. As indicated in the Section 11.1 to 11.4, mitigation measures implemented for European sites related to Lough Corrib and Galway Bay will ensure that potential construction impacts are successfully mitigated with no residual impacts from construction, including construction-related traffic.

Habitat degradation as a result of indirect effects associated with construction-related traffic

Mitigation measures will be implemented to manage the construction fleet and construction-related traffic for the Project. These mitigation measures will be implemented through the CEMP by the contractor during

construction (construction pollution risk) and by Galway County Council/TII over the operational lifespan of the Project (maintenance) and will ensure that hydrogeological, hydrological and air quality impacts do not occur and that the spread of non-native invasive species by the construction fleet is averted.

Therefore, habitat degradation as a result of impacts on the existing groundwater regime, hydrology regime from dust and emissions or from the introduction and spread of non-native invasive species will not occur or affect the conservation objective attributes and targets supporting the conservation condition of the QIs and SCIs of the Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Cregganna Marsh SPA, Rahasane Turlough SPA and Rahasane Turlough SAC (see Table 9.43 to Table 9.49). Therefore, there are no residual direct or indirect impacts that could adversely affect the integrity of these European sites as a result of construction-related traffic.

A summary of the residual impacts associated with the construction-related traffic of the Project is presented in Table 11.19 below.

Table 11.19 Summary of Residual Hydrological Impacts

Potential Direct or Indirect Impacts	Could the conservation objectives be affected? See Table 9.43 to Table 9.49 for more details for more details on links to Qis and specific attributes and targets of the conservation objectives	Are mitigation measures required?	Are there any residual direct or indirect impacts that could adversely affect the integrity of Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Cregganna Marsh SPA, Rahasane Turlough SPA, Rahasane Turlough SAC?
Construction			
Construction works affecting the groundwater quality	Increase in construction-related traffic on the wider, existing road network could indirectly impact nearby European sites through water-quality related impacts by way of surface runoff to non-tarred areas	To ensure the construction fleet is well maintained and utilises the designated roads responsibly in line with the CEMP	No
Construction works affecting surface water quality	Increase in construction-related traffic on the wider, existing road network could indirectly impact nearby European sites through water-quality related impacts by way of surface runoff	To ensure the construction fleet is well maintained and utilises the designated roads responsibly in line with the CEMP	No
Construction works affecting air quality	Increase in construction-related traffic on the wider, existing road network could indirectly impact nearby European sites through additional emissions	To ensure the construction fleet is well maintained in line with the CEMP	No
Construction works affecting air quality	Increase in construction-related traffic on the wider, existing road network could result in the introduction and spread of non-native invasive species to nearby European sites	To ensure the construction fleet is well maintained and kept clear of debris in line with the CEMP	No

11.6.1 Conclusion of Assessment for European Sites Supporting QIs / SCIs that may be Impacted by Construction-related Traffic

None of the potential direct or indirect impacts associated with the Project will affect the conservation objectives of any of the QIs and SCIs associated with the European sites in the vicinity of the M18, R458 and N67. As detailed under the introductory paragraphs of Section 10, implementation of the mitigation measures in the CEMP ensures that any direct or indirect or *ex-situ* impacts to the conservation objectives supporting the QI/SCI species/habitats of European sites will not arise and will ensure that adverse effects on site integrity are avoided. Refer to Table 9.43 to Table 9.49 and Table 10.1 for how these mitigation measures relate back to the QIs and conservation objectives of Lough Corrib SAC.

Following an examination, analysis and evaluation in light of best scientific knowledge of all relevant information in respect of the QI/SCI species/habitats of Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Cregganna Marsh SPA, Rahasane Turlough SPA and Rahasane Turlough SAC adjacent and near to the M18, R458 and N67 and within the extended, existing road network of the potential construction-related traffic of the Project, the potential impacts and mitigation measures, and whether or not the predicted impacts would affect the conservation objectives that support the conservation condition for the QIs/SCIs concerned, it has been concluded that the Project does not pose a risk of adversely affecting (either directly or indirectly) the integrity of Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Cregganna Marsh SPA, Rahasane Turlough SPA and Rahasane Turlough SAC and there is no reasonable scientific doubt with the conclusion.

12. Potential for In Combination Effects

This section presents the assessment carried out to examine whether any other plans or projects have the potential to act in combination with the Project to adversely affect the integrity of the European sites where impacts may still have an in combination effect and include the following: Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC, Inner Galway Bay SPA, Inishmore Island SAC, Kilkieran Bay and Islands SAC, Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SPA, Rahasane Turlough SAC or Cregganna Marsh SPA, Maumturk Mountains SAC, The Twelve Bens/Garraun Complex SAC, Connemara Bog Complex SAC, Connemara Bog Complex SPA, Ross Lake and Woods SAC, East Burren Complex SAC, Moneen Mountain SAC, Black Head-Poulsallagh Complex SAC and Gortnandarragh Limestone Pavement SAC.

All other European sites fall beyond the zone of influence of the Project. Therefore, there is no potential for any other plans or projects to act in combination with the Project to adversely affect the integrity of any other European sites.

12.1 Analysis of Potential In Combination Effects

12.1.1 The Project

As assessed in Section 11, none of the potential impacts associated with the Project will result in any perceptible residual effect on the receiving environment or on the Qualifying Interests/Special Conservation Interests of the European sites within the potential ZoI of the Project.

Therefore, there will not be any residual impacts associated with the Project that will adversely affect the conservation objectives supporting the conservation condition of the Qualifying Interests/Special Conservation Interests of those European sites, and the Project in isolation will not adversely affect the integrity of those European sites.

The residual impacts associated with the Project, whilst not of a magnitude to result in adverse effects on European site integrity themselves, were also assessed to consider whether there was the potential for other plans or projects to have similar low-level impacts that could potentially act cumulatively or in combination to adversely affect the integrity of any/all of the European sites within the ZoI of the Project.

Although a portion of the drainage from the Project will be discharged to the surface water network that drains to Lough Corrib SAC (analysis of potential hydrological impacts on this European site is detailed in Section 9.1.4.4), Galway Bay Complex SAC (analysis of potential hydrological impacts on this European site is detailed in Section 9.2.4.2) and Inner Galway Bay SPA (analysis of potential hydrological impacts on this European site is detailed in Section 9.4.4.2), the effect on water quality will be imperceptible. Nevertheless, given the large catchment of the River Corrib and the other river systems that drain to Galway Bay, and the potential for the other plans and projects therein to affect water quality, there is the potential for an in combination effect.

There will be some change in air quality in the vicinity of the Project during operation (as detailed in Section 9.1.4.5), and to a lesser extent along the M18, R458 and N67 due to construction-related traffic during construction (as detailed in Section 9.6), although it will not in itself affect the conservation objectives of Lough Corrib SAC (the only European site within the ZoI of any potential air quality effects) (as detailed in Section 9.1.4.5) or the European sites around the along the M18, R458 and N67 (Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SPA, Rahasane Turlough SAC or Cregganna Marsh SPA) (as detailed in Section 9.6.4.1). The potential for in combination effects to occur through air quality effects is limited to the immediate vicinity of where the Project passes through, or close to, Lough Corrib SAC. Therefore, only the Galway City Development Plan 2023-2029, and any projects that may arise from it, have the potential to cumulatively affect air quality here.

During construction, disturbance to Otter in the River Corrib (Lough Corrib SAC), and to wintering birds across the Assessment Boundary, will be temporary to short-term, will not have any long-term population effects, and will not have any effect on the conservation objectives of Lough Corrib SAC (as detailed in Section 9.1.4.8), Galway Bay Complex SAC (as detailed in Section 9.2.4.4and Section 9.2.4.5) and Inner

Galway Bay SPA (as detailed in Section 9.4.4). During operation, the Project will not affect Otter use of the River Corrib. In terms of disturbance to wintering birds, considering the zoning of lands where wintering birds were recorded, the protective policies set out in the relevant development plans (see Appendix Q), the low number of SCI listed bird species generally recorded and their infrequent use of most of the winter bird sites, the minimal effect of any operational disturbance from road traffic in these wintering bird sites, and the abundance of alternative suitable habitat to support wintering birds locally, future development will not act in combination with the Project to affect the SPA SCI bird populations or the integrity of either Lough Corrib SPA (as detailed in Section 9.3.4) or Inner Galway Bay SPA (as detailed in Section 9.4.4).

12.1.2 Plans and Planned and Committed Projects

Cumulative effects can result from individually insignificant but collectively significant actions/developments taking place over a period of time or concentrated in a location. The following development types are included in considering cumulative effects:

- Existing projects (under construction)
- Projects which have been granted consent but not yet started
- Projects for which consent has been applied for which are awaiting a decision, including those under appeal
- Projects proposed at a plan level, if relevant (e.g. future strategic infrastructure such as roads or greenways)

The potential for in combination effects to arise in the receiving environment, including River Corrib and Galway Bay, from any existing or proposed land use plans or developments is regulated and controlled by the environmental protective policies and objectives of the Galway City Development Plan 2023-2029 and Galway County Development Plan 2022-2028. Any planned or committed plan or project that could potentially affect European sites in Galway Bay, or any other European site, in combination with the Project, must adhere to these overarching environmental protective policies and objectives. These policies and objectives will ensure the protection of the European site within the zone of influence of the Project, and include the requirement for any future plans or projects to undergo Screening for Appropriate Assessment and/or Appropriate Assessment to examine and assess their effects on European sites, alone and in combination with other plans and projects.

There are specific objectives and policies in the Galway City Development Plan 2023-2029 and Galway County Development Plan 2022-2028 to protect biodiversity, and specifically European sites. Policies within the Galway City Development Plan 2023-2029 Policy 5.2 (1), Policy 5.2 (2), and Policy 5.2 (11) relate to the protection of European sites, AA and commitments to not permitting projects giving rise to adverse effects on the integrity of European sites without demonstrating there are no alternatives, there are imperative reasons of overriding public interest, and undertaking all compensation measures necessary to ensure the overall coherence of the network of European sites.

Policies within the Galway County Development Plan 2022-2028 NHB 1, NHB 2, and NHB 3 relate to the protection of European sites, AA and commitments to not permitting projects giving rise to adverse effects on the integrity of European sites without demonstrating there are no alternatives, there are imperative reasons of overriding public interest, and undertaking all compensation measures necessary to ensure the overall coherence of the network of European sites.

The Galway City Development Plan 2023-2029 also includes policies for protection of European sites regarding its integrity relating to waters (Policy 5.2 (2), Policy 5.2 (4), Policy 5.2 (7), Policy 5.2 (12), Policy 5.2 (18), Policy 9.2 (6)).

The Galway County Development Plan 2022-2028 also includes policies to protect water quality, wetland sites and peatlands (from pollution via surface and ground water) (WR 1, WR 2, WTWF 1 and P 1).

Although other plans and projects have the possibility to act in combination with the Project to affect air quality locally in the vicinity of the Lough Corrib SAC, considering the land use zonings and objectives that relate to lands in this area in the Galway City Development Plan 2023-2029 (Recreation and Amenity, Agriculture and High Amenity and Agricultural), and the protective policies and objectives included within

the Plan to protect air quality and European sites, developments in Galway City will not act in combination with the Project to affect the integrity of any European sites due to impacts on air quality.

Land use plans for the other local authorities (e.g. Clare County Council) whose functional areas include surface water features which drain to the Galway Bay, were examined and analysed and those land use plans also include protective environmental policies to protect European sites and the receiving groundwater, and surface water environments. The potential cumulative impacts on those European sites within the ZoI of the Project from the proposed works in combination with other plans and projects, as identified from Galway City Council's and Galway County Council's planning e-portals and An Bord Pleanála map viewer are identified and assessed in Appendix R.

The full assessment of the potential in combination effects of the land use plans listed in Table 12.1 are presented in Appendix R. The full assessment of live and/or approved projects are also detailed in Appendix R, with Table 12.1 indicating a sample of the projects, in particular, large projects such as road infrastructure projects and coastal protection projects which were assessed.

Table 12.1 Land Use Plans and Projects considered for the In Combination

National Plans
National Development Plan Ireland 2021-2030
Project Ireland 2040 – National Planning Framework
National Marine Planning Framework. The Project Ireland 2040
National Spatial Strategy for Ireland 2002-2020
Climate Action Plan 2024
River Basin Management Plan for Ireland 2018-2021
The River Basin Management Plan for Ireland (2022-2027) – (under review)
National Sustainable Mobility Policy 2022-2025
4th National Biodiversity Action Plan 2023-2030
National Energy & Climate Plan 2021-2030
Climate Action and Low-Carbon Development – National Policy Position Ireland (Updated 2021)
National Air Pollution Control Programme (NAPCP) Report 2021
Water Services Strategic Plan 2015
National Water Resources Plan – Framework Plan 2021
The draft Water Services Strategic Plan 2050 (WSSP 2050)
Ireland's Rural Development Programme 2014-2020
Our Rural Future Rural Development Policy 2021-2025
Foodwise 2025
Food Vision 2030
Regional Plans
Regional Spatial & Economic Strategy- Northern and Western Region 2020-2032 (RSES)
Regional Planning Guidelines for the West Region 2010-2022
West Catchment Flood Risk Assessment and Management (CFRAMS) Study
Wild Atlantic Way Operational Programme 2015-2019
Galway Transport Strategy (GTS)
Water supply schemes
Wastewater Treatment Works (Public and Private)
Pollution Reduction Plans and Programme
County/Local Plans

Galway County Development Plan 2022-2028

Galway County Heritage and Biodiversity Plan 2017-2022

Galway County Council Climate Action Plan 2024-2029

Draft Loughrea Local Area Plan 2024-2030

Galway City Council Development Plan 2023-2029

Galway City Biodiversity Action Plan 2014-2024

Galway City Climate Adaption Strategy 2019-2024

Ardaun Local Area Plan 2018-2024

Clare County Development Plan 2023-2029

Clare Biodiversity Action Plan 2017-2023 (still in effect according to local authority website)

Clare County Council Climate Adaptation Strategy 2019-2024

Galway Masterplan GCC 20/47 ABP310568-28

Mayo County Development Plan 2022-2028

Galway County Development Plan 2015-2021

Galway City Council Development Plan 2017-2023

Clare County Development Plan 2017-2023

Mayo County Development Plan 2014-2020

Draft Loughrea Local Area Plan 2024-2030

Ardaun Local Area Plan 2018-2024

Athenry Local Area Plan 2012-2018 - Now Athenry Local Area Plan 2012-2022

Gort Local Area Plan 2013-2019

Now Gort Local Area Plan 2013-2023

Headford Local Area Plan 2015-2021

Loughrea Local Area Plan 2012-2018

Maigh Cuilinn Local Area Plan 2013-2019

Maigh Cuilinn Local Area Plan 2013-2023

Oranmore Local Area Plan 2012-2018

Tuam Local Area Plan 2011-2017

Tuam Local Area Plan 2018-2024

Gaeltacht Local Area Plan 2008-2018

Bearna Local Area Plan 2007-2017 Variation No.2(a) to the Galway County Development Plan 2015-2021-Bearna is effective from 23rd July 2018

Galway City Local Economic and Community Plan 2015-2021

Local Economic and Community Plan Framework Plan 2024–2029

Vision 2020 NUI Galway Strategic Plan 2015–2020

NUI Shared vision, shaped by values Strategic Plan 2020–2025

Projects/Strategies

N59 Maigh Cuilinn (Moycullen) Bypass Road Project

Galway to Dublin Cycleway

Connemara Greenway (from Galway City to Clifden))

Galway to Spiddal Greenway (Bearna to Spiddal Cycleway)

R336 Bearna to Scríb via Ros an Mhíl Upgrade/Improvements

Sáilín to Silverstrand Coastal Protection Scheme

Proposed Galway Harbour Port Extension

There have been numerous developments within the last 5 years in the locality of the Project. The full list of these projects is provided and assessed in Appendix R.

12.2 Conclusion of In Combination Assessment

The majority of the projects assessed in Appendix R are relatively small-scale projects, including renovations or extensions to existing residential properties which did not constitute a potential risk to the environment. However, a number relate to relatively large-scale developments, including small, medium and large-scale residential developments, commercial and industrial developments and public scheme works.

All of these developments have been subject to the environmental requirements of the County and City Development Plans mentioned above, as well as the environmental requirements of the Planning and Development Act.

All of these plans and projects, listed in Appendix R, have been assessed for the likely significant direct, indirect and cumulative impacts at an individual level with the Project (pairwise), as well as an overall cumulative assessment of all plans and projects combined together with the Project, for the potential to act cumulatively to impact on the conservation objectives of the European sites in question.

None of the plans assessed will give rise to any in combination effects at either an individual level or cumulatively. For those developments which had the potential to affect the receiving environment, mitigation measures have been developed and included within the consented planning conditions to avoid or mitigate any potential effects on European sites. Equally, the Project poses no risk to the receiving environment in any European sites. Having considered and assessed the Project in combination with all plans and projects listed in Appendix R, there is no potential for the Project in combination with other plans and projects to undermine the conservation objectives, or adversely affect the integrity, of any European sites, particularly in light of the mitigation measures included as part of the Project.

The project level mitigation in tandem with the environmental protective policies set out in the overarching land use plans, ensures there is no potential for projects individually (pairwise) or cumulatively with all the other projects or plans as well as with the Project, to act in combination to impact on the conservation objectives of any European sites.

13. NIS Conclusion

This updated NIS has examined and analysed, in light of the best scientific knowledge, with respect to those European sites within the zone of influence of the Project, the potential impact sources and pathways, the manner in which these could impact on the European sites' qualifying interest habitats and species, and special conservation interest species and habitats, and whether the predicted impacts would adversely affect the integrity of any European sites.

Following an examination, analysis and evaluation in light of best scientific knowledge, of all relevant information in respect of the Qualifying Interests and Special Conservation Interests of the assessed European sites (Lough Corrib SAC, Lough Corrib SPA, Galway Bay Complex SAC, Inner Galway Bay SPA, Inishmore Island SAC, Kilkieran Bay and Islands SAC, Ardrahan Grassland SAC, Castletaylor Complex SAC, Kiltiernan Turlough SAC, Lough Fingall Complex SAC, Rahasane Turlough SAC, Rahasane Turlough SPA, Cregganna Marsh SPA, Maumturk Mountains SAC, e Twelve Bens/Garraun Complex SAC, Connemara Bog Complex SAC, Connemara Bog Complex SPA, Ross Lake and Woods SAC, East Burren Complex SAC, Moneen Mountain SAC, Black Head-Poulsallagh Complex SAC or Gortnandarragh Limestone Pavement SAC), the potential impacts, and whether or not the predicted impacts would affect the conservation objectives that support the conservation condition of the Qualifying Interests/Special Conservation Interests, it has been concluded that the Project does not pose a risk of adversely affecting (either directly or indirectly) the integrity of any European sites.

Mitigation measures are set out within this updated NIS and the effective implementation of these mitigation measures will ensure that any impacts on the conservation objectives of European sites will be avoided during the construction and operation of the Project such that there will be no adverse effects on any European sites.

It has also been objectively concluded by Scott Cawley Ltd., following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted impacts from the Project and the effective implementation of the mitigation measures proposed, that the Project will not adversely affect (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans or projects, and there is no reasonable scientific doubt in relation to this conclusion.

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