BusConnects Galway: Cross-City Link (University Road to Dublin Road)

August 2022

Environmental Impact Assessment Report

Volume 2
Main Chapters

BUS CONNECTS GALWAY

SUSTAINABLE TRANSPORT FOR A BETTER CITY.

Preface

The structure of this Environmental Impact Assessment Report (EIAR) for the BusConnects Galway: Cross-City Link (University Road to Dublin Road) (hereafter referred to as the Proposed Scheme) is summarised as follows:

Volume 1: Non-Technical Summary

Volume 1 provides a non-technical summary of the information contained in Volume 2 of the EIAR.

Volume 2: Main Environmental Impact Assessment Report

Volume 2 provides a general introduction, outlines the environmental impact assessment process, describes the scope of the Proposed Scheme, presents the consideration of reasonable alternatives and describes the environmental impacts specific to the Proposed Scheme.

Volume 3: Figures

Volume 3 provides drawings and large format images (labelled as 'Figures') that illustrate the information detailed in Volume 2 of the EIAR.

Volume 4: Appendices

Volume 4 provides documentation and data that is supplemental to the information provided in Volume 2 of the EIAR.

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Galway City Council

BusConnects Galway: Cross-City Link (University Road to Dublin Road)

Glossary and Abbreviations

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Glossary of Terminology, Abbreviation and Acronyms

Term, Abbreviation or Acronym	Description
A	Alluvium
AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
ABP	An Bord Pleanála
ACA	Architectural Conservation Areas
AcEsk	Eskers comprised of gravels of acidic reaction
AD	Anno Domini
A & E	Accident and Emergency
AeoUND	Aeolian undifferentiated
AEP	Annual Exceedance Probability
Ag	Alluvium (gravelly)
AlluvMin	Alluvial (min)
AminDW	Deep well drained mineral soil (mainly acidic)
AminPD	Mineral poorly drained (mainly acidic)
AminPDPT	Peaty Gleys Acidic
AminSP	Surface water gleys / Ground water gleys shallow
AminSRPT	Shallow rocky peaty, non-peaty mineral complexes (mainly acidic)
AminSW	Shallow well drained mineral soil (mainly acidic)
Annex I Habitats	Habitat types whose conservation requires the designation of Special Areas of Conservation. Priority habitats, which are in danger of disappearing within the EU territory, are highlighted with an asterisk.
Annex I Species	Annex I of the Birds Directive lists 193 bird species and sub-species which are: i) in danger of extinction, ii) vulnerable to specific changes in their habitat, iii) considered rare because of small populations or restricted local distribution and / or iv) require particular attention for reasons of the specific nature of habitat. Article 4 of the Birds Directive has classified a number of Special Protection Areas (SPAs) for regularly occurring migratory birds and those birds listed on Annex I of the directive.
Annex II Species	Animal and plant species whose conservation requires the designation of Special Areas of Conservation.
Annex IV	Animal and plant species in need of strict protection.
Annex V	Animal and plant species whose taking in the wild and exploitation may be subject to management measures.
AQG	Air Quality Guideline
As	Alluvium (sandy)
ASD	Autism Spectrum Disorder
Asi	Alluvium (silty)
ASL	Advance Stacking Location
ASR	Air sensitive receptor
ATCs	Automatic Traffic Counts
AVL	Automatic Vehicle Location
AWB	Artificial Surface Waterbodies
AWQR	Annual Water Quality Rating
BCI	Bat Conservation Ireland
Birds of Conservation Concern in Ireland	BirdWatch Ireland and the Royal Society for the Protection of Birds (RSPB) in Northern Ireland provided a list of priority bird species for conservation action on the island of Ireland. These Birds of Conservation Concern in Ireland are published in a list known as the BoCCI List. In this BoCCI List, birds which breed and / or winter in Ireland are classified into three separate lists (Red, Amber and Green), based on the conservation status of the bird and hence conservation priority.
Bq / m3	Bequerel per cubic metre
BktPt	Blanket Peat
BminDW	Deep well drained mineral soil (mainly basic)
BminPD	Mineral poorly drained (mainly basic)
BminPDPT	Peaty gleys basic parent materials basic
BminSP	Surface water gleys / groundwater gleys shallow
BminSPPT	Peaty gleys shallow

Term, Abbreviation or Acronym	Description
BminSRPT	Lithosols peats
BminSW	Renzinas / Lithosols
BMW	Biodegradable Municipal Waste
BoCCI	Birds of Conservation Concern in Ireland
BRE	Building Research Establishment Group
BRT	Bus Rapid Transit
BS	British Standard
BSBI	Botanical Society of Britain and Ireland
BSI	British Standard Institute
BTH	Built Heritage
BTO	British Trust for Ornithology
BusConnects Galway – Cross City Link	The BusConnects Galway – Cross City Link is the works for Galway which is from University Road to Dublin Road (Proposed Scheme).
Bus Gate	A Bus Gate is a sign-posted short length of stand-alone bus lane. This short length of road is restricted exclusively to buses, taxis and cyclists plus emergency vehicles. It facilitates bus priority by removing general through traffic along the overall road where the bus gate is located. General traffic will be directed by signage to divert away to other roads before they arrive at the Bus Gate.
Bus Lane	An on-road carriageway reserved primarily for the use of buses. A bus lane forms part of a road link and it is located within the contiguous road surface.
CA	Conservation Area
CaCO3	Calcium Carbonate
CAP	Climate Action Plan
CARO	Climate Action Regional Office
Catchment	The area of land bounded by watersheds draining into a river, basin or reservoir.
CBA	Cost Benefit Analysis
CBC	Core Bus Corridor
CC	Construction Compound
CCTV	Close-circuit television
CDRWMP	Construction and Demolition Resource and Waste Management Plan
CEA	Cumulative Effects Assessment
CEMP	Construction Environmental Management Plan
CERC	Cambridge Environmental Research Consultants
CESSM	Civil Engineering Standard Model of Measurement
CGS	County Geological Sites
CH4	Methane
CIE	Córas Iompair Éireann
CIEEM	Chartered Institute of Ecology and Environmental Management
CIfA	Chartered Institute for Archaeologists
CIRIA	Construction Industry Research and Information Association
CNL	Construction Noise Levels
CNOSSOS	Common Noise Assessment Methods in Europe
CNT	Construction Noise Threshold
CO	Carbon Monoxide
COMAH	Control of Major Accident Hazards Involving Dangerous Substances
Construction Phase	The processes and activities on or off site that contribute or are instrumental to the construction of the Proposed Scheme towards, and finally to, the Operational Phase.
Construction Year (2023)	For the purposes of modelling, a Construction Year of 2023 is assumed.
CORINE	Co-ordinated Information on the Environment
CP	Communications Plan
CPO	Compulsory Purchase Order
CRTN	Calculation of Road Traffic Noise
cSAC	Candidate Special Area of Conservation
CSM	Conceptual Site Model
CSMMP	Construction Stage Mobility Management Plan
CSO	Central Statistics Office
CSZ	Core Sustenance Zone

Term, Abbreviation or Acronym	Description
CTMP	Construction Traffic Management Plan
Cut	Cut over raised peat
Cycle Lane	A cycle lane is a lane on the carriageway that is reserved either exclusively or primarily for cycling and is separated from general traffic or bus lanes by road markings.
Cycle Track	A cycle track is a separate section of the road dedicated for cycling only. This space will generally be isolated from other vehicular traffic by a physical kerb.
DAHG	Department of Arts, Heritage and the Gaeltacht
DAHGI	Department of Arts, Heritage, Gaeltacht and the Islands
DAU	Development Applications Unit
dB	Decibel
DCCAE	Department of Communications, Climate Action and Environment
DCENR	Department of Communications, Energy and Natural Resources
DCHG	Department of Culture, Heritage and the Gaeltacht
DECLG	Department of the Environment, Community and Local Government
DEFRA	Department of Environment, Food and Rural Affairs
DEHLG	Department of the Environment, Health and Local Government.
Designated sites	Selected sites designated with the aim to conserve habitats and species of conservation concern.
Design Year (2038)	For the purposes of modelling, a Design Year of 2038 is assumed.
DFI	Disability Federation Ireland
DHLGH	Department of Housing, Local Government and Heritage
DHPLG	Department of Housing, Planning and Local Government
DM	Do Minimum
DMRB	Design Manual for Roads and Bridges
DMURS	Design Manual for Urban Roads and Streets
DN	Do Nothing
DoT	Department of Transport
DS	Do Something
DTTAS	Department of Transport, Tourism and Sport
EC	European Commission
ED	Engineering Designers
EEA	European Environment Agency
EFLA	European Foundation of Landscape Architecture
EFT	Emission Factor Toolkit
EIA	Environmental Impact Assessment – refers to the assessment process and the assessment that An Bord Pleanála will carry out.
EIAR	Environmental Impact Assessment Report – refers to the EIA report document.
EIRP	Environmental Incident Response Plan
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPR	Emerging Preferred Route
ESB	Electricity Supply Board
ESD	Effort Sharing Decision
ETS	Emission Trading Scheme
EU	European Union
EUPHA	European Public Health Association
EVs	Electric Vehicles
FenPT	Fenpeat
FRA	Flood Risk Assessment
FRM	Flood Risk Management
GCC	Galway City Council
GCh	Gravels derived from chert
GEIA	Guidelines for planning authorities and An Bord Pleanála on carrying out Environmental Impact Assessment
GGr	Gravels derived from granite
GGBFS	Ground granulated blast-furnace slag
GHG	Greenhouse Gas

Term, Abbreviation or Acronym	Description
GIS	Geographic Information System
GLs	Gravel derived from limestone
GLC	Ground level concentrations
GLPSsS	Gravels derived from Lower Palaeozoic sandstones and shales
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GMp	Gravels derived from metamorphic rocks
GNI	Gas Networks Ireland
GPO	General Post Office
GPR	Ground Penetrating Radar
GPS	Global Positioning System
GSI	Geological Survey Ireland
GTS	Galway Transport Strategy
GWB	Groundwater Bodies
GWP	Global Warming Potential
ha	Hectares
HA	Hydrometric Area
HDV	Heavy Duty Vehicle
HMWB	Highly Modified Water Bodies
HEV	Historic Environment Viewer
HEVs	Hybrid Electrical Vehicles
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
HLC	Historic Landscape Character
hPa	Hectopascals
HSA	Health and Safety Authority
HSE	Health Service Executive
Hydromorphology	Hydromorphology is a term used in river basin management to describe the hydrological (water flow, energy etc.) and geomorphological (surface features) processes and attributes of rivers, lakes, estuaries and coastal waters.
Hz	Hertz
IAA	Irish Architectural Archive
IAIA	International Association for Impact Assessment
IAQM	Institute of Air Quality Management
ICE	Internal Combustion Engine
ICOMOS	International Council of Monuments and Sites
IEL	Industrial Emissions License
IEMA	Institute of Environmental Management and Assessment
IES	Institute of Environmental Sciences
IFI	Inland Fisheries Ireland
IGI	Institute of Geologists of Ireland
INDCs	Intended Nationally Determined Contributions
Invasive species	An invasive species is a plant, fungus, or animal species that is not native to a specific location.
IPCC	Intergovernmental Panel on Climate Change
IPHI	Institute of Public Health in Ireland
IPI	Irish Planning Institute
IrSTCSsS	Irish sea till derived from Cambrian sandstones and shales
IrSTLPSsS	Irish Sea Till derived from Lower Palaeozoic sandstones and shales
IrSTLs	Irish sea till derived from limestones
ISMP	Invasive Species Management Plan
IOA	Institute of Acoustics
ISO	International Organization for Standardization
ITM	Irish Transverse Mercator
IW	Irish Water
JTCs	Junction Turning Counts

Term, Abbreviation or Acronym	Description
KER	Key Ecological Receptors – Ecological receptors include any living organisms (other than humans), the habitat which supports such organisms, or natural resources which could be adversely affected by the Proposed Scheme
kHz	Kilohertz
km	Kilometre
kt	Kilotonnes
kV	Kilovolt
Lac	Lacustrine sediments
LAM	Local Area Model
LAP	Local Area Plan
$L_{Aeq,T}$	The equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).
LEBM	Low Energy Bound Mix
LED	Light Emitting Diode
LEVs	Low Emission Vehicles
LGV	Light Goods Vehicle
LoW	List of Waste
LP	Lamp Post
m	Metres
made	Made ground
MarSands	Marine sands and gravels
MarSed	Marine / Estuarine sediments
MASP	Metropolitan Area Strategic Plan
mBGL	Metres Below Ground Level
Mbs	Marine beach sands
MCA	Multi-Criteria Analysis
Mesc	Estuarine silts and clays
mg / m3	Milligrams per cubic metre
mOD	Metres above Ordnance Datum
MRF	Materials Recovery Facility
MS	Mile Stones
MSA	Million Standard Axles
MSW	Municipal Solid Waste
NAF	National Adaptation Framework
NaPTAN	National Public Transport Access Nodes
Natura Impact Statement	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 prepared to enable the carrying out by the competent authority of an Appropriate Assessment as required under the Habitats Directive.
NBDC	National Biodiversity Data Centre
NCM	National Cycle Manual
NDP	National Development Plan
NFGWS	National Federation of Group Water Schemes
NH3	Ammonia
NHA	Natural Heritage Area
NIAH	National Inventory of Architectural Heritage
NIFTI	National Investment Framework for Transport in Ireland
NIS	Natura Impact Statement
NMI	National Museum of Ireland
NMS	National Monuments Service
NMVOC	Non-methane volatile organic compounds
NOx	Nitrogen oxides
NO	Nitric oxide
NO2	Nitrogen dioxide
N2O	Nitrous oxide
NPF	National Planning Framework

Term, Abbreviation or Acronym	Description
NPWS	National Parks and Wildlife Services
NRA	National Roads Authority
NSLs	Noise Sensitive Locations
NTA	National Transport Authority
NTM	National Transport Model
O3	Ozone
OBI	O'Brien Institute
Opening Year (2023)	For the purposes of modelling, an Opening Year of 2023 is assumed
Operational Phase	This phrase refers to the processes and activities implemented following the Construction Phase to ensure the appropriate environmental management of the Proposed Scheme over time.
OPW	Office of Public Works
OS	Ordnance Survey
OSI	Ordnance Survey Ireland
Pb	Lead
PB	Post Box
PC	Process contribution
PEC	Predicted Environmental Concentration
Pedestrian Link	A stretch of footpath that facilitates the movement of pedestrian traffic which can be located immediately adjacent to or segregated from a road link.
PM	Particulate matter
PM2.5	Particulate matter of less than 2.5 microns
PM10	Particulate matter of less than 10 microns
pNHA	Proposed Natural Heritage Area
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity
PRO	Preferred Route Option – this is the route option chosen, and the subject of the EIA.
PRFs	Potential Roost Features
ProPG	Professional Practice Guidance on Planning and Noise
Proposed Scheme	BusConnects Galway: Cross-City Link (University Road to Dublin Road)
Protected Cycle Lane	This refers to a cycle lane that is protected intermittently with pencil bollards or armadillos between the cycle lane and the traffic lane.
PSO	Public Service Obligation
PSZ	Public Safety Zone
Rck	Bedrock outcrop or subcrop
QBC	Quality Bus Corridor
QI	Qualifying Interest
QoS	Quality of Service
Quiet Street Treatment	Quiet Streets are called so due to the low amount of general traffic and are deemed suitable for cyclists sharing the roadway with general traffic without the need for segregated cycle tracks. The Quiet Street Treatment would involve appropriate advisory signage for both general road users and cyclists.
RBD	River Basin District
RBMP	River Basin Management Plan
Rck	Bedrock outcrop or subcrop
RMP	Record of Monuments and Places
RMS	Root mean squared
RMSE	Root mean square error
Road Link	A stretch of national, regional or local road network that predominantly facilitates the movement of vehicular traffic along a carriageway.
RPA	Root Protection Area
RPS	Record of Protected Structures
RSA	Road Safety Authority
RSES	Regional Spatial and Economic Strategy
RTPI	Real-time Passenger Information
SAC	Special Area of Conservation
Salmonid	Any species of the family (Salmonidae) of elongate bony fishes (such as a salmon or trout) that have the last three vertebrae upturned (i.e. ray-finned fish).

Term, Abbreviation or Acronym	Description
SCATS	Sydney Coordinated Adaptive Traffic System
SCI	Special Conservation Interest
SDG	Sustainable Development Goal
SDR	Standardised Death Rate
SDZ	Strategic Development Zone
SEA	Strategic Environmental Assessment
SFPA	Sea Fisheries Protection Authority
Shared Surface	Part of a carriageway that facilitates more than one mode of transport e.g. Shared Surface Pedestrian / Cycle Lane, Shared Surface Bus / Cycle Lane etc.
SHD	Strategic Housing Development
Signal Controlled Priority	Signal Controlled Priority uses traffic signals to enable buses to get priority ahead of other traffic on single road sections and is only effective for short distances.
SLR	Single-lens Reflex
SMR	Sites and Monuments Record
SOx	Sulphur oxides
SO2	Sulphur dioxide
SPA	Special Protection Area
SPZ	Source Protection Zone
SUDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
SWO	Storm Water Overflow
TCA	Townscape Character Assessment
TCSsS	Till derived from Cambrian sandstones and shales
TdlMr	Tidal Marsh
TGr	Till derived from granites
The Birds Directive	The Birds Directive (formally known as Council Directive 2009/147/EC on the conservation of wild birds) is a European Union directive adopted in 2009. It replaces Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds. It aims to protect all European wild birds and the habitats of listed species, in particular through the designation of Special Protection Areas.
The Habitats Directive	EU Directive on the Conservation of Habitats, Flora and Fauna (92/43/EEC), commonly known as “the Habitats Directive”, was adopted in 1992, came into force in 1994 and was transposed into Irish law in 1997.
TIA	Transport Infrastructure Assessment
TICCIH	The International Committee for the Conservation of the Industrial Heritage
TII	Transport Infrastructure Ireland
TLPSsS	Till derived from Lower Palaeozoic sandstones and shales
TLs	Till derived from limestones
TMp	Till derived from metamorphic rock
TMp	Till derived from metamorphic rocks
Toucan Crossing	A Toucan Crossing is a roadway crossing designed to enable both pedestrians and cyclists to cross the road with purposefully designed signal controls.
TPO	Tree Preservation Order
TQz	Till derived from quartzites
TSM	Traffic Signs Manual
UK	United Kingdom
UKHA	United Kingdom Highways Agency
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
Urban	Urban (ground made)
Urban Realm	Urban Realm is the term for everyday street spaces that are used by the public to cross, shop, socialise, play and use for activities including walking, exercising and commuting.
US	United States
UV	Ultra Violet
UWWT	Urban Waste-Water Treatment

Term, Abbreviation or Acronym	Description
UWWTP	Urban Wastewater Treatment Plant
VDI	Verein Deutscher Ingenieure
VDV	Vibration Dose Value
VOCs	Volatile Organic Compound
VRDP	Visual Representation of Development Proposals
VSLs	Vibration Sensitive Locations
WCP	Waste Collection Permit
WEEE	Waste Electrical and Electronic Equipment
WFD	Water Framework Directive
WHO	World Health Organization
Ws	Windblown sands
Wsd	Windblown sands and dunes
WWTP	Wastewater Treatment Plant
ZAP	Zone of Archaeological Potential
ZoI	Zone of Influence
µg / m3	Micrograms per cubic metre

Chapter 01
Introduction

Contents

1 Introduction

1.1 Introduction

This Environmental Impact Assessment Report (EIAR) is for the BusConnects Galway: Cross-City Link (University Road to Dublin Road) (hereafter referred to as the Proposed Scheme). The extent of the Proposed Scheme (i.e., the extent of the road and street network where physical and / or transport management interventions are proposed) is presented in Diagram 1.1.

This Chapter introduces the Proposed Scheme, summarises the Environmental Impact Assessment (EIA) process, describes the methodology used to prepare this EIAR and outlines the non-statutory consultation activities that have been carried out to date.

The Proposed Scheme comprises the 'Cross-City Link', supporting sections of the 'Inner-City Access Route' and other associated traffic management measures considered necessary to enable the introduction of the Cross-City Link.

The Proposed Scheme has an overall length of approximately 6.7km. The Cross-City Link will begin from R863 University Road at the intersection of R864 Newcastle Road. It proceeds along R863 University Road, across the Salmon Weir Bridge and staying on the R863, before turning onto R866 St Francis Street / Eglinton Street, at the Galway Courthouse junction. The Proposed Scheme continues along the R866 on St. Francis Street and Eglinton Street and around the northern (R866) and eastern (R336) perimeter of Eyre Square and on to R339 Forster Street. It then continues through the Fairgreen Road Junction and along R339 College Road as far as the junction with Lough Atalia Road. From here, the Proposed Scheme continues on R339 College Road to Moneenageisha junction and terminates on R338 Dublin Road immediately prior to the entrance to the Woodlands Campus for Brothers of Charity.

The Proposed Scheme also encompasses numerous roads within the city centre including Fairgreen Road, Bothar Uí Eithir, Prospect Hill, Bothar na mBan, St. Brendan's Avenue, Headford Road, Dyke Road, Woodquay, Daly's Place, Merchants Road, Forthill Street, Queen Street and Dock Road.

The Proposed Scheme will support integrated sustainable transport usage through infrastructure improvements and transport management measures for active travel (both walking and cycling), and the provision of enhanced bus priority measures for existing (both public and private) and all future services who will use the Proposed Scheme.

Diagram 1.1: Extent of the Proposed Scheme. Source Google Earth. Not to scale.

The Proposed Scheme will form a central route for public transport, cyclists and better connect places of interest for pedestrians along an east-west corridor through the city centre.

The Proposed Scheme will provide for considerable journey time reliability for existing bus services coming into and running through the city centre while also complementing the proposed new city bus network cross-city spine routes, proposed as part of the Galway Transport Strategy (GTS, 2016). The city bus network routes will be designed to coalesce along this high-quality corridor, providing high-frequency services with journey time reliability and opportunities for interchange.

The Proposed Scheme will ensure that public transport services can access key areas such as the retail and recreational centre of the city; public transport hubs at the rail and bus stations; City and County Halls; along with the city centre hotels and Bed & Breakfasts on College Road to the east of the city centre and key areas such as University Hospital Galway, NUI Galway, the Sportsgrounds, and the Galway Cathedral.

The Proposed Scheme will include reconfiguration of traffic movements to facilitate improved pedestrian, cyclist and bus accessibility and movement, infrastructural works at certain roads and junctions, and improvements to the public realm at a number of locations within the city centre, including Eyre Square North, Woodquay and in the vicinity of Galway Cathedral.

1.2 Aims and Objectives

Galway City Council's strategic objectives for transport as outlined in the Galway Transport Strategy (GTS, 2016) are:

- to promote and encourage sustainable transport;
- to manage the traffic in a way which maximises mobility and safe movement; and
- to maintain and develop/upgrade infrastructure.

The Proposed Scheme aims to improve access along the Proposed Scheme which will enable and deliver efficient, safe, and integrated sustainable transport movement to meet travel demand. The objectives of the overall BusConnects programme are to:

- Enhance the capacity and potential of the public transport system by improving bus speeds, reliability and punctuality through the provision of bus lanes and other measures to provide priority to bus movements over general traffic movements;
- Enhance the potential for cycling by providing safe infrastructure for cycling, segregated from general traffic wherever practicable;
- Support the delivery of an efficient, low carbon and climate resilient public transport service, which supports the achievement of Ireland's emission reduction targets;
- Enable compact growth, regeneration opportunities and more effective use of land, for present and future generations, through the provision of safe and efficient sustainable transport networks;
- Improve accessibility to jobs, education and other social and economic opportunities through the provision of improved sustainable connectivity and integration with other public transport services; and
- Ensure that the public realm is carefully considered in the design and development of the transport infrastructure and seek to enhance key urban focal points where appropriate and feasible.

The planning and design of the Proposed Scheme has been guided by these aims and objectives, with the need for the Proposed Scheme described in detail in Chapter 2 (Need for the Proposed Scheme) of this EIAR.

The outcomes achieved from delivering the Proposed Scheme will be:

- An attractive, resilient, equitable public transport network better connecting communities and improving access to work, education and social activity (refer to Chapter 6 (Traffic & Transport) for further details);
- Facilitate a transport infrastructure network that prioritises walking and cycling and a mode shift to public transport resulting in better air quality and reduced carbon emissions (refer to Chapter 6 (Traffic & Transport), Chapter 7 (Air Quality) and Chapter 8 (Climate) for further details); and
- Support increased economic and social potential through integrated land-use and transport planning to reduce the time burden of travel (refer to Chapter 6 (Traffic & Transport) and Chapter 10 (Population) for further details).

1.3 Programme

In the event of approval by ABP under Section 51 of the Roads Act and confirmation of the Compulsory Purchase Order (CPO) for the Proposed Scheme to allow property acquisition, it is envisaged that construction would commence early 2023, with an expected construction programme to completion of approximately 18 – 20 months.

1.4 Role of Galway City Council

Galway City Council fully recognises that Galway currently has a traffic and transport problem, due to its reliance on the private car, which has been influenced by the existing public transport network, limited cycling facilities, a large rural hinterland and being the key gateway in and out of Connemara.

Combined with this, it has a road and street network which is ill-suited to the high traffic flows currently prevalent, contributing to increased congestion and delay which is affecting quality of life and impacting on the functionality of the City.

To address this, a fundamental shift is needed towards sustainable travel within the city, reducing the dependency on the private car and taking action to make Galway more accessible and connected, enhancing quality of life within the City for all.

In order to meet the objectives, set out in Section 1.2, Galway City Council with Galway County Council and in partnership with the National Transport Authority, developed the GTS, an Integrated Transport Strategy for Galway City & Environs. The Strategy aims to address the current and future transport requirements of the city and surrounding towns and villages.

One of the key proposals in the GTS is the Cross-City Link (i.e. the Proposed Scheme), a corridor linking the western and eastern suburbs of the city, through the city centre – linking homes with places of work, study, retail and recreation.

The Proposed Scheme is being delivered by Galway City Council and funded by the National Transport Authority under the Sustainable Measures Transport Grant.

1.5 EIAR – Process, Screening, Content and Methodology

1.5.1 Statutory Requirements

As set out in the Department of Housing, Planning and Local Government (DHPLG) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DHPLG 2018) (hereafter referred to as the "2018 Guidelines"), the EIA Directive requires that public and private projects that are likely to have significant effects on the environment be made subject to an assessment prior to development consent being given.

Environmental Impact Assessment (EIA) is a process to be undertaken in respect of applications for specified classes of development listed in the EIA Directive before a decision in respect of development consent is made. The process involves the preparation of an Environmental Impact Assessment Report (EIAR) by the applicant, consultations with the public, relevant prescribed bodies and any other affected Member States, and an examination and analysis of the EIAR and other relevant information leading to a reasoned conclusion by the competent authority on the likely significant effects of the proposed development on the environment. Again, as observed in the 2018 Guidelines, the provisions of the EIA Directive are aimed at enhancing the EIA process through ensuring the completeness and quality of the EIAR submitted by the applicant and the examination undertaken by the competent authority and by providing for early and effective public participation before the development consent decision is made.

The EIA Directive requires that public and private projects listed in the Directive that are likely to have significant effects on the environment be made subject to an assessment prior to development consent being given. Annex II of the EIA Directive lists class 10(b) Urban development projects and class 10(d) lists Construction of roads.

The Roads Act 1993, as amended by S.I. No. 279/2019 – European Union (Roads Act 1993) (Environmental Impact Assessment) (Amendment) Regulations 2019, provides at section 50(1)(a) that a road development that consists of any of the following shall require EIA: (i) the construction of a motorway; (ii) the construction of a busway; (iii) the construction of a service area; (iv) any prescribed type of road development consisting of a proposed public road or the improvement of an existing public road.

The Roads Regulations 1994 (S.I. No. 119/1994), as amended, prescribes the following types of road development for the purposes of section 50(1)(a)(iv) of the Roads Act:

> *(a) the construction of a new road of four or more lanes, or the realignment or widening of an existing road so as to provide four or more lanes, where such new, realigned or widened road would be eight kilometres or more in length in a rural area, or 500 metres or more in length in an urban area;*
>
> *(b) the construction of a new bridge or tunnel which would be 100 metres or more in length.*

Section 50(1)(b) of the Roads Act provides that ABP may direct that a proposed road development, other than a development to which s.50(1)(a) applies, be subject to an EIA.

Section 50(1)(c) of the Roads Act provides that, where a road authority considers that a proposed road development, other than a development to which s.50(1)(a) applies, consisting of the construction of a proposed public road or the improvement of an existing public road would be likely to have significant effects on the environment, it shall inform ABP in writing prior to making any application to ABP for an approval of the proposed development.

Galway City Council's EIA screening determination was notified to ABP in writing on the 29th of August 2022 in accordance with Section 50(1)(c) of the Roads Act.

Section 50(1)(e) of the Roads Act provides that a decision on whether proposed development would or would not be likely to have significant effects on the environment shall take into account the relevant selection criteria in Annex III of the EIA Directive.

Section 50(1)(f) requires the road authority to make its EIA screening determination available for inspection by members of the public, and to make an electronic version of it available on its website. Galway City Council's EIA screening determination was made available for public inspection on the 29th of August 2022 and an electronic version of it was published on its website *https://www.galwaycity.ie/busconnects-galway-cross-city-link* on the 29th of August 2022 in accordance with s.50(1)(f) of the Roads Act.

In accordance with section 50(1B) of the Roads Act, it is the road authority, in this case Galway City Council, that shall prepare the EIAR in respect of the proposed development that is subject to a requirement for EIA.

This EIAR has been prepared to comply with the requirements for a valid EIAR as set out in:

- The Roads Act 1993, as amended by S.I. No. 279/2019 – European Union (Roads Act 1993) (Environmental Impact Assessment) (Amendment) Regulations 2019
- The Roads Regulation 1994 (S.I. No. 119/1994) as amended by S.I. No. 279/2019 – European Union (Roads Act 1993) (Environmental Impact Assessment) (Amendment) Regulations 2019
- S.I. No. 296/2018 - European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, (hereafter referred to as the 2018 EIA Regulations), and
- Article 5 of and Annex IV to the EIA Directive 2011/92/EU as revised by Directive 2014/52/EU.

1.5.2 Relevant Policy, Plans and Guidelines

This EIAR has been prepared in accordance with, but not limited to, the following legislation and guidance:

- The Environmental Impact Assessment Directive (Directive 2011/92/EU as revised by Directive 2014/52/EU);
- Roads Act 1993, (as amended);
- Roads Regulations 1994, (as amended);
- Climate Action and Low Carbon Development Act 2015, as amended;
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA, May 2022);

- Department of Housing, Planning and Local Government (DHPLG) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (hereafter referred to as the 2018 Guidelines) (DHPLG 2018);
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (hereafter referred to as the European Commission EIAR Guidance) (European Commission 2017);
- European Commission (2006). Clarification of the application of Article 2(3) of the EIA Directive.
- European Commission (2012). Interpretation suggested by the Commission as regards the application of the EIA Directive to ancillary/associated works.
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission 2013);
- Clarification of the application of Article 2(3) of the EIA Directive (European Commission, 2006).
- Interpretation suggested by the Commission as regards the application of the EIA Directive to ancillary/associated works (European Commission 2012).
- National Roads Authority (NRA) Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA 2008); and
- Advice Note 17: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects (The Planning Inspectorate 2019).

Key policy documents that inform the examination of all environmental topic areas include:

- Project Ireland 2040 National Planning Framework (Government of Ireland 2018);
- Project Ireland 2040 National Development Plan 2021 – 2030 (Government of Ireland 2021);
- Climate Action Plan 2021 (Government of Ireland 2021);
- Smarter Travel: A Sustainable Transport Future: A New Transport Strategy for Ireland 2009 – 2020 (DTTAS 2009);
- Northern and Western Regional Assembly (NWRA) Regional Spatial & Economic Strategy 2020-2032 (RSES);
- Galway Transport Strategy (2016);
- Galway City Development Plan (2017-2023);
- Galway County Development Plan (2022-2028), including the Metropolitan Area Strategic Plan;
- Draft Galway City Development Plan (2023-2029).

This EIAR takes into account the results of the Strategic Environmental Assessment (SEA) of the above policy documents, where applicable.

In addition to the applicable EIA legislation and guidance, European Union (EU) and national legislation relating to the specialist areas have also been considered as part of the process and are addressed in the relevant assessment chapters.

1.5.3 EIA Process

EIA is a systematic and an iterative process that examines the potential environmental impacts of a proposed scheme and establishes appropriate design and mitigation measures to avoid, reduce or offset impacts. The assessment of anticipated and predicted significant environmental impacts from the Proposed Scheme has been conducted in accordance with best practice as detailed in the chapters and associated appendices for each environmental topic.

The EIA process followed for the assessment of the Proposed Scheme can be summarised as follows:

- Screening – Determining whether or not an EIA is required for the Proposed Scheme. This included a review of the Proposed Development and understanding the legislative requirement for EIA under the Roads Act 1993;
- Consideration of the EIAR's Scope – For the preparation of this EIAR the EIA team considered the characteristics of the Proposed Scheme and the likely relevant issues which could arise due to its construction and operation;
- Consideration of reasonable alternatives – refer to Chapter 3.
- Baseline Data Collection – Establishment of a robust baseline of the existing environment in the study area of the Proposed Scheme, including a review of existing available information and undertaking any surveys identified as required during the Scoping phase;
- Impact Assessment – Assessment of the potential environmental impacts of the Proposed Scheme with and without mitigation measures, and an iterative process of informing design to avoid impacts;
- Mitigation – Formulation of mitigation measures to ameliorate the potential impacts of the Proposed Scheme which cannot be avoided through design;
- Consultation – With Statutory Authorities, Stakeholders, the public and other bodies;
- Reasoned conclusion - The Competent Authority, in this case ABP, on the significant effects of the Project on the environment, based on the examination of the EIA Report.
- Decision – The competent authority, in this case ABP, will decide if the Proposed Scheme can be authorised, and if so, may specify conditions that must be adhered to;
- Announcement – The public is informed of the decision;
- Right of review – The public concerned have the right to seek a legal review of the decision, subject to meeting the necessary procedural requirements; and
- Monitoring – When required, monitoring of the effectiveness of implemented mitigation measures during construction and operation.

1.5.4 Screening and the Legislative Requirement for EIA

Screening is the first stage of the EIA process, whereby a decision is made on whether or not an EIA is required. As set out in section 1.5.1 (Statutory Requirements), Section 50(1)(a) of the Roads Act provides that EIA is mandatory for the following project types:

- *(i) The construction of a motorway;*

- *(ii) The construction of a busway;*
- *(iii) The construction of a service area;*
- *(iv) Any prescribed type of road development consisting of the construction of a proposed public road or the improvement of an existing public road'.*

The Road Regulations prescribe the following for the purposes of Section 50(1)(a)(iv):

- *'(a) The construction of a new road of four or more lanes, or the realignment or widening of an existing road so as to provide four or more lanes, where such new, realigned or widened road would be eight kilometres or more in length in a rural area, or 500 metres or more in length in an urban area'; and*
- *'(b) The construction of a new bridge or tunnel which would be 100 metres or more in length.'*

The Proposed Scheme does not fall within any of these categories or criteria, therefore it is necessary to carry out screening to determine whether *the construction of a proposed public road or the improvement of an existing public road would be likely to have significant effects on the environment*, as provided under Section 50(1)(c). Section 50(1)(e) of the Roads Act requires the screening to be carried out by reference to the criteria specified in Annex III of the EIA Directive.

Galway County Council made an EIA screening determination on the 29th of August 2022 which was notified to ABP in writing on the 29th of August 2022 in accordance with section 50(1)(c) of the Roads Act, and which was made available for inspection by the public on the 29th of August 2022 and published on *https://www.galwaycity.ie/busconnects-galway-cross-city-link* on 29th of August 2022 in accordance with section 50(1)(f) of the Roads Act. Following the consideration of the accumulation of the environmental effects of the Proposed Scheme, it was concluded by Galway City Council, in accordance with the statutory scheme, that the Proposed Scheme has the potential to have a significant effect on the environment, and that an Environmental Impact Assessment Report be prepared.

1.5.5 Consideration of the EIAR Scope

The scope of the EIA was developed having regard to the characteristics of the Proposed Scheme and all likely relevant issues which could arise due to its construction and operation.

In addition, during the development of the EIAR, prescribed bodies and relevant non-statutory consultees (Section 1.6 of this Chapter) were consulted to apprise them of the proposed approach to the EIAR and they were afforded the opportunity to provide comment on the approach.

Comments received during this consultation with prescribed bodies and non-statutory bodies were reviewed and considered in the preparation of this EIAR.

Moreover, as a result of the non-statutory public consultation in respect of the Proposed Scheme, submissions and observations received from the public were considered and, where appropriate, included in the EIAR.

1.5.6 Contents of EIAR

As set out in the European Commission's Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (2017):

"the EIAR is the document prepared by the developer that presents the output of the assessment. It contains information regarding:

- *the Project;*
- *the likely significant effect of the Project;*
- *the Baseline scenario;*
- *the proposed Alternatives;*
- *the features and Measures to mitigate adverse significant effects;*
- *as well as a Non-Technical Summary; and*
- *any additional information specified in Annex IV of the EIA Directive."*

The EPA EIA Guidelines (EPA, 2022) set out a similar description of the EIAR, based on the EIAR definition in the revised EIA Directive 2014/52/EU.

Article 5 of and Annex IV to the EIA Directive, as well as and Section 50(2) of the Roads Act specify the information to be contained in an EIAR in relation to this Proposed Scheme.

For clarity on the information to be contained in the EIAR, the relevant sections of the legislation are reproduced in
Table 1.1.

Table 1.1: Annex IV of the EIA Directive

Annex IV – Information Referred to in Article 5(1) (Information for the EIAR)
1. Description of the project, including in particular: • A description of the location of the project; • A description of the physical characteristics of the whole project, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases; • A description of the main characteristics of the operational phase of the project (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; and • An estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases.
2. A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

Annex IV – Information Referred to in Article 5(1) (Information for the EIAR)
3. A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.
4. A description of the factors specified in Article 3(1) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydro morphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.
5. A description of the likely significant effects of the project on the environment resulting from, inter alia: • The construction and existence of the project, including, where relevant, demolition works; • The use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; • The emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; • The risks to human health, cultural heritage or the environment (for example due to accidents or disasters); • The cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; • The impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; • The technologies and the substances used. The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project.
6. A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.
7. A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.

Annex IV – Information Referred to in Article 5(1) (Information for the EIAR)
8. A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.
9. A non-technical summary of the information provided under points 1 to 8.
10. A reference list detailing the sources used for the descriptions and assessments included in the report'.

Section 50(2) of the Roads Act 1993 specifies the information to be contained in an EIAR and is reproduced in Table 1.2.

Table 1.2: Section 50(2) of the Roads Act

Section 50(2) of the Roads Act
"50(2) The road authority or the Authority, as the case may be, shall ensure that an environmental impact assessment report referred to in subsection (1B) — • *(a) is prepared by competent experts;* • *(b) subject to subsection (3), contains the following information:* *(i) a description of the proposed road development comprising information on the site, design, size and other relevant features of the development;* *(ii) a description of the likely significant effects of the proposed road development on the environment;* *(iii) a description of any features of the proposed road development and of any measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;* *(iv) a description of the reasonable alternatives studied by the road authority or the Authority, as the case may be, which are relevant to the proposed road development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed road development on the environment;* *(v) a non-technical summary of the information referred to in subparagraphs (i) to (iv);* *(vi) any additional information specified in Annex IV that is relevant to the specific characteristics of the particular proposed road development or type of proposed road development and to the environmental features likely to be affected,* *and* • *c) takes into account the available results of other relevant assessments carried out pursuant to any Act of the Oireachtas or under European Union legislation with a view to avoiding duplication of assessments."*

1.5.7 EIAR Structure

In order to ensure accessibility and to cover each of the topics included in Table 1.1, this EIAR presents the data in line with the outline structure provided in Table 1.3. The EIAR for the Proposed Scheme is presented in four volumes as follows:

- Volume 1 – Non-Technical Summary: This summarises the findings of the EIAR in a clear, accessible format that uses non-technical language and supporting graphics. The non-technical summary describes the proposed development, alternatives considered, existing environment, impacts and mitigation measures and relevant aspects of the EIAR in a manner that can be easily understood by the general public.
- Volume 2 – Main Report: This includes introductory chapters in addition to 'assessment' chapters for each environmental topic in accordance with Article IV of the EIA Directive. The introductory chapters provide the relevant project context whilst the assessment chapters provide a description of the relevant environmental topics and likely significant impacts with summary chapters provided thereafter.
- Volume 3 – Figures: This provides the drawings, maps and graphics (including photomontages) which support and are cross-referenced in Volume 2.
- Volume 4 – Appendices: This provides the technical reports that support and are cross-referenced within Volume 2. This includes other relevant drawings, modelling outputs, background reports and/or supporting documents.

Table 1.3: EIAR Structure

EIAR	Description
Volume 1: Non-Technical Summary	
NTS	Summary of the EIAR in non-technical language.
Volume 2: Main Report	
1	Introduction & Environmental Impact Assessment Process
2	Need for the Proposed Scheme
3	Consideration of Reasonable Alternatives
4	Proposed Scheme Description
5	Construction
6	Traffic & Transport
7	Air Quality
8	Climate
9	Noise & Vibration
10	Population
11	Human Health
12	Biodiversity
13	Water
14	Land, Soils, Geology & Hydrogeology
15	Archaeological Cultural Heritage and Architectural Heritage
16	Landscape (Townscape) and Visual
17	Waste & Resources
18	Material Assets
19	Risk of Major Accidents and / or Disasters
20	Cumulative Impacts and Environmental Interactions
21	Summary of Mitigation & Monitoring Measures
22	Summary of Significant Residual Impacts

EIAR	Description
Volume 3: Figures	
Figures	Graphics and plans supporting the EIAR chapters, illustrating the Proposed Scheme and environmental information. Figure reference numbers correspond to the relevant EIAR chapter (e.g. Figure 8.1 relates to Chapter 8)
Volume 4: Appendices	
Appendices	Technical reference information supporting the EIAR chapters, such as calculations and detailed background data. Appendix numbers correspond to the relevant EIAR chapter (e.g. Appendix 8.1 relates to Chapter 8)

While the EIAR has been prepared in compliance with the EIA Directive, it has also been written to make it accessible to a wider, non-specialist audience. Where technical terminology is used, an explanation is provided in the text, and / or in the glossary of terms which is provided at the beginning of Volume 2 of the EIAR.

Generally, the structure of Volume 2 (Environmental Assessment) Chapters of this EIAR aligns with both the European Commission EIAR Guidance (2017) and EPA Guidelines (EPA, 2022), and includes the following headings:

- Introduction: Provides an overview of the aims and objectives of the specific chapter in assessing the Proposed Scheme and outlines the scope of the assessment;
- Methodology: Describes the forecasting methods and evidence used to identify and assess the significant impacts on the environment;
- Baseline Environment: The baseline refers to the current state of environmental characteristics. It involves the collection and analysis of information on the condition, sensitivity and significance of relevant environmental topics which are likely to be significantly impacted by the Proposed Scheme;
- Predicted Impacts: Reporting in the EIAR is structured to ensure that criteria and standards of significance, sensitivity and magnitude used as part of the assessment are identified and documented and that the level of certainty of data is recorded. An explanation is provided for the assessment criteria that have been applied within each environmental topic area, including reference to the appropriate published guidance and the results of any other relevant assessments under other EU law;
- Mitigation and Monitoring Measures: This section sets out measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse impacts on the environment and, where appropriate, identifies any monitoring arrangements. This section covers both the Construction and Operational Phases; and
- Residual Impacts: Any significant impacts that are predicted to remain after all mitigation measures have been implemented are referred to as ‘Residual Impacts’. These are the remaining environmental impacts of the Proposed Scheme that could not be reasonably avoided.

A number of the Environmental Assessment chapters also consider a ‘Do-Nothing’ scenario. This scenario outlines what is likely to happen to the environment should the Proposed Scheme not be implemented, taking account of the continuation or change of current management regimes as well as the continuation or change of trends currently evident in the environment.

In line with Transport Infrastructure Ireland's (TII) most recent Traffic and Transport Assessment Guidelines (TII 2014), Chapter 6 (Traffic & Transport) considers a 'Do-Minimum' and a 'Do-Something' scenario. A 'Do- Minimum' scenario considers conditions where permanent improvements or changes to the road or public transport network that have taken place, or have been approved to take place, but the Proposed Scheme is not constructed. The 'Do Something' scenario considers where the Proposed Scheme is constructed and all elements of the design are implemented. The Do-Minimum and Do-Something scenarios are also assessed in assessments that rely on traffic outputs such as Air Quality (Chapter 7), Climate (Chapter 8) and Noise & Vibration (Chapter 9).

The assessments evaluate the Construction and Operational Phases of the Proposed Scheme, with the likelihood, extent, magnitude, duration and significance of potential impacts described. The interactions in impacts between different environmental aspects and the potential for cumulative impacts to arise are also considered. For all environmental topics, the significance of any residual impacts remaining are assessed and presented.

The assessment criteria used generally follow the European Commission EIAR Guidance (European Commission 2017) and EPA EIAR Guidelines (EPA 2022), as reproduced in Table 1.4 unless otherwise stated and described within the relevant EIAR Chapter.

Table 1.4: Description of Effects from the EPA Guidelines (EPA 2022)

Assessment Criteria	
Quality of Effects	
It is important to inform the non-specialist reader whether the effect is positive, negative or neutral.	Positive Effects A change which improves the quality of the environment (for example, by increasing species diversity or improving the reproductive capacity of an ecosystem; or by removing nuisances; or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative / Adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing a nuisance).
Significance of Effects	
'Significance' is a concept that can have different meanings for different topics – in the absence of specific definitions for the different topics the following definitions may be useful.	Imperceptible An effect capable of measurement but without noticeable consequences.
	Not Significant An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
	Very Significant Effects

Assessment Criteria	
	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment
	Profound Effects An effect which obliterates sensitive characteristics
Extent and Context of Effects	
Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced.	Extent Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Context Describe whether the extent, durations, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Probability of Effects	
Descriptions of effects should establish how likely it is that the effect will occur so that the Competent Authority can take a view of the balance of risk over advantage when making a decision.	Likely Effects The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Duration and Frequency of Effects	
'Duration' is a concept that can have different meanings for different topics in the absence of specific definitions for different topics the following definitions may be useful.	Momentary Effects Effects lasting from seconds to minutes.
	Brief Effects Effects lasting less than a day.
	Temporary Effects Effects lasting less than a year.
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years.
	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years.
	Reversible Effects Effects that can be undone, for example through remediation or restoration.
	Frequency of Effects Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)

1.5.8 Details of Competent Experts

This EIAR for the Proposed Scheme has been prepared by a team of competent experts and the main author(s) and details of the expertise of each competent expert for each environmental topic are provided in Table 1.5.

Table 1.5 : Details of Competent Experts

Topic	Main Author – Competency Details
Chapter 1 (Introduction & Environmental Impact Assessment Process)	**Sinead Whyte MSc CMIWEM, Arup** Sinead Whyte is an Associate Director with Arup and has over 25 years' experience as an Environmental Consultant. She holds a MSc in Experimental Physics and is Chartered for over 15 years with the Institute of Water and Environmental Management. She has been responsible for the preparation of EIARs for numerous major infrastructure schemes including a number of EIAR prepared for Dublin BusConnects schemes. Sinead presented expert witness evidence at the An Bord Pleanála oral hearings into these developments. Sinead Whyte was the lead co-ordinator for the Proposed Scheme EIAR and supervised the preparation of Chapter 1 of the EIAR. **Brian Burke BE CEng, Arup** Brian Burke is an Associate with Arup and has over 18 years' experience as a Transportation Engineer. He holds a degree in Civil Engineering and is a Chartered member of Engineers Ireland. He has lead and managed design teams for multiple transportation related schemes, including BusConnects Dublin, Little Island Sustainable Transport Interventions, Lough Atalia Bridge Road Lowering Project and Bothar na dTreabh (N6) Multi-Modal Corridor Improvement Scheme. Brian presented expert witness evidence at the An Bord Pleanála oral hearings for the Galway Harbour Expansion Oral Hearing and a proposed large retail development in Galway City. Brian Burke was the Project Manager for the BusConnects Galway: Cross-City Link (University Road to Dublin Road) project and supervised the review of Chapter 1 of the EIAR. **Donal McDaid BEng, MSc, Arup** Donal McDaid is a Director and leads Arup's Transport & Resources Group in Arup Ireland. Donal has over 25 years' experience working on, and leading multi-disciplinary teams on transport planning and environmental studies and large-scale transport infrastructure project planning, design and implementation, both in Ireland and overseas. Donal is the Arup director with overall responsibility for the Arup involvement in the 12 EIARs for Dublin Bus Connects. Donal was the Project Director for the BusConnects Galway: Cross-City Link (University Road to Dublin Road) project and approved Chapter 1 of the EIAR.
Chapter 2 (Need for the Proposed Scheme)	**Sinead Whyte** See above **Brian Burke** See above **Donal McDaid** See above
Chapter 3 (Consideration of Reasonable Alternatives)	**Sinead Whyte** See above

Topic	Main Author – Competency Details
	Brian Burke See above **Donal McDaid** See above
Chapter 4 (Proposed Scheme Description)	**Sinead Whyte** See above **Brian Burke** See above **Donal McDaid** See above
Chapter 5 (Construction)	**Sinead Whyte** See above **Brian Burke** See above **Donal McDaid** See above
Chapter 6 (Traffic & Transport)	**Sean Kearns MSc SYSTRA** Sean is a Senior Director in SYSTRA's consultancy business with 20 year's professional experience in transport modelling and appraisal. He is the technical director for the development of the NTA's Regional Modelling System and has participated in the development of numerous significant transport strategies and appraisal projects throughout Ireland. **Michael Hornung MSc, BA, SYSTRA** Michael is a Principal Consultant working in SYSTRA's consultancy business with over 6 years of experience in transport modelling and has prior work experience in the aviation industry. He holds a MSc in Transport Planning and Engineering and a B.A. in Business Economics. Michael is leading the transport modelling work for the Galway Cross City Link Project which is a key input to Chapter 6 of the EIAR.
Chapter 7 (Air Quality)	**Sinead Whyte** See above

Topic	Main Author – Competency Details
	Elsie O'Gorman, BEng MIEI iChemE, Arup Elsie is a Design Engineer in Arup's Environmental Consulting team. Elsie graduated from University College Cork in 2019 with a BEng (Hons) in Process and Chemical Engineering. Elsie is experienced in air quality and climate impact assessments for planning across a range of different projects including infrastructure and industrial schemes.
Chapter 8 (Climate)	**Sinead Whyte** See above **Elsie O'Gorman** See above
Chapter 9 (Noise & Vibration)	**Mhairi Riddet BSc, MSc, MIOA, Arup** Responsibility: Undertaking of noise and vibration impact assessment and preparation of Chapter 9. Mhairi Riddet is an experienced acoustic consultant, with over 5 years of specialist experience, and over 10 years of general project experience. She holds an MSc in Acoustic Engineering and is a Member of the Institute of Acoustics. Mhairi has prepared numerous acoustic assessments for planning purposes, both in Ireland and Australia, and has experience assessing noise for many different purposes. **David Hiller, BSc, MSc, PhD, Arup** David has managed and undertaken a diverse range of infrastructure and buildings projects, covering planning, environmental and building design aspects. He has provided expert witness for a variety of planning and litigation inquiries, including acting on behalf of hospitals and a theatre potentially affected by vibration from Dublin Metro North, a legal claim in the High Court in Dublin relating to construction traffic vibration, and providing expert evidence in relation to noise from shale gas exploration in NW England. David is a member of the British Standards committees that revised BS5228 on construction noise and vibration and BS8233 on sound insulation for buildings. He is on the Association of Noise Consultants' panel revising the Guidelines on Measurement and Assessment of Groundborne Noise and Vibration.
Chapter 10 (Population)	**Paul Fingleton BSc, MSc.** Paul is a member of the International Association for Impact Assessment as well as the Institute of Environmental Management and Assessment. Paul has over twenty years' experience working in the area of Environmental Assessment. Paul has been involved in a diverse range of projects including contributions to, and co-ordination of, a number of complex EIARs, NISs and / or IPPCL Applications for projects. **Conor Crowther BSc, MSc.**

Topic	Main Author – Competency Details
	Conor attained a masters degree from the University of Akureyri where his masters thesis focussed on an environmental assessment of a theoretical offshore wind farm development in Ireland. Conor is a corporate member of the Irish Planning Institute and sits on their Marine Spatial Planning Committee. Conor has experience working as part of team projects and in the preparation of planning documents and EIAR chapters on behalf of multi-nationals and infrastructural providers, such as pharmaceutical, waste management, renewable energy and IT manufacturing providers. Conor also liaises with the various government agencies and local authorities as part of the preparation of the various planning documentation and EIAR chapters.
Chapter 11 (Human Health)	**Paul Fingleton** See above **Conor Crowther** See above
Chapter 12 (Biodiversity)	**Ger O'Donoghue B.Sc. M.Sc.** Ger has carried out a large number of 'Appropriate Assessments' over the past 12 yrs. as required under the EU Habitats Directive for developments likely to have significant impacts on Natura 2000 European sites. He has also carried out Appropriate Assessments and produced Natura Impact Reports for a number of plans including Masterplans, Local Area Plans and Town Development Plans. He has monitored the Clare River at Claregalway, a key site for the all-Ireland Daubenton's Bat Survey for 12 yrs. and is part of a team that surveys the Lydacan Castle roost in the Coole-Garryland Complex SAC for the Brown long eared bat monitoring programme for Bat Conservation Ireland and the NPWS. He is a member of BirdWatch Ireland, the Irish Whale & Dolphin Group and Bat Conservation Ireland and the Chairperson of the Galway Bat Group. Ger is a guest lecturer on the M.Sc. in Biodiversity and Land Use Planning Course in NUI Galway and the Applied Marine and Freshwater and Agricultural Science Courses at GMIT.
Chapter 13 (Water)	**Mesfin Desta PhD FIEI, Arup.** Mesfin Desta is a Principal Hydrologist with Arup and has over 16 years of experience as a hydrologist. He holds a PhD in Civil Engineering (thesis in hydrology) from UCD and MSc in Engineering Hydrology from NUI Galway. He is a chartered member and Fellow of Engineers Ireland since 2006. He has been responsible for the preparation of Water/Hydrology Chapters of EIAR's for various projects including transport infrastructures, wind farms, Strategic Housing Developments, etc. Mesfin Desta prepared the Water chapter.
Chapter 14 (Land, Soils, Geology & Hydrogeology)	**Marie Fleming BSc (Hons), MSc. Arup** Marie is an Associate working in the Ground Engineering team in Arup and has a Bachelor of Science (Earth Sciences) honours degree from University College Cork and a Master's Degree in Engineering Geology from Imperial College London. Marie has over 18 years professional experience on large

Topic	Main Author – Competency Details
	infrastructure projects and is a Professional Geologist (PGeo) with the Institute of Geologists of Ireland (IGI), a Chartered European Geologist (EurGeol) with the European Federation of Geologists and a Fellow of the Geological Society of London (GSL). She has prepared numerous Land, Soils, Geology & Hydrogeology Impact Assessments for infrastructural developments including DART Underground and the M7 Osberstown Interchange and R407 Sallins Bypass.
Chapter 15 (Archaeological Cultural Heritage and Architectural Heritage)	**Faith Bailey BA, MA, MCIFA, IAC** Faith is a Senior Archaeologist and Cultural Heritage Consultant with IAC Ltd. She holds an MA in Cultural Landscape Management and a BA in single honours archaeology from the University of Wales, Lampeter. She is a licence eligible archaeologist and has over 20 years' experience working in commercial archaeology. Faith's in-depth knowledge of the planning systems and heritage legislation within both the Republic of Ireland and Northern Ireland, twinned with the excellent working relationship she has developed between our clients and statutory authorities makes her one of the most experienced archaeological and cultural heritage consultants currently operating within the sector. Faith has significant experience in the preparation of Briefs of Evidence and taking the stand as the expert witness at Oral Hearings. Projects that have successfully been brought through Oral Hearing include large infrastructural schemes and SID projects.
Chapter 16 (Landscape (Townscape) & Visual)	**David Bosonnet, BAgSc, Brady Shipman Martin** David is a qualified and senior Landscape Architect at Brady Shipman Martin, landscape, planning, and visualisation professionals. He has over 26 years' experience as a landscape architect, working on over 125 landscape and visual assessments for a wide range of projects including industrial, pharmaceutical, roads, residential, energy, waste, quarries, and on-shore wind farm proposals throughout Ireland. He also has extensive experience in the detail design and implementation of landscape projects, as well as landscape management and maintenance. He is a co-author of TII's Standards Document 'Landscape character assessment (LCA) and landscape and visual assessment (LVIA) for proposed national roads (TII, 2020)' and TII's technical document for LCA/LVIA for linear infrastructure in Ireland.
Chapter 17 (Waste & Resources)	**Janet Lynch BEng, MCTWM, MIEI CEng, Arup** Janet Lynch is a Senior Project Engineer with Arup with over 17 years' experience in Industrial Emissions licensing, EIA and planning including, Resource and Waste Management: Construction and operational waste management plans, Energy from Waste, waste re-use, recycling and landfill, Innovative waste treatment technologies; Planning and EIA project management (energy, renewables, industrial, infrastructure); Industrial Emissions (IE) License applications & review (waste, biomass, oil and gas, energy, cement, pharmaceutical); Circular Economy; Water: Tender Assessments for Irish Water and Dublin City Council; Assistant Project Manager for the expansion of Irelands largest water treatment plant at Ballymore Eustace, Co. Kildare in 2006. Janet holds an honours degree in Civil and Environmental Engineering from University College Cork, a FETAC Certificate in Waste Facility Management and a Certificate in Applied Project Management from the IEI and University Limerick. She is a Chartered member of the Chartered Institution of Wastes Management (MCTWM) and a Chartered Member of Engineers Ireland.

Topic	Main Author – Competency Details
	Hannah Lesbirel MEnvSci, GradIEMA, Arup Hannah Lesbirel is a Consultant with ARUP. She holds an honours master's degree in Environment Science from University of Southampton. Hannah has 4 years' relevant experience and in particular, develops technical and operational solutions for waste management for strategic reporting. Hannah develops strategic solutions for waste management across a variety of types of projects, from small to large and city scale developments. Hannah has experience as waste and resource specialist for several environmental planning and permitting works, contributing to the generation of baseline reports and environmental statement chapters for waste and resource management, reviewing planning applications and discharge of conditions including London Legacy Development Corporation, confidential mixed used skyscraper, London and Thames Water Upgrade Works.
Chapter 18 (Material Assets)	**Sinead Whyte** See above
Chapter 19 (Risk of Major Accidents and / or Disasters)	**Sinead Whyte** See above
Chapter 20 (Cumulative Impacts & Environmental Interactions)	**Sinead Whyte** See above
Chapter 21 (Summary of Mitigation & Monitoring Measures)	**Sinead Whyte** See above
Chapter 22 (Summary of Significant Residual Impacts)	**Sinead Whyte** See above

1.6 Consultation

1.6.1 Consultation Objectives

Public participation has been an integral part of the evolution of the Proposed Scheme from the outset to seek feedback and participation throughout its development. Galway City Council has undertaken a comprehensive consultation and engagement process with stakeholders, landowners and members of the public throughout the design progression of the Proposed Scheme. In fact, the consultation process for the concept of the Proposed Scheme commenced with its inclusion in the GTS and Galway City Development Plan, refer to Chapter 2 (Need for the Scheme) for further information.

The primary objective of the non-statutory public consultation process was and is to provide opportunities for members of the public and interested stakeholders to contribute to the Proposed Scheme planning and design and to inform the development process. Stakeholder participation in the planning and design of the Proposed Scheme was encouraged from an early stage through on-the-ground engagement, information campaigns and engagement with Elected Representatives.

The early involvement of the public and stakeholders ensured the views of various groups, individuals and stakeholders were taken into consideration throughout the development of the Proposed Scheme and in the preparation of this EIAR.

The non-statutory consultation process assisted in:

- The establishment of a sufficiently robust environmental baseline for the Proposed Scheme and its surroundings;
- The identification, early in the process, of specific concerns and issues relating to the Proposed Scheme so that they could be appropriately accounted for in the design and assessment scope; and
- Ensuring the appropriate involvement of the public and stakeholders in the assessment and design process.

1.6.2 Consultation Events and Stakeholder Engagement

Initial consultation with Stakeholders began in May 2017 with letters issued to 45 Stakeholders including Educational Institutions, Business Representatives, Statutory Undertakers, Public Transport Providers and Parking Providers amongst others. Follow-up face-to-face meetings with a number of these Stakeholders were held in June 2017.

Continuous consultation with the Elected Representatives of Galway City Council have taken place during the development of the scheme, including workshop events and presentations at Council Meetings. These began with a workshop in June 2018 and most recently a briefing to Councillors in July 2021.

Stakeholder workshops were held in relation to the Proposed Scheme, including a workshop organised by Galway City Council in relation to ongoing transportation projects within the city in October 2019. A Workshop Information event was also held with Cycling Stakeholders (representatives of numerous cyclist related groups) in November 2019.

A non-statutory public consultation on the emerging preferred scheme was also undertaken. Due to COVID-19 restrictions in place throughout 2020 and 2021, Galway City Council engaged in virtual and on-line non-statutory public consultation on the Cross-City Link project. In response to guidelines from the Irish Government and the National Public Health Emergency Team (NPHET), no information events were held in person. As a consequence, a virtual consultation was undertaken. The purpose of the non-statutory consultation was to encourage stakeholders to identify questions or issues they want Galway City Council and the design team to consider, as the project progresses through design and statutory processes. The consultation commenced on October 22nd, 2020 and the initial duration of the consultation period was 6 weeks.

Due to the reopening of the retail sector in December 2020, Galway City Council extended the non-statutory public consultation on the Cross-City Link project, to allow the business community in the city to engage at a point in time when their busiest season would be concluded, in January 2021.

In addition to the virtual information room, a series of engagement sessions with various stakeholders was held during the consultation period. Over 130 stakeholders were invited to 5 virtual 'sectoral' briefings, as part of the non-statutory public consultation. Invited stakeholders included public transport operators, community groups, emergency services, businesses, taxis operators, car park operators, educational institutions, transport consultancies, and cycling groups. A total of 36 stakeholders attended these meetings.

1.6.3 Summary of Main Issues Raised

The key issues raised during this consultation phase are summarised as follows:

- Public realm:
  - The provision of safer pedestrian and cyclist facilities in areas of public realm (refer to Chapter 6 (Traffic & Transport) for an assessment of pedestrian and cyclist facilities);
  - The greening of public areas including the provision of planters (refer to Chapter 16 (Landscape (Townscape) and Visual) for an assessment of landscaping proposals).
- Deliveries, access, parking:
  - The maintenance of access for deliveries (refer to Chapter 4 (Proposed Scheme Description) and Chapter 6 (Traffic & Transport) for a description of access arrangements);
  - Access by private car to the city centre (refer to Chapter 4 (Proposed Scheme Description) and Chapter 6 (Traffic & Transport) for a description of access arrangements);
  - The loss of parking (refer to Chapter 6 (Traffic & Transport) for an assessment of the loss of parking);

- Additional traffic:
  - The potential increases in journey times for private traffic (refer to Chapter 6 (Traffic & Transport) for an impact assessment of the Proposed Scheme on general traffic);
  - The impact of displaced traffic on alternative routes (refer to Chapter 6 (Traffic & Transport) for an impact assessment of the Proposed Scheme on affected alternative routes);
- Cyclist and pedestrian safety:
  - The design of the Proposed Scheme relative to cyclist safety (refer to Chapter 4 (Proposed Scheme Description) and Chapter 6 (Traffic & Transport) for a description of cycle facilities);
  - The provision of lighting and a design for vulnerable users (refer to Chapter 4 (Proposed Scheme Description) for a description of lighting proposals and how the Proposed Scheme accommodates all users);
- Land acquisition and devaluation of property:
  - The acquisition of land to develop the Proposed Scheme (refer to Chapter 10 (Population) for an assessment of land acquisition);
- Noise pollution:
  - Noise from buses and general traffic (refer to Chapter 9 (Noise & Vibration) for an assessment of noise impact at properties).

The issues raised by respondents were further considered during the ongoing design development of the Proposed Scheme.

1.6.4 Consultation with Prescribed Bodies and Interested Parties

In addition to the extensive non-statutory public consultation on the Proposed Scheme, Galway City Council and the design team undertook consultation and produced a report titled "*Information on the Approach to Environmental Assessment*". The report was issued to prescribed bodies and relevant non-statutory consultees (refer to Table 1.6) in October 2021.

Consultations were also conducted with organisations such as the National Parks and Wildlife Service (NPWS) and Transport Infrastructure Ireland (TII) and these are considered in the development of the relevant impact assessments chapters in Volume 2 of this EIAR.

Table 1.6: Prescribed Bodies and Interested Parties

Prescribed Bodies and Interested Parties	
An Chomhairle Ealaíon (the Arts Council)	Galway Chamber
An Garda Siochána	Galway City Council
An Taisce	Galway County Council
Bus Éireann	Galway Fire Service
Corrib Navigation Trust	Galway Harbour Company
Department of Agriculture, Food and the Marine	Gas Networks Ireland
Department of Defence	Geological Survey of Ireland
Department of Education	Health Service Executive

Prescribed Bodies and Interested Parties	
Department of Environment, Climate and Communications	Health and Safety Authority
Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media	Heritage Council
Department of Culture, Heritage & the Gaeltacht, Built Heritage & Architectural Policy	Inland Fisheries Ireland
Development Applications Unit, Department of Housing, Local Government & Heritage	Irish Rail
The National Monuments Service, Department of Housing, Local Government & Heritage	Irish Water
The National Parks & Wildlife Service, Department of Housing, Local Government & Heritage	National Ambulance Service Ireland
Department of Transport	National Transport Authority
Eirgrid	National University of Ireland (Galway)
Environmental Protection Agency	Northern & Western Regional Assembly
ESB Networks Ireland	Office of Public Works
Fáilte Ireland	Transport Infrastructure Ireland
	Waterways Ireland

The issues raised through the EIAR consultation can be summarised as follows:

Development Applications Unit, Department of Housing, Local Government & Heritage – noted that there are a significant number of designated archaeological sites along the Proposed Scheme.

In particular, the route will traverse the Zone of Archaeological Potential for Historic Galway (GA094-100----) and will cross the circuit of the medieval town defences (GA094-100001-) at multiple locations. The submission also noted the requirement for AA screening and recommends that all hydrological links between the project areas and the nearby designated sites be assessed. The content of this submission is dealt with in Chapter 12 Biodiversity, Chapter 13 Water, Chapter 14 Land, Soils, Geology and Hydrogeology, Chapter 15 Archaeological Cultural Heritage and Architectural Heritage, the Screening for Appropriate Assessment and the Natura Impact Statement (NIS).

Geological Survey – noted that a County Geological Site is located in the vicinity of the Proposed Scheme; St Augustine's Well. This is a freshwater spring emerging from underground karst limestone conduits, which flows a few metres into Lough Atalia from the cityside shore. The submission also notes that the proposed scheme is underlain by a 'Regionally Important Aquifer – Karstified (conduit)' and a 'Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones and the Groundwater Vulnerability map indicates both 'High' and 'Extreme' groundwater vulnerability. The content of this submission is dealt with in Chapter 14 Land and Soils.

Health and Safety Authority – noted that the proposed location of the temporary construction compounds and parts of the transport route are within the consultation distance (400m) for Circle K Energy Ireland terminal at New Docks. The content of this submission is dealt with in Chapter 19 Major Accidents and Disasters.

1.6.5 Landowners

During the preliminary design process, 23 no. land folios were identified as potentially requiring either full or partial acquisition in order to complete the Proposed Scheme. An investigation of the land registry database was undertaken to identify potentially impacted landowners.

In total 31 landowners were identified as potentially affected by the scheme including some lands in the ownership of the local authorities. Letters, outlining the scheme, were sent to identified landowners on 16 October 2020. Where landowners were not readily identifiable, letters were issued to the property. The letters issued contained a brief description of the scheme and a request for the landowner to make contact with the design team to discuss the impact of the scheme on their property.

Landowner meetings commenced in January 2021 and have occurred across all of 2021 and into 2022. Contact has been made with representatives of the majority of potentially impacted folios. There has been ongoing engagement with landowners whose properties are affected, as design development has progressed on the Proposed Scheme.

Over the course of the engagements, affected property owners have had the opportunity to discuss, among other things, the following aspects with Galway City Council and the Design Team:

- Overall scheme proposals and potential impacts;
- Timelines for the scheme design development and associated EIAR assessment;
- Procedural matters such as planning and CPO process;
- Specific details of impact of scheme on landowner property including approximate extent of encroachment; and
- General information around reinstatement and accommodation works.

1.7 References

DHPLG (2018). Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.

DTTAS (2009). Smarter Travel: A Sustainable Transport Future: A New Transport Strategy for Ireland 2009 – 2020.

EPA (2022). Guidelines of the Information to be contained in Environmental Impact Assessment Reports.

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

European Commission (2006). Clarification of the application of Article 2(3) of the EIA Directive.

European Commission (2012). Interpretation suggested by the Commission as regards the application of the EIA Directive to ancillary/associated works.

European Commission (2017). Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment"

EU (2013). Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment.

Galway City Development Plan (2017-2023).

Galway County Development Plan (2022-2028), including the Metropolitan Area Strategic Plan.

Draft Galway City Development Plan (2023-2029).

Government of Ireland (2018). Project Ireland 2040 National Planning Framework.

Government of Ireland (2021). Project Ireland 2040 National Development Plan 2021 – 2030.

Government of Ireland (2021). Climate Action Plan 2021.

GTS (2016) Galway Transport Strategy: An integrated transport management programme for Galway City and environs.

NRA (2008). Environmental Impact Assessment of National Road Schemes – A Practical Guide.

NWRA (2019) Regional Spatial & Economic Strategy 2020-2032 (RSES);

The Planning Inspectorate (2019). Advice Note 17: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects.

Transport Infrastructure Ireland (TII) (2014) Traffic and Transport Assessment Guidelines

Directives and Legislation

EIA Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU.

S.I. No 14 of 1993 - Roads Act 1993.

S.I. No 119 of 1994 - Roads Regulations 1994.

S.I. No. 296/2018 – European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

S.I. No. 279/2019 – European Union (Roads Act 1993) (Environmental Impact Assessment) (Amendment) Regulations 2019.

Chapter 02
Need for the Proposed Scheme

Contents

2 Need for the Scheme

2.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) outlines the need for the BusConnects Galway: Cross-City Link (University Road to Dublin Road) (hereafter referred to as the Proposed Scheme).

Our sustainable future relies on a built environment consisting of spaces and places that connects people and creates inclusive societies that are characterised by social cohesion. Sustainable transport infrastructure assists in creating more sustainable communities and healthier places, while also stimulating our economic development. It contributes to enhanced health and well-being when delivered effectively.

Traffic congestion in Galway has been an issue for decades. Congestion impacts on quality of life, the urban environment, safety of all road users and the economic performance of Galway City as the Gateway and economic driver of the West of Ireland Region. Its impact extends far beyond the city into the wider county and region, due to the large commuter population reliant on the city for employment and education.

The targeted population growth for Galway City is 50-60% (40,000-50,000 more people) by 2040 (as outlined in the National Planning Framework adopted 2018) (Government of Ireland, 2018). The growth of the city is already evident in the development of key sites including Bonham Quay and Crown Square, with other sites such as Sandy Road and Dyke Road earmarked for future investment and regeneration.

Responding to these challenges is supported by an extensive policy framework of International, European, National, Regional and Local policy, planning strategies and plans. The key policy and planning documents are described in Section 2.2, along with a summary of how the Proposed Scheme responds to the relevant objectives. Section 2.3 identifies the need to respond to current deficiencies in our transport system and how those deficiencies have shaped the development of the Proposed Scheme. The benefits from the provision of the Proposed Scheme are presented in Section 2.4.

2.2 Policy Context

The Proposed Scheme is supported by an extensive framework of International, European, National, Regional and Local policy, planning strategies and plans. This framework has strongly informed and influenced the aims and objectives for the Proposed Scheme as set out in EIAR Chapter 1 (Introduction).

The Proposed Scheme is a key measure that delivers on commitments within the National Development Plan (2021-2030), Galway Transport Strategy (2016) and the Climate Action Plan 2021.

For each policy, the following sections outline the key policy documents which the Proposed Scheme supports and how the Proposed Scheme responds to the relevant policy objectives.

Further information on the planning and policy context for the Proposed Scheme is provided in the Planning Compliance Report which is included in the planning application documentation.

2.2.1 International Policy

2.2.1.1 United Nations 2030 Agenda

In September 2015, Transforming Our World, the 2030 Agenda for Sustainable Development was adopted by all 193 Members States of the United Nations (UN, 2015) (hereafter 'UN's 2030 Agenda'). The UN's 2030 Agenda aims to deliver a more sustainable, prosperous, and peaceful future for the entire world, and sets out a framework for how to achieve this by 2030. This framework is made up of 17 Sustainable Development Goals (SDGs) (Diagram 2.1) which cover the social, economic, and environmental requirements for a sustainable future.

Diagram 2.1: The 17 Sustainable Development Goals

The SDGs are integrated, recognising that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability.

SDGs 3, 8, 9, 11 and 13 and the associated targets are relevant to the Proposed Scheme as presented in Table 2.1.

Table 2.1: Sustainable Development Goals and targets relevant to Proposed Scheme

Sustainable Development Goals (SDGs)	SDG Target
Goal 3: Ensure healthy lives and promote well-being for all at all ages.	Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

Sustainable Development Goals (SDGs)	SDG Target
Goal 8 - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.	Target 8.9: By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products.
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.	Target 9.1: Develop quality, reliable, sustainable, and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human wellbeing, with a focus on affordable and equitable access for all.
Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable.	Target 11.2: By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.
Goal 13: Take urgent action to combat climate change and its impacts.	Target 13.2: Integrate climate change measures into national policies, strategies and planning.

In Ireland, the SDGs are being implemented through the National Implementation Plan 2018-2020[1] (DCCAE, 2018), which is in direct response to the UN's 2030 Agenda. More information on the National Implementation Plan is presented in Section 2.2.3.11.

The Proposed Scheme supports the SDG goals and targets set out in the relevant SDGs. It will provide for enhanced walking, cycling and bus infrastructure, which will subsequently enable more efficient, safe and integrated sustainable transport movement in Galway City.

2.2.2 European Policy

2.2.2.1 Sustainable and Smart Mobility Strategy 2020

The Sustainable and Smart Mobility Strategy (European Commission, 2020) sets out a number of goals as to how people will move within and between cities in the future. It has identified 82 initiatives which have been categorised into 10 'flagships.'

The flagship of most relevance to the Proposed Scheme is 'Flagship 3 – Making interurban and urban mobility more sustainable and healthy'. It states that:

[1] A revised National Implementation Plan is due to be published in 2021. See Section 2.2.3.11.

'*Increasing the modal shares of collective transport, walking and cycling, as well as automated, connected and multimodal mobility will significantly lower pollution and congestion from transport, especially in cities and improve the health and well-being of people. Cities are and should therefore remain at the forefront of the transition towards greater sustainability*.'

A target of the Sustainable and Smart Mobility Strategy relevant to the Proposed Scheme is to double the number of safe cycle lanes in cities within the European Union to 5,000km in the next decade.

The Proposed Scheme supports the objectives of the EU's Sustainable and Smart Mobility Strategy through significant investment in bus priority, cycle and pedestrian infrastructure along the route of the Proposed Scheme, thereby supporting and encouraging growth in active travel and public transport usage.

2.2.2.2 European Union (EU) Green Deal 2019

The EU Green Deal (European Commission, 2019) sets out one of the most ambitious road maps for an entire continent to transition to a low carbon economy, as committed to in the Paris Agreement 2015[2]. It sets out key policies aimed at cutting emissions and preserving the natural environment. It commits the EU to becoming climate neutral by 2050, with a reduction of between 50 to 55% by 2030 when compared to 1990 emission levels. By focusing on transport, buildings, and energy, the EU Green Deal is setting out a process to help everybody work together and try and move in the same direction.

A key component of the EU Green Deal roadmap to transforming the EU's economy for a sustainable future is *'accelerating the shift to sustainable and smart mobility'*. It seeks to reduce the transport sectors greenhouse gas emissions by 90% by 2050. '*The EU transport system and infrastructure will be made fit to support new sustainable mobility services that can reduce congestion and pollution, especially in urban areas*'. It is noted that pollution is concentrated in cities and that a combination of measures are required such as '*improving public transport and promoting active modes of transport such as walking and cycling*.'

The Proposed Scheme supports the objectives of the EU Green Deal through investment in cycle and pedestrian infrastructure, in addition to bus priority, along the route of the Proposed Scheme, thereby supporting and encouraging growth in active travel and sustainable public transport usage.

2.2.3 National Policy

2.2.3.1 Project Ireland 2040 – National Development Plan 2021-2030 (NDP)

The Project Ireland 2040 is the government's long-term overarching strategy to make Ireland a better country for all its people.

[2] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

The National Planning Framework (hereafter referred to as the NPF) (Government of Ireland, 2018) and the National Development Plan (hereafter referred to as the NDP) (Government of Ireland, 2021) combine to form Project Ireland 2040. The NDP and the NPF, were adopted in May 2018 and an update to the NDP was published on 04 October 2021.

The NDP is the national capital investment strategy plan. Its sets out the framework of expenditure commitments to secure the Strategic Investment Priorities to the year 2030 and support the delivery of the 10 National Strategic Outcomes (NSOs) identified in the NPF. The NSOs directly related to the Proposed Scheme are described in Section 2.2.3.3 Table 2.2.

The NDP sets out a programme of investment that includes indicative capital expenditure allocations. Although the NDP does not specifically allocate funding to the Proposed Scheme, there are a number of funding avenues within the NDP that are relevant to the Proposed Scheme, including:

- €360 million per annum national active travel budget up to 2025; and
- €35 billion allocated to transport-related requirements detailed in the NDP.

This is supplemented by the October 2021 budget announcement allocating approximately €1.8 billion in 2022 for sustainable mobility, including active travel. In addition, almost €50 million of provisional funding under the Urban Regeneration & Development Fund has been specifically allocated to a Galway City Council Transport Connectivity Project and a Public Space and Street project in Galway City.

Under the heading ‘Major investments in this NDP’ the NDP sets out a selection of national infrastructure projects and ‘BusConnects for Ireland’s Cities’ is highlighted under the heading ‘NSO 4 - Sustainable Mobility’.

The NDP states under:

NSO4 ‘Sustainable Mobility’ that:

‘This NDP provides for significant investment in active travel, bus and rail infrastructure over the next ten years in terms of expanding sustainable mobility options in our cities, towns and villages, supporting our ambition for compact growth and seeking to develop our regional cities as centres of scale in line with the NPF targets. In the previous NDP, the Transport sector had an allocation of approximately €21 billion for the period 2018-2027. The revised NDP sets out further ambitious plans to enhance public transport, active travel options and the connectivity of communities throughout Ireland. Transport projects by their nature are delivered over a multi-year horizon. The scale of the Transport-related requirements under the revised NDP amounts to c. €35 billion in total over 2021-2030.’

‘The Climate Action Plan (CAP) recognises that Ireland must achieve a significant modal shift from car to active travel and public transport if we are to achieve our target of a 51% reduction in Green House Gas emissions by 2030 and ultimately net zero by 2050.

CAP sets a target for 500,000 additional daily active travel and public transport journeys by 2030 and investment planned under this NDP will be directed toward achieving that challenging target.'

It also highlights, with specific regard to BusConnects:

'Transformed active travel and bus infrastructure and services in all five of Ireland's major cities (including Galway City) is fundamental to achieving the overarching target of 500,000 additional active travel and public transport journeys by 2030.'

It continues:

'BusConnects will overhaul the current bus system in all five cities by implementing a network of 'next generation' bus corridors (including segregated cycling facilities) on the busiest routes to make journeys faster, predictable and reliable. BusConnects will enhance the capacity and potential of the public transport system by increasing and replacing the bus fleets with low emission vehicles.'

It further states that:

'Increasing the attractiveness of the bus systems in the cities will encourage modal shift away from private car use, leading to a reduction in congestion and associated costs in the major urban areas'.

NSO8 'Transition to a Climate-Neutral and Climate Resilient Society' identifies BusConnects under the Strategic Investment Priorities (Transport) and the need to shift away from carbon intensive transport systems. The NDP identifies specific measures including:

- *'Delivering priority public transport programmes including BusConnects, DART+ Expansion Programme and Metrolink so that increased transport demand is met by greener public transport;*
- *Replacing existing diesel public buses with lower emitting alternatives under the BusConnects programme, while promoting commercial bus services and small public service vehicle industry to use low-emission fleet;*
- *Encouraging a significant modal shift through greater levels of investment and further development of meaningful alternatives to private car uses under the following three major environmentally sustainable mobility schemes:*
  - *additional cycling and walking infrastructure which will provide additional sustainable mobility options to complement increased capacity and faster, higher quality public transport in our main cities;*
  - *travel demand management measures in the five cities; and*
  - *pilot initiatives for low emitting technologies in the transport sector.'*

The Proposed Scheme forming part of the overall BusConnects Programme is therefore identified as a 'Strategic Investment Priority' project, with an associated investment commitment, which has been determined as central to the delivery of the NPF vision.

The Proposed Scheme is an integral part of Ireland's efforts to reduce carbon by providing the infrastructure necessary to deliver a sustainable transport network.

The Proposed Scheme will facilitate targeted population growth in Galway City by meeting existing and future travel demand through investment in a sustainable transport network and services. As required in the NDP, the Proposed Scheme will provide the infrastructure needed to help facilitate a modal shift from private car to public transport, cycling and walking. It will also bring to fruition a key investment priority of the NDP to help deliver the full 'BusConnects programme'.

2.2.3.2 Department of Transport: Statement of Strategy 2021 – 2023

The Statement of Strategy (Department of Transport, 2021) sets out objectives, goals and an action based strategic approach which are designed to support continuing economic recovery, fiscal consolidation, job creation and social development. It notes that:

'Aligned with the National Planning Framework and the National Economic Plan we will maintain and develop high quality sustainable road, public transport and active travel networks to enable economic activity, essential services and social connections between and within our cities, regions and communities. Ireland's land transport system – comprising our road and rail networks, together with bus, rail and taxi services – is of fundamental importance to both societal and economic wellbeing.'

The Statement of Strategy includes an action commitment to 'support any necessary adaptation of our critical transport infrastructure and services in response to Ireland's changing climate appropriate public spending and investment in efficient, sustainable, integrated and accessible land transport networks and services.'

The Statement of Strategy mission is the implementation of the National Cycling Policy Framework 2009 – 2020 (see Section 2.2.3.6) and the Road Safety Strategy 2013 – 2020 (see Section 2.2.3.7):

'To deliver an accessible, efficient, safe and sustainable transport system that supports communities, households and businesses'.

The need for the Proposed Scheme is supported by Statement of Strategy mission to deliver an accessible and efficient transport system. The Proposed Scheme will contribute towards the Statement of Strategy mission by improving both bus and cycle infrastructure allowing for greater modal choices in Galway City.

2.2.3.3 Project Ireland 2040 - National Planning Framework (NPF)

The NPF is a 20-year planning framework which combines with the NDP to form Project Ireland 2040 which is the government's long-term overarching national planning strategy.

It aims to guide population and jobs growth over the next 20 years across all parts of Ireland, supported by a flexible and sustainable planning framework. The NPF informs all other planning policy documents including the Regional Spatial and Economic Strategy (see Section 2.2.4.1) and the Galway County Council Development Plan (see Section 2.2.5.2) and Galway City Development Plan (see Section 2.2.5.3).

The NPF's ambition is to create a single vision and a shared set of goals for each community to shape the growth and development of Ireland by providing a framework up to the year 2040. These goals are expressed as National Strategic Outcomes (NSO), shared benefits which the NPF will deliver if implemented according to the objectives of the NPF. Some of the NPF NSO's relevant for the Proposed Scheme are set out in Table 2.2 with a corresponding statement on how the Proposed Scheme meets each respective NSO objective.

Table 2.2: Strategic Outcomes of the NPF

National Strategic Outcome (NSO)	How the Proposed Scheme meets the NSO Objective?
NSO1 Compact Growth: '*Carefully managing the sustainable growth of compact cities, towns and villages will add value and create more attractive places in which people can live and work. All our urban settlements contain many potential development areas, centrally located and frequently publicly owned, that are suitable and capable of re-use to provide housing, jobs, amenities and services, but which need a streamlined and co-ordinated approach to their development, with investment in enabling infrastructure and supporting amenities, to realise their potential. Activating these strategic areas and achieving effective density and consolidation, rather than more sprawl of urban development, is a top priority*.'	The Proposed Scheme will bring greater accessibility to the city centre and improve connectivity between communities and locations along its route facilitating access to housing, jobs, amenities and services. The Proposed Scheme will enhance the capacity of the sustainable transport network, and as a consequence will help to achieve greater land use densities that will encourage compact growth in compliance with the objectives of NSO1.
NSO4 Sustainable Mobility: '*In line with Ireland's Climate Change mitigation plan, we need to progressively electrify our mobility systems moving away from polluting and carbon intensive propulsion systems to new technologies such as electric vehicles and introduction of electric and hybrid traction systems for public transport fleets, such that by 2040 our cities and towns will enjoy a cleaner, quieter environment free of combustion engine driven transport systems.*'	The Proposed Scheme will provide infrastructure to support a sustainable transport network that will facilitate a modal shift from private car usage to sustainable transport. It will reduce journey times and increase journey time reliability and increase the attractiveness of active travel and public transport for travel, which will in turn reduce fossil fuel usage in private travel. The Proposed Scheme will support integrated sustainable transport usage through infrastructure improvements for active travel (both walking and cycling), and the provision of enhanced bus priority measures for existing (both public and private) and all future services who will use the Proposed Scheme.

National Strategic Outcome (NSO)	How the Proposed Scheme meets the NSO Objective?
NSO5 A Strong Economy supported by Enterprise, Innovation and Skills: '*This will depend on creating places that can foster enterprise and innovation and attract investment and talent. It can be achieved by building regional economic drivers and by supporting opportunities to diversify and strengthen the rural economy, to leverage the potential of places. Delivering this outcome will require the coordination of growth and place making with investment in world class infrastructure, including digital connectivity, and in skills and talent to support economic competitiveness and enterprise growth*.'	The Proposed Scheme is a high-quality development that will provide the infrastructure required to facilitate sustainable transport options which will service the current and future transport needs of Galway City and surrounding areas. The Proposed Scheme represents a significant investment in transport infrastructure that will improve accessibility to Galway City, a city of regional significance, and land uses associated with the city, including economic, educational, amenity and social uses, for example.

Specifically, with regard to the Galway City and Metropolitan Area, the NPF states that:

'*The Galway Metropolitan area shares many of the challenges arising from growth and economic success with much larger cities. In common with Dublin, Galway needs to accommodate a greater proportion of the growth it generates within its metropolitan boundaries. Challenges to be addressed include housing choice and affordability, transport/ mobility and urban quality, especially outside the core-city centre area.*'

Under the heading 'Key future growth enablers for Galway include' it highlights that:

'*Provision of a Citywide public transport network, with enhanced accessibility between existing and proposed residential areas and the City Centre, third level institutions and the employment areas to the east of the city*.'

'Public realm and urban amenity projects, focused on streets and public spaces, particularly in support of an extended city centre area and where residential and employment areas can be linked to pedestrian routes'.

NSO 4 notes that:

'*major urban areas are too heavily dependent on road and private, mainly car based, transport with the result that our roads are becoming more and more congested. The National Development Plan makes provision for investment in public transport and sustainable mobility solutions to progressively put in place a more sustainable alternative*'.

BusConnects is referenced as a sustainable mobility solution, and the Proposed Scheme involves the implementation of this sustainable mobility solution through facilitating greater bus, cycle and pedestrian accessibility into, within and across Galway City.

At the core of the NPF is sustainability and more environmentally friendly development, which is implemented through the National Strategic Objectives (NSOs), Strategic Infrastructure Projects (SIPs) and accompanying National Policy Objectives (NPOs). In addition to the NSOs referenced above, there are a number of NPOs pertaining to the Proposed Scheme such as:

- *NPO 27 – "Ensure the integration of safe and convenient alternatives to the car into the design of our communities, by prioritising walking and cycling accessibility to both existing and proposed developments"*
- *NPO 52 – "The planning system will be responsive to our national environmental challenges and ensure that development occurs within environmental limits, having regard to the requirements of all relevant environmental legislation and the sustainable management of our natural capital"*
- *NPO 64 – "Improve air quality and help prevent people being exposed to unacceptable levels of pollution in our urban and rural areas through integrated land use and spatial planning that supports public transport, walking and cycling as more favourable modes of transport to the private car"*
- *NPO 75 – "Ensure that all plans, projects and activities requiring consent arising from the National Planning Framework are subject to the relevant environmental assessment requirements including SEA, EIA and AA as appropriate"*

The NPF also highlights the importance of the public realm and improving access to public transport in order to improve the 'liveability' of urban areas. The Proposed Scheme includes public realm improvements, to allow for greater access to public transport and to improve the liveability of the city. Further information on compliance with local policy on public realm is provided in Section 2.2.5.4.

2.2.3.4 National Sustainability Mobility Policy

The National Sustainable Mobility Policy (Department of Transport 2022) sets a framework for active travel and public transport to support the 51% reduction in greenhouse gas emissions by 2030. The vision for the policy is: 'To connect people and places with sustainable mobility that is safe, green, accessible and efficient.'

The Policy includes three key principles, as follows:

1. Safe and Green Mobility;
2. People Focused Mobility; and
3. Better Integrated Mobility.

The principles are supported by 10 'high level goals' and those considered relevant to the Proposed Scheme are set out further below.

The foreword of the policy document comments, as follows:

'Increased funding under the National Development Plan will allow us to improve and expand walking, cycling and public transport options across the country to enable access to education, health care, work, cultural and public life by sustainable modes of travel. This will include commencing delivery of BusConnects programmes in our five cities, DART+ and Metrolink in Dublin along with increased investment in the inter-urban and regional rail network.'

In regard to walking and cycling infrastructure the Introduction section states:

'The design of walking and cycling infrastructure, as well as areas in the vicinity of public transport services, are important safety factors. Well-designed, well-maintained, appropriately-lit, continuous and better integrated infrastructure can help people feel safe and encourage them to choose these options over the private car…..Expanding walking and cycling options to promote greater use of active travel can support our climate targets to reduce emissions as well as improving fitness levels and public health, and reducing congestion and private car use. Diverting short car trips to active modes will have a particular benefit in reducing air pollution'

It further comments:

'There is a need to rebalance transport movement in metropolitan areas and other urban centres away from the private car and towards active travel and public transport. This will require a greater allocation of available road/street space to be given to sustainable mobility. In addition, a rebalancing of traffic light signalling at junctions to better facilitate walking, cycling and public transport is required. The overarching objective in urban centres should be to focus more on the movement of people rather than the movement of the private car.'

Under the heading 'Implementation, monitoring and review' it sets out that:

'The Leadership Group will report to the Minister for Transport on a quarterly basis and progress on implementation of the Policy will be overseen In order to measure progress'. It further outlines that part of the reporting will include (inter alia):

- *'Kilometres of active travel infrastructure developed annually; and*
- *Kilometres of bus lanes/bus priority developed annually.*'

The Policy supports 'Safe and Green Mobility' by (inter alia):

'Expanding bus capacity and services through the BusConnects Programmes in the five cities of Cork, Dublin, Galway, Limerick and Waterford; improved town bus services; and the Connecting Ireland programme in rural areas'.

Under the heading 'Expand availability of sustainable mobility' it comments, as follows:

'Improving active travel infrastructure in both urban and rural areas together with improved and expanded public transport services across the country is needed to reduce car dependency. Increased investment in walking and cycling infrastructure will provide a safe and connected network to those who wish to

travel by active means. Implementation of public transport projects such as (inter alia): BusConnects.'

Projects such as BusConnects are identified as key priorities to deliver an improved and expanded bus service. It sets out under Goal 3 'Expand availability of sustainable mobility in metropolitan areas' the following:

'BusConnects programmes comprise a number of different elements including the network redesign of bus services and the development of core bus corridors infrastructure, including segregated cycling facilities, on the busiest routes to make journeys'.

It also outlines that:

'Our bus system carries by far the greatest number of passengers across the public transport system and improvements to it are vital in the context of improving people's accessibility and increasing modal shift. Improved and expanded bus services and infrastructure are a key priority, and in the five metropolitan areas, these improvements and expansions will be delivered through BusConnects programmes in each.'

It also comments that:

'BusConnects will enhance the capacity and potential of the public transport system by increasing and replacing the bus fleets with low emission vehicles and introducing a new system of Next Generation Ticketing and cashless payments.'

Table 2.3 sets out how the Proposed Scheme meets the Principles and Goals of the National Sustainable Mobility Policy.

Table 2.3: National Sustainability Mobility Policy Principles and Goal

Principle	Goal	Goal	Proposed Scheme Response
Safe and Green Mobility	*'Improve mobility safety.'*	*'Goal 1 aims to improve the safety of all mobility options including active travel, road and rail to prioritise the safety and security of those working on / travelling by sustainable mobility.'*	Signage and road markings will be provided along the extents of the Proposed Scheme to clearly communicate information, regulatory and safety messages to the road users. The Proposed Scheme will also generally include segregated cycling and enhanced at grade junctions improving overall safety along the corridor.
	'Decarbonise public Transport.'	*'Goal 2 aims to reduce emissions by transitioning the bus, rail and small public service vehicle (SPSV) fleet across the country to low/zero emission vehicles in line with available technology. The actions under this goal are aligned with the actions in the Climate Action*	The Proposed Scheme aligns with the goal as it will make public transport and active travel a key component to the solution. The Proposed Scheme will comprise transport infrastructure that supports the delivery of an efficient, low carbon and climate resilient public transport service.

Principle	Goal	Goal	Proposed Scheme Response
		Plan 2021 to reduce emissions in the sustainable mobility sector.'	
	'Expand availability of sustainable mobility in metropolitan areas.'	*'Goal 3 aims to expand the capacity and availability of sustainable mobility in our five cities (Cork, Dublin, Galway, Limerick and Waterford). This will be done through improved walking, cycling, bus and rail infrastructure, improved transport interchange and expanded public transport services. Transformed active travel and bus infrastructure and services in all five cities is fundamental to achieving the targets of 500,000 additional daily active travel and public transport journeys and a 10% reduction in kilometres driven by fossil fuelled cars by 2030.'*	The Proposed Scheme aligns with the goal as BusConnects Galway – Cross City Link Infrastructure Works is the GCC's programme to greatly improve bus services in the Galway, of which the Proposed Scheme is part. The Proposed Scheme will provide the advantage of segregated cycling facilities along the preferred route in both directions, where possible. These high-quality cycle lanes will help to reduce dependency on private car use for short journeys. The design of each junction has given priority to pedestrian, cycle and bus movements, where possible. Junctions have been designed to ensure a high level of comfort and priority for sustainable modes of travel (e.g., walking, cycling and public transport) by prioritising the space and time allocated to these modes within the operation of a junction. Along the Proposed Scheme route, improvements and enhancements will be made to footpaths, walkways and pedestrian crossings.
	'Expand availability of sustainable mobility in regional and rural areas.'	*'Goal 4 aims to expand the capacity and availability of sustainable mobility in a regional and rural context. This will be done through the delivery of improved active travel infrastructure, expansion of regional bus and rail services and local bus networks, and improved connectivity between different transport modes.'*	The Proposed Scheme aligns with the goal as it will expand the capacity of the public transport network within Galway. The Proposed Scheme will also enhance interchanges between the various modes of public transport operating in Galway City and its wider metropolitan area. The design has been developed with this in mind and, in so far as possible, is seeking to provide for improved existing or new interchange opportunities with other transport services.
	'Encourage people to choose sustainable mobility over the private car.'	*'Goal 5 aims to encourage modal shift to more sustainable options across all ages through behavioural change and demand management measures.'*	The Proposed Scheme will promote a modal shift from private car use to more sustainable forms of transport. It will enhance active travel networks and thus will encourage the use of these modes, reducing reliance on the private car.

Principle	Goal	Goal	Proposed Scheme Response
People Focused Mobility	*'Take a whole of journey approach to mobility, promoting inclusive access for all.'*	*'Goal 6 aims to support a whole of journey approach from planning a journey to arriving at the final destination and make sustainable mobility accessible and affordable to everyone. A whole of journey approach is also supported under Goals 7 and 10 through implementing a universal design approach to the design of new and retrofitted infrastructure; adherence to the Design Manual for Urban Roads and Streets; and promoting integrated mobility through innovative technologies.'*	The Proposed Scheme aligns with the goal as it has considered the Design Manual for Urban Roads and Streets (Department of Transport, 2019) and the National Cycle Manual (NTA 2011).
	'Design infrastructure according to Universal Design Principles and the Hierarchy of Road Users model.'	*'Goal 7 aims to support enhanced permeability and ensure that the universal design principle and Hierarchy of Road Users model is used to inform future investment decisions to reduce inequalities, support a whole of journey approach, and prioritise sustainable mobility.'*	The Proposed Scheme aligns with goal 7 as the design is based on the hierarchy of Road users model with Pedestrians improvements prioritised.
	'Promote sustainable mobility through research and citizen engagement.'	*'Goal 8 aims to improve research and citizen engagement around sustainable mobility and collaboration with other government departments, agencies and stakeholders in delivering the Policy.'*	A consultation exercise has been undertaken and has helped to inform the design and layout of the Proposed Scheme. The GCC is also working in partnership with various government departments and third parties to deliver a high quality sustainable transport scheme for Galway.
Better Integrated Mobility	*'Better integrate land use and transport planning at all levels.'*	*'Goal 9 aims to support compact growth and transport – oriented development through better integrated land use and transport planning.'*	The Proposed Scheme will enhance the capacity of sustainable transport infrastructure as well as the efficiency of Galway's road network. The enhanced sustainable transport provision along the scheme corridor can help to achieve greater land use densities that will promote compact sustainable growth.
	'Promote smart and integrated	*'Goal 10 aims to make the use of sustainable*	The Proposed Scheme aligns with the goal as it will enhance interchanges

Principle	Goal	Goal	Proposed Scheme Response
	mobility through innovative technologies and development of appropriate regulation.'	*mobility and the interchange between different modes easier through investment in smart digital solutions. Alongside better integrated land use and transport planning, technological advances in transport can enable people to move seamlessly from one mode to another and support a whole of journey approach.'*	between the various modes of public transport operating in Galway City and its wider metropolitan area, both now and in the future.

The Proposed Scheme is supported by the National Sustainable Mobility Policy. The Proposed Scheme as part of the BusConnects Programme is identified as a key project to help deliver Irelands climate commitments and reduction of greenhouse gas emissions from the transport sector. The implementation of the Proposed Scheme will contribute to modal shift towards sustainable transport options, it will expand, enhance and connect to pedestrian and cycle networks.

2.2.3.5 Smarter Travel – A Sustainable Transport Future: A New Transport Policy for Ireland 2009 - 2020

The Department of Transport, Tourism and Sport (DTTAS) is currently finalising a National Sustainable Mobility Policy which will replace both the Smarter Travel Policy document and National Cycle Policy Framework.

The new National Sustainable Mobility Policy will be *"centred upon three overarching principles – Safe and Green Mobility, People Focused Mobility and Better Integrated Mobility".* The policy will align with various National Strategic Outcomes (NSOs) in the NPF, and *"will also support the actions in the Climate Action Plan to reduce transport emissions in line with necessary EU and Irish targets in respect of active travel and public transport".*

The current Sustainable Transport Future: A New Transport Policy for Ireland 2009 – 2020 (hereafter referred to as 'Smarter Travel Policy') (DTTAS 2009a) is the National planning policy document to deliver an integrated transport policy for Ireland as supported by Government. A SEA, NIS and AA were produced as part of Smarter Travel Policy.

The Smarter Travel Policy set out a series of actions and measures covering infrastructural and policy elements to promote and encourage the vision of a sustainable travel and transport system for the period 2009 to 2020. The Smarter Travel Policy also provides funding over the lifetime of the Policy to provide information and improve facilities for cyclists, walkers, and public transport users.

The vision presented in Smarter Travel Policy is summarised by five key goals:

1. *'Improve quality of life and accessibility to transport for all and, in particular, for people with reduced mobility and those who may experience isolation due to lack of transport';*
2. *'Improve economic competitiveness through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks';*
3. *'Minimise the negative impacts of transport on the local and global environment through reducing localised air pollutants and greenhouse gas emissions';*
4. *'Reduce overall travel demand and commuting distances travelled by the private car'; and*
5. *'Improve security of energy supply by reducing dependency on imported fossil fuels'.*

In regard to Public Transport it sets out that:

'We estimate that by 2020 we will need to provide public transport to meet the needs of an additional 90,000 commuters on top of the 140,000 likely to be catered for by Transport 21. The bus will be at the heart of moving these additional people.'

It further comments that:

'Bus use is particularly important for those without access to a car, the young, older people and people with mobility issues. If we are to encourage the use of public transport in Ireland, the availability of a safe, accessible, integrated and reliable service for 18+ hours of the day is essential in any attempts to increase patronage and gain more users.'

The Proposed Scheme will enhance the effectiveness / efficiency of future bus services as well as active travel required by Smarter Travel. The Proposed Scheme will maximise the efficiency of the transport network through the integration of cycling and public transport modes and support the provision of sustainable transport alternatives to reliance on car-based journeys.

2.2.3.6 The National Cycle Policy Framework (NCPF) 2009 - 2020

The National Cycle Policy Framework 2009-2020 (hereafter referred to as the NCPF) (DTTAS 2009b) is Ireland's cycling policy framework. The vision is to create a strong cycling culture in Ireland, stating that 'Cycling will be a normal way to get about, especially for short trips'. The NCPF outlines 19 specific objectives, so that by the year 2020 10% of all journeys made were intended to be by bicycle. This policy framework outlines a number of interventions to make cycling easier and safer. The interventions specific to the Proposed Scheme are:

- *'We will pay special attention to integrating cycling and public transport. As commuting distances are lengthening, the importance of combining the bicycle with the bus, tram or train grows. We will provide state-of-the-art cycling parking at all appropriate PT interchanges and stops.'*

- Objective 2: *'Ensure that the urban road infrastructure is designed/retrofitted so as to be cyclist-friendly and that traffic management measures are also cyclist friendly.'; and*
- Objective 8: *'Ensure proper integration between cycling and public transport will assist in increasing the uptake in cycling across the region'.*

The Proposed Scheme will facilitate sustainable modes of transport and therefore supports the objectives set in the NCPF through the provision of safe cycling infrastructure network segregated from general traffic, wherever practicable.

2.2.3.7 Road Safety Strategy

The Road Safety Strategy (2021-2030) (Road Safety Authority (RSA), 2021 sets out targets to be achieved in terms of road safety in Ireland. The core aim of the Strategy is to achieve Vision Zero in Ireland by 2050 where no one will be seriously injured or killed on roads with an interim target to reduce fatalities and serious injuries by 50% by 2030.
The Strategy goes on to note that overall, 1,303 fatalities were recorded in Ireland between 2013-2020, with the following observed:

- Between 2013 and 2020, 269 fatalities were pedestrians, equating to 21% of the total number of fatalities; and
- Between 2013 and 2020, 79 fatalities were cyclists. Equating to 6% of the total number of fatalities.

The document sets out strategies for engineering and infrastructure that can effectively reduce collisions. The Proposed Scheme incorporates measures that will contribute to improving road safety in the form of upgrades to key junctions, and new / upgraded pedestrian and cycle infrastructure along the corridor.

2.2.3.8 Climate Action Plan 2021

The Climate Action Plan 2021 (Government of Ireland 2021b) sets out at a national level how Ireland is to halve its emissions by 2030 (51% reduction) and reach net zero no later than 2050. The Climate Action Plan is a road map to delivering Irelands climate ambition. There are 475 actions identified that extend to all sectors of the economy aiming to transform Ireland into a low carbon nation over the next three decades.

Regarding modal shift, the Climate Action Plan 2021 sets out that:

> *'The proposed pathway in transport is focused on accelerating the electrification of road transport, the use of biofuels, and a* ***modal shift*** *to transport modes with lower energy consumption (e.g. public and active transport)' (emphasis added).*

Promoting more sustainable travel modes is seen as critical for climate policy. It offers an opportunity to *'improve our health, boost the quality of our lives, meet the need of our growing urban centres and connects our rural, urban and suburban communities'*.

The key targets to meet the emissions reduction include:

- *'Provide for an additional 500,000 daily public transport and active travel journeys';*
- *'Develop the required infrastructural, regulatory, engagement, planning, innovation and financial supports for improved system, travel, vehicle and demand efficiencies'; and*
- *'Reduce ICE [Internal Combustion Engine] kilometres by c. 10% compared to present day levels'.*

ICE reduction measures include:

- *'Reallocating road space from the private car to prioritise walking, cycling and public transport';*
- *'Enhancing permeability for active travel'; and*
- *'Delivering safer walking and cycling routes to encourage greater uptake of active transport.'*

BusConnects is referenced as a major transport project that will help to deliver the 500,000 additional sustainable journeys. A key goal of the plan is to provide citizens with reliable and realistic sustainable transport options. The Climate Action Plan further states:

> *'The new approach to public transport will be based on a vision of an integrated public transport network, enabling short, medium and long distance trips for people in every part of Ireland. This will mean increasing the frequency of existing rail and bus services and expanding the bus network through the Connecting Ireland approach.'*

The implementation of the Proposed Scheme will deliver the transport infrastructure required to support sustainable transport options that will in turn support the key actions set out in the Climate Action Plan 2021. The Proposed Scheme will expand, enhance and connect to pedestrian and cycle networks and will assist in facilitating the delivery of modal shift.

BusConnects will support the delivery of an efficient low carbon and climate resilient public transport service, contributing to emission reduction target achievement. BusConnects will contribute to Ireland's journey to a low carbon / carbon neutral, energy efficient and reliable transport system which aligns with Government net zero policy commitments and enable customers to make sustainable choices.

Acknowledging that various policy initiatives are required to deliver national targets that are aligned to the Paris Agreement, BusConnects can facilitate services that are beneficial to communities. While mandated reductions are not required at an individual scheme level, carbon must be invested wisely. Chapter 8 (Climate) of this EIAR contains an assessment of the greenhouse gas emissions associated with the Proposed Scheme.

2.2.3.9 Programme for Government – Our Shared Future 2020

The Programme for Government – Our Shared Future 2020 (hereafter referred to as the 'Programme for Government') (Government of Ireland, 2020) sets out the Government's plan for the next five years. It states that the Government will

'*Develop and implement existing strategies for our cities such as 'the Galway Transport Strategy'*. The key objectives of the programme include the need to:

- *'Address pinch points for buses and expand priority signalling for buses and real time information; and*
- *Give greater priority to bus services by expanding quality bus corridors and consider the introduction of Bus Rapid Transport services.'*

Specifically, regarding BusConnects, the Programme for Government states it will also '*prioritise plans for the delivery of … BusConnects in Galway'*.

2.2.3.10 Building on Recovery: Infrastructure and Capital Investment 2016 – 2021

The Department of Public Expenditure and Reform (DPER) published the Building on Recovery: Infrastructure and Capital Investment Plan in September 2015 (hereafter referred to as the Capital Plan) (DPER, 2015). It presented the findings of a Government-wide review of infrastructure and capital investment policy and outlined the Government's commitment to ensuring that the country's stock of infrastructure is capable of facilitating economic growth.

This report identifies the need to improve public transport facilities noting:

'It is therefore essential that road, rail and public transport networks are developed and maintained to the standard required to ensure the safe and efficient movement of people and freight.

In addition, getting people out of cars and onto public transport has a key role to play in reducing Ireland's carbon emissions, by providing a viable, less polluting alternative to car and road transport for many journeys.'

The transport capital allocation in this Capital Plan is largely framed by the recommendations and priorities set out in the Strategic Investment Framework for Land Transport (DoT 2015), which centres on:

- *Maintaining and renewing the strategically important elements of the existing land transport system;*
- *Addressing urban congestion; and*
- *Maximise the contribution of land transport networks to our national development.*

The Capital Plan incorporates the following key objectives relevant to this Proposed Scheme:

- *€3.6 billion of Public Transport Investment including further upgrading of Quality Bus Corridors.*

The Proposed Scheme is consistent with these recommendations, priorities and objectives as set out in the Strategic Investment Framework for Land Transport (DoT 2015), and the Capital Plan. The Proposed Scheme is a significant investment in the improvement of public transport facilities including bus, cycle and pedestrian network enhancements and extensions.

2.2.3.11 The Sustainable Development Goals National Implementation Plan 2018 – 2020

A new National Implementation Plan 2021-2023 is currently being finalised and is due to be published in 2021. Public consultation was undertaken between July-September 2021. The plan *"will set out arrangements for interdepartmental coordination, stakeholder engagement and actions needed for further SDG Implementation from 2021 to 2023".*

The current Sustainable Development Goals National Implementation Plan 2018 - 2020 (DCCAE 2018) is in direct response to the UN's 2030 Agenda (see Section 2.2.1.1) and provides a whole-of-government approach to implement the 17 SDGs. SDGs 3, 8, 9, 11 and 13 and the associated targets are relevant to the Proposed Scheme as presented in Table 2.1. The current National Implementation Plan sets out 19 specific actions to implement the SGDs.

The Proposed Scheme supports the goals and targets set out in the National Implementation Plan as it provides infrastructure that will support sustainable transport and will improve the safety of road users through the further segregation of road vehicles and active travel modes.

2.2.3.12 Investing in Our Transport Future – Strategic Investment Framework for Land Transport 2015

Investing in Our Transport Future – Strategic Investment Framework for Land Transport (hereafter referred to as SIFLT) (DTTAS, 2015) sets out the priorities to guide the allocation of future investment to develop and manage Irelands transport network. It establishes:

- *'High level priorities for future investment in land transport; and*
- *Key principles, reflective of those priorities, to which transport investment proposals will be required to adhere'.*

Urban Congestion and maximising the contribution of land transport networks to our national development are key priorities of the SIFLT Measures to address both, including:

- *'Improved and expanded public transport capacity';*
- *'Improved and expanded walking and cycling infrastructure'; and*
- *'Support identified national and regional spatial planning priorities'.*

The key principles for land transport investment proposals are:

- *'The overall outcomes of transport investment, as governed by these principles, should maintain and improve the quality of life of citizens and be consistent with environmental, climate and biodiversity objectives, imperatives and obligations, including those arising from the EU Habitats Directive';*
- *'The next key priority for investment involves measures to address current and future urban congestion and to improve the efficiency and sustainability of urban transport including improved and expanded public transport; capacity*

and walking and cycling infrastructure, improved traffic management and bus priority; and more and better use of Intelligent Transport Systems'; and

- *'To receive funding, transport projects must be implemented in conjunction with the implementation of supportive national and regional spatial planning policies, along with other demand management measures where appropriate'.*

The Proposed Scheme is compliant with the 'priorities' set out by the SIFLT as the infrastructure will support the improvement and expansion of public transport capacity and provide significantly improved facilities for active travel. The Proposed Scheme will improve the efficiency of public transport and encourage mode shift through delivering journey time savings.

2.2.3.13 National Investment Framework for Transport in Ireland

The Department of Transport (DoT) has finalised the transport framework, the National Investment Framework for Transport in Ireland (hereafter referred to as NIFTI) (DoT 2021) to ensure alignment with the policies of the NPF.

The NIFTI sets out the DoT's strategy for the development and management of Ireland's land transport network (roads, public transport, walking and cycling) over the next two decades. The NPF and its projections around population and settlement patterns are central to the development of NIFTI. The purpose of NIFTI is to enable the delivery of Project Ireland 2040 and the ten National Strategic Objectives (NSOs) by guiding the appropriate investment in Ireland's roads, active travel and public transport infrastructure.

The NIFTI sets out the types of positive outcomes transport investment can deliver, including:

- Delivering clean, low carbon and environmentally sustainable mobility;
- Supporting Successful Places and Vibrant Communities;
- Facilitating Safe, Accessible, Reliable and Efficient Travel on the Network; and
- Promoting a Strong and Balanced Economy.

To invest sustainably, the NIFTI establishes hierarchies which prioritise environmentally sustainable and proportional solutions to a given transport need or opportunity. In combination, it is intended that these hierarchies will ensure that we tackle the right problems with the right solutions. The investment priorities are based on two hierarchies:

1. Modal Hierarchy; and
2. Intervention Hierarchy.

Modal Hierarchy

The NIFTI Modal Hierarchy is:

- Active Travel;
- Public Transport; and
- Private Vehicles.

NIFTI Modal Hierarchy identifies travel modes to be accommodated and encouraged when investments and other interventions are made. Sustainable modes, starting with active travel and then public transport, will be encouraged over less sustainable modes such as the private car.

Active travel is the most sustainable mode of travel. Increasing the share of active travel can reduce the carbon footprint of the transport sector, improve air quality, reduce urban congestion, and bring about positive health impacts as a result of increased physical activity. The attractiveness of this mode is dependent on infrastructure for example, dedicated footpaths, segregated cycle lanes and the quality and priority of road crossing points all impact upon the number of people engaging in active travel.

Intervention Hierarchy

The NIFTI Intervention Hierarchy is:

- Maintain;
- Optimise;
- Improve; and
- New.

'*To support the delivery of the NPF, and to make best use of our existing assets, a hierarchy of these intervention types will be applied. Maintaining the existing transport network will be given first priority, followed by maximising the value of the network through optimising its use. Infrastructural investments will only be considered after these two categories have been assessed as inappropriate for the identified problem, with upgrades to existing infrastructure to be considered before new infrastructure*.'

Decarbonising the transport sector is a key priority for reaching Ireland's climate change targets. The NIFTI supports sustainable mobility and encourages active travel and public transport. It supports projects that will reduce urban congestion, particularly those that include new sustainable mobility infrastructure and optimises the existing infrastructure to prioritise sustainable transport modes.

The Proposed Scheme is compliant with the NIFTI as it will facilitate accessible and reliable public transport. It supports sustainable transport modes including active travel modes. The NIFTI recognises that active travel is the most sustainable mode of travel and acknowledges that the attractiveness of this mode is dependent on infrastructure for example, dedicated footpaths, segregated cycle lanes and the quality and priority of road crossing points all impact upon the number of people engaging in active travel.

The Proposed Scheme provides improved infrastructure for active travel modes, while optimising, improving and, where necessary, providing new infrastructure to improve bus network services for Galway.

2.2.3.14 Healthy Ireland – The National Physical Activity Plan for Ireland 2016

This plan was launched in 2016 and aims *'to increase population levels of physical activity which would lead to health, economic and social benefits'*. The plan includes a number of '*Action Areas'* which provide building blocks for greater participation in physical activity.

Action Area 4 (Environment) specifically promotes active transport as a sustainable way to increase physical activity. Active transport modes such as walking and cycling are being facilitated by the Proposed Scheme.

2.2.3.15 Five Cities Demand Management Study

This study focusses on the five main cities across Ireland, namely Dublin, Cork, Galway, Limerick and Waterford. The study was undertaken by Systra on behalf of the Department of Transport '*to identify and review the drivers for, and potential management measures of, vehicle movements'* in the five cities.

These measures are known as Transport Demand Management (TDM) measures and *'aim to influence and change travel demand patterns and encourage more efficient and sustainable use of transport resources'.* One of the mission areas includes the prioritisation of the BusConnects Galway plans.

The following TDM measures of relevance to the Proposed Scheme and to Galway City are proposed as part of the study:

- FM11: Congestion Charging – it is considered that this may be delivered in Galway City subject to the delivery of improved public transport facilities.
- PTM04: Public Parking Controls – reduction of on street parking is included in the proposed scheme in line with the delivery of sustainable mobility infrastructure.
- PP04: Enhance Delivery of the National Planning Framework – the Proposed Scheme represents enhanced delivery of the NPF (see section 2.2.3.3).
- PTM17: Car Free Zones & Streets – it is noted that this is already in place in Galway through implementation of the 'City Centre Access Network', which will be supplemented by the Proposed Scheme.
- TC07: Urban Traffic Management Centres – the Proposed Scheme includes a bus gate and it is stated in the study that Galway has been operating an Urban Traffic Management Centre since 2011.

2.2.4 Regional Policy

2.2.4.1 Regional Spatial and Economic Strategy for the Northern and Western Regional Assembly 2020-2032

The principal purpose of the Northern and Western Regional Assembly (NWRA) Regional Spatial Economic Strategy 2020-2032 (hereafter referred to as RSES) (NWRA, 2020) is to support the implementation of Project Ireland 2040 by providing a long-term strategic planning and economic framework for the

development of the region. A SEA, NIS and AA were produced as part of the RSES.

The RSES represents the regional tier for planning policy and provides a vision; a spatial plan and investment framework to shape future development of the Northern and Western Region to the year 2032. The RSES was formally adopted in January 2020 by NWRA and replaces the previous Regional Planning Guidelines for the Border Region 2010 – 2022 (Regional Planning Guidelines Office 2010).

The RSES is centred on five key growth ambitions:

1. Economy and Employment – A Vibrant Region;
2. Environment – Natural Region;
3. Connectivity – Connected Region;
4. Quality of Life – Inclusive Region; and
5. Infrastructure – Enabling our Region.

Under Key Growth Ambition – 3. Connectivity – the benefits of sustainable travel are recognised and highlighted '*Sustainable travel can have significant benefits for individuals, workplaces and educational facilities in terms of health and wellbeing, costs and time associated with travel. It has the potential to reduce congestion and emissions and to exploit investment in sustainable transport'*.

In this respect, the GTS is referenced as a best practice example of *'where the integration of transport, spatial and economic planning is to be delivered',* as it is incorporated and adopted into both the Galway County Council Development Plan and the Galway City Development Plan.

The RSES includes a number of high-level transport principles to support the delivery of integrated transport, spatial and economic planning:

- *'Support improved strategic and local connectivity';*
- *'Expand attractive public transport and other alternatives to car transport;*
- *'Recognise the role of the car and cater appropriately for it'; and*
- *'Reduce congestion; and cater to the demands associated with longer-term population and employment growth, in a sustainable manner'.*

On the basis of these principles, a number of core priority outcomes are identified, including:

- *'Supporting the achievement of 'compact, smart growth' through the achievement of 'mutual consistency' between land use and transport planning/investment/service provision';*
- *'Strengthening public transport, walking and cycling accessibility/connectivity within Galway City and environs';*

With regard to investment in the bus network in Galway City, it is recognised in the RSES that *'investment in bus infrastructure and services will be delivered through Bus Connects and the relevant parts of the GTS'*.

Included within the Proposed Scheme is provision for walking and cycling. The RSES recognises the importance of walking and cycling in facilitating modal shift - '*Facilitating modal shift to more sustainable transport options, including walking and cycling is a key element in promoting healthier lifestyles, better traffic management and assisting in mitigating climate change'*.

The RSES develops Regional Policy Objectives (RPOs) that are aligned to the key growth ambitions above. These are aligned to the UN's 2030 Agenda (UN, 2015), EU thematic objectives[3] and the NPF (Government of Ireland 2018).

Those RPOs that relate to the Proposed Scheme are as follows:

RPO6.26: '*The walking and cycling offer within the region shall be improved to encourage more people to walk and cycle, through:*

b) Safe walking and cycle infrastructure shall be provided in urban and rural areas, the design shall be informed by published design manuals, included the Design Manual for Urban Roads and Streets (DMURS) and the NTA Cycle Manual'.

RPO6.29: '*The management of space in town and village centres should deliver a high level of priority and permeability for walking, cycling and public transport modes to create accessible, attractive, vibrant and safe, places to work, live, shop and engage in community life'*.

RPO 6.30: '*Planning at the local level should promote walking, cycling and public transport by maximising the number of people living within walking and cycling distance of their neighbourhood or district centres, public transport services and other services at the local level such as schools'*.

RPO 6.32: *'Invest in transport networks and services in the region that are socially inclusive and provide a quality of service, connectivity and facilities to meet all societal needs, disabilities (including mobility, sensory and cognitive impairments) and meet the needs and opportunities of an ageing population'.*

RPO 6.50: *'Continue to encourage Active Travel initiatives and where possible leverage technology and digital platforms to enhance the delivery of cycleway and walking infrastructure, particularly in our urban centres'.*

As the only city in the Northern and Western Region, Galway is recognised as the principal driver of the region, with a commensurate challenge to accommodate an increased proportion of its' envisaged growth within the existing metropolitan area. A specific Metropolitan Area Strategic Plan (MASP) (hereafter referred to as the Galway MASP) (NWRA 2020) is contained within the RSES for Galway City, with the following vision:

'The Vision of this MASP is that Galway will be a leading global city, renowned as a successful, sustainable, competitive, compact and accessible city of scale that supports a high quality of life, maintains its distinctive identity and supports its rich heritage, language and cultural experience. A Metropolitan area that is environmentally responsible, resilient to change and that attracts and retains

[3] European Regulation (EU) No 1303/2013

talent and skills and fosters innovation and creativity. An Area that offers sustainable choices in housing, work, transport and lifestyle opportunities for its communities, while supporting the health and wellbeing of its people.'

The Galway MASP affirms the support for the implementation of the GTS and its constituent interventions. The Galway MASP is contained within the RSES and identifies the strategic planning and investment framework to enable growth. The Galway MASP is aligned with the RPOs in the RSES to allow integrated transport and land use. The vision for the MASP is as follows:

'*The MASP provides a strategic focus on the City and environs and sets out how it is envisaged the NPF will be implemented in the regional context of the RSES. The vision for Galway is that it will be a leading European city renowned for its quality of life, its history, its culture and its people.*

It is and will be a place that embraces modern technologies, high standards of education, competitive and sustainable enterprises.

The challenges to the city's development will be met by the integrated and timely provision of infrastructure much of which is included in this strategy'.

To achieve the vision, the Galway MASP sets out RPOs. Those most relevant to the Proposed Scheme are set out below.

RPO 3.6.7: '*The Assembly supports the delivery of the infrastructure projects outlined below to develop the MASP:*

- *Galway City Ring Road; and*
- *Galway Transport Strategy.'*

In addition to the above RPOs, the Galway MASP also identifies *'Key Transportation Components',* of which the following are of most relevance to the Proposed Scheme:

- *'Development of a cross-city network of bus services which can serve the major trip attractors with five core bus routes to provide a minimum 15-minute frequency service during the peak periods and sustain a high-frequency service throughout the day'.*
- *'Provision of a core, secondary and feeder cycle network which includes segregated cycle routes, on-road cycle lanes and /or wide bus lanes to cater for both buses and cyclists along the same route'*
- *'Provision of measures to reduce traffic volumes in the city centre core, additional pedestrianisation and pedestrian priority, improvement of pedestrian facilities, in particular safe crossings, improvements to the public realm and use of universal design'.*

The above Key Transportation Components represent key characteristics of the Proposed Scheme, in that, they promote improved pedestrian, cycle and bus transport infrastructure. The Proposed Scheme is therefore supported by, and specifically identified as a keen enabler of the RSES.

BusConnects is identified as a key infrastructure project to deliver on the principles of Healthy Placemaking, Climate Action and Economic Opportunity, which will support the regional growth strategy for the Northern and Western Region including the Galway MASP.

The Proposed Scheme will support continued improved integration of transport with land use planning. The delivery of improved high-capacity Core Bus Corridors will enable and support the delivery of both residential and economic development opportunities, facilitating the sustainable growth of Galway MASP. The dedicated bus lanes proposed will improve bus journey times and reliability while the cycle lane and pedestrian infrastructure will promote modal shift from private car to active travel. The RSES not only seeks an improved and enhanced bus network but also places sustainable travel at the core of its transport objectives.

2.2.5 Local Policy

2.2.5.1 Galway Transport Strategy

The Galway Transport Strategy (GTS) (Galway City Council (GCC), 2016) is a comprehensive transport strategy for Galway City and its environs (including areas within the jurisdiction of Galway County Council), intended to establish a framework for the development of the transport network over the next 20 to 30 years. The GTS sets out proposals for the road network, public transport network, walking network and cycling network, and contains a number of significant proposals which will allow the city to continue to grow in a sustainable manner. The GTS has been adopted by both GCC and Galway County Council, and is implemented through the policies of their Development Plans.

The following principles are set out in the GTS:

1. To promote and encourage sustainable transport, and in particular to make it convenient and attractive to walk, cycle or use public transport.
2. To improve accessibility and permeability to, and within the city centre for pedestrians, cyclists and public transport users. While also maintaining an appropriate level of access for vehicular traffic for commercial and retail purposes.
3. To maximise the safety and security of pedestrians, cyclists and other transport users, particularly within the core city centre.
4. To manage and increase transport capacity (where necessary), for the efficient movement of people and goods into and within the city.
5. To provide opportunities to enhance the city centre public realm through traffic management and transport interventions.
6. To maintain and develop transport infrastructure and services to a high degree of quality and resilience.
7. To adopt a ‘smarter technology’ approach to all transport interventions, whereby transport infrastructure and services are future-proofed.

The GTS contains a number of comprehensive proposals across a number of transport modes, including the following significant measures:

- Establishment of a new cross-city bus network to serve Galway City;
- Establishment of primary, secondary and feeder cycle networks;
- Provision of a safe and efficient plan for general traffic to access key destinations in Galway City Centre, while discouraging through traffic;
- Creation of a high-quality public transport corridor through the city from east to west, which will be utilised to some extent by all proposed bus services (the Cross-City Link);
- Transformation of Galway City Centre into a new space where walking, cycling and public transport are all prioritised over private car traffic;
- Establishment of an orbital two-way traffic route around Galway City Centre;
- Establishment of an inner-city two-way traffic route in the environs of Galway City Centre;
- Implementation of the N6 Galway City Ring Road (N6GCRR) scheme to provide an additional crossing of River Corrib to the north of Quincentenary Bridge; and
- Localised route and junction improvement works at a number of locations to improve junction efficiency, to improve pedestrian and cyclist facilities and to incorporate priority for public transport services.

The GTS is underpinned by an extensive volume of supporting material, including Environmental Screening Assessments, Technical Feasibility Reports and Scheme Appraisal Reports using the Western Regional Multi-Modal Model, to ensure that a robust, evidence-based strategy can be put in place. The GTS was completed in September 2016 and has subsequently been incorporated and adopted into the Galway County Council Development Plan (Section 2.2.5.2) and GCC Development Plan (Section 2.2.5.3).

The GTS examined a number of options for each project identified and undertook a Multi-Criteria Assessment (MCA) of each option utilising the Common Appraisal Framework (CAF) for Transport Projects and Programmes appraisal categories.

Utilising the assessment criteria above, the GTS identified proposed improvements to the city transport network including the ‘Cross City Link’ (i.e. the Proposed Scheme), ‘City Centre Access Network’, and ‘Inner City Access Route’.

The Cross City Link (i.e. the Proposed Scheme) is to form a central route for public transport, cyclists and pedestrians along a corridor from west to east, through the city centre. It will complement the proposed new city bus network routes approaching from the east and west of the city centre, which coalesce along this high-quality corridor, providing high-frequency services with journey time reliability and opportunities for interchange.

The Cross City Link (i.e. the Proposed Scheme) will ensure that public transport services can access key areas such as the retail & recreational centre of the city, public transport hubs at the rail & bus stations, City & County Halls along with the city centre hotels and bed & breakfasts on College Road, key areas such as University Hospital Galway, NUI Galway, the Sportsgrounds and the car parking and coach facilities at Galway Cathedral.

Within the GTS proposals for Galway City Centre, this central priority corridor is to be complemented by a two-way inner-city vehicle access route linking Lough Atalia Road to the N6 via Fairgreen Road, Bóthar Uí hEithir, Prospect Hill, Bóthar na mBan and Headford Road. The Proposed Scheme also includes the reconfiguration of traffic flow along the Inner-City Access Route between the junction of Bóthar Uí hEithir/College Road and Bóthar na mBan/Headford Road, and improvements to ancillary adjacent streets.

2.2.5.2 The Galway County Development Plan (2022-2028)

This plan which was adopted in May 2022, makes provision for the following objectives of relevance to the Proposed Scheme

GCTPS 1 Galway County Transport & Planning Study and Galway Transportation Strategy

It is a policy objective of Galway County Council to support and facilitate the implementation of the Galway County Transport & Planning Study and Galway Transport & Planning Study across all modes of transport.

GCTPS 3 Sustainable Transport

The County will seek to support a variety of measures which will reduce car dependency for residents, and will specifically seek to improve access to sustainable transport choices (including responsive and “flexible” modes) for those residents in rural areas of the County.

GCTPS 9 Collaboration with Galway City

The Galway County Council will collaborate with Galway City Council as appropriate to bring forward transport proposals and measures which will enhance travel to and from Galway City in a manner which is compatible with the GTS and GCTPS, and where possible maximises the benefits to both areas from this approach.

PT 2 Development of Public Transport Infrastructure To engage and work closely with the National Transport Authority and other relevant transport authorities and both public and private operators, in facilitating and securing improvements to footpaths, pedestrian crossing points and permeability to facilitate access and encourage use of public transport and to secure the implementation of recommendations of the GTS bus network and the expansion of public transport infrastructure in areas such as spaces for parking of local link buses and services in the County.

2.2.5.3 Galway City Development Plan (2017-2023)

GCC have recently commenced a review of the Galway City Development Plan, undertaking early stage public consultation. A revised Galway City Development Plan 2023-2029 is not expected to be finalised until February 2023.

The existing Galway City Development Plan (2017 - 2023) (GCC, 2017) sets out a strategic transport aim as follows:

'*To integrate sustainable land use and transportation, facilitating access and choice to a range of transport modes, accessible to all sections of the community that ensures safety and ease of movement to and within the city and onward connectivity to the wider area of County Galway and the West Region*.'

The implementation of the GTS is also a strategic aim of GCC, as set out within the City Development Plan; in particular the implementation of the Proposed Scheme and a reduction in car movements through the city centre and the implementation of the proposed cross-city radial bus network as identified in the GTS.

The Galway City Development Plan also lists the following specific objectives in relation to Transportation and specifically in relation to Public Transport and Pedestrians:

- *Implement traffic management and infrastructural changes to facilitate the provision of the 'Cross – City Link' as part of the GTS;*
- *Implement traffic management and infrastructural changes to facilitate the development of a public bus network in accordance with the GTS;*
- *Support the improvement of access for public transport, pedestrian and cyclists to and within major employment areas and institutions;*
- *Prioritise improvements to pedestrian movements and safety within the city centre including extension of pedestrianisation, provision of wider footpaths and shared streets; and*
- *Prioritise improvements to pedestrian movements and safety between the City Centre, Woodquay and Bóthar na mBan to the Headford Road LAP area*.

The Proposed Scheme is directly in keeping with each of the strategic and specific objectives of the existing Galway City Development Plan.

2.2.5.4 Galway City Public Realm Strategy

The Galway Public Realm Strategy (GCC 2019) explores the current condition of Galway City's townscape and network of public and green spaces, and sets out a vision and strategy for improvements to guide investment and development in the future. The strategy recognises the ambition of the GTS to provide more space within the public realm for pedestrians and cyclists, and seeks to utilise this ambition advantageously within the public realm.

The Proposed Scheme includes some public realm enhancements which has been developed in line with the Public Realm Strategy and with pedestrian and cyclist prioritisation in mind, refer to Chapter 16, (Landscape (Townscape) and Visual) of this EIAR for further details.

2.2.5.5 GCC Climate Adaptation Strategy 2019-2024

As part of the Climate Change Action Plan 2019 (see Section 2.2.3.8), GCC produced and adopted its own Climate Adaptation Strategy in 2019 (GCC, 2019). The GCC Climate Adaptation Strategy considers actions to be implemented by GCC, in order to tackle the significant issues of climate change within Galway City.

The strategy identifies transport infrastructure as critical infrastructure and highlights smarter travel as a way of reducing the demand on the infrastructure and subsequently reducing transport emissions. To achieve effective climate adaptation, the strategy includes several actions which the Proposed Scheme supports.

Climate Adaptation Strategy Action 8-2 is of particular relevance to the Proposed Scheme:

'Develop policies to reduce air pollution from road vehicles, which promote a modal shift to cycling, public transport and support the decarbonisation of road vehicles.'

2.2.5.6 Galway City Local Economic & Community Plan 2015-2021

This plan aims to *'promote and support economic development and to promote and support local and community development in Galway City'*. Goal 4 states '*Galway. A sustainable, resilient urban environment and the regional capital of the West'*, and the plan aims to support the improvement of transport infrastructure, in line with the Integrated Transport Management Programme for Galway City (Galway Transport Strategy) in order to help realise this goal. The Proposed Scheme is aligned with this approach (see section 2.2.5.1).

2.3 Transport Need

In preparing the Galway Transport Strategy (GTS) a number of studies were undertaken by GCC and the National Transport Authority (NTA) to assess the need and demand for transport improvements in Galway City and the surrounding areas. In these studies, transport demand and supply issues were examined and the transport interventions required to meet future demand were derived. The recommendations from these studies have been taken on board in the formulation of the GTS.

The following sections provide a summary of the need for transport solutions to help Galway City and the surrounding areas achieve sustainable growth and the vision of the GTS for Galway: '*a connected city region driven by smarter mobility.'*

2.3.1 Current Issues Affecting the Transport Network

A number of specific characteristics of Galway City and environs result in significant problems and inefficiencies with respect to the movement of people and goods, including:

- An over-reliance on private cars;
- Peak hour congestion and journey time unreliability for all motorised transport;
- Safety concerns as a result of traffic congestion;
- Many key junctions within the city operating at or over capacity;
- Connectivity issues on the National and Regional road network resulting in significant volumes of cross-county and strategic travel demand between east and west Galway being concentrated and funnelled through the city area in order to cross the River Corrib;
- The pattern of residential development in the area, along with the location of employment destinations, generating a large amount of cross-city as well as city-bound travel demand;
- Large amounts of residential development located proximate to major employment and educational destinations city-wide, but not readily accessible by walking, cycling or public transport, thereby encouraging travel by private car;
- The short distance between Lough Corrib and Galway Bay, two significant natural physical constraints impacting upon the city;
- A natural barrier to cross-city and cross-county travel formed by Lough Corrib, the River Corrib and Galway Bay, with the three principal river crossings experiencing heavy traffic flows, leading to congestion and delay;
- The position of Galway City as a major regional centre for employment and education for a large geographical area, leading to large numbers of long-distance commuters for whom public transport is not currently a viable option, which leads to greater numbers of cars entering the city;
- The impact of traffic congestion on the City's reputation, particularly with regard to inward development;
- The suburban nature of much of the residential areas, and the wide distribution of jobs across a number of central and non-central locations, which lead to a situation where travel by public transport is not a viable option for many journeys;
- Long journey times and delays on the current bus network, due in part to the limited available road space in the city centre for introducing bus priority which both reduces its attractiveness to passengers and increases costs of operating; and
- Limited road space on most of the principal roads, which reduces opportunities for safe and comfortable cycling.

2.3.2 The Pedestrian Network

The GTS identified areas of Galway City where the quality of the pedestrian facilities is poor and where private and public vehicular traffic impacts on the safety and comfort of pedestrians.

There are streets throughout Galway City with substandard or missing footpaths, limited or no crossing facilities, and permeability issues resulting from the manner in which residential areas have been developed. Some suburban residential areas are accessible by direct routes, but these are substandard and not suitable for use by mobility impaired pedestrians. Other residential areas have no footpaths provided for pedestrian access to main thoroughfares. The absence of permeability within housing areas often leads to excessively circuitous trips for pedestrians to walk relatively short distances. Within a 'walkable city', all of these factors discourage walking as an active travel mode for short trips. In order to address this, the GTS aims:

- *To provide improvements for pedestrians along city centre public transport corridors;*
- *To increase priority given to pedestrians over road traffic;*
- *To increase legibility and wayfinding; and*
- *To increase the quality, comfort and safety of the pedestrian facilities*.

The GTS identifies measures to ensure that the needs of pedestrians, including the mobility impaired and disabled, are fully considered in the design of all new facilities and upgrades of existing facilities. Measures include:

- *Revision of road junction layouts, where appropriate, to provide dedicated pedestrian crossings, reduce pedestrian crossing distances, provide more direct pedestrian routes and reduce the speed of turning traffic;*
- *Creation of permeable pedestrian environments in residential areas, amenable to walking, and maximising accessibility to the proposed bus network;*
- *In conjunction with An Garda Síochána, evaluate, and where appropriate seek the introduction of, lower speed limits in the core city centre area and on residential streets;*
- *Cooperation with other agencies in the enforcement of laws in relation to parking on footpaths; and*
- *Removal of unnecessary street clutter to facilitate ease of movement along streets and through 'places'.*

The Proposed Scheme affords the opportunity to implement the measures identified in the GTS and improve the pedestrian environment along, and in some instances in the vicinity of the route of the Proposed Scheme, while taking cognisance of, and supporting pedestrian and public realm planning objectives locally. Refer to Chapter 6 (Traffic & Transport) of this EIAR for an assessment of the Proposed Scheme for an assessment of the impact of the Proposed Scheme on the pedestrian network.

2.3.3 The Cycle Network

Although Galway City's generally flat topography is conducive to cycling, the GTS reports that the modal share of all journeys by bicycle was 5% in 2016, which is relatively low. Similar to the bus network (see Section 2.3.4), the existing network of cycle infrastructure is limited and discontinuous. Furthermore, the volume of vehicular traffic on the narrow city centre streets also contributes to an environment that is neither appealing nor perceived as safe for cycling.

While there have been numerous cycle network improvements in recent years, not least the roll-out of the Bike Share Scheme, and several schemes in development aimed at enhancing the network, the cycling environment remains limited. Diagram 2.2 indicates the extent of the cycle network as reported in the GTS in 2016.

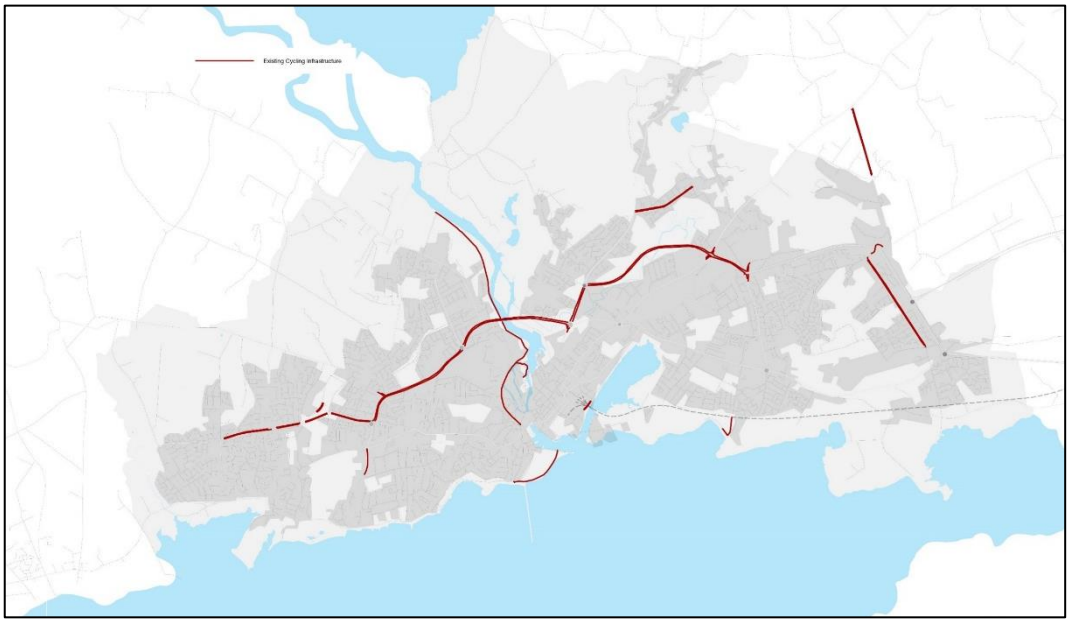

Diagram 2.2: Extent of Cycle Network in Galway City (GTS, 2016)

GTS Appendix F "GTS Cycle Network & Infrastructure Development" presents the cycle network proposed by the GTS. The cycle network has been developed on the basis of three networks categorised as primary, secondary and feeder networks (Diagram 2.3). The GTS proposes to provide a cycle network which support each other and reinforce connections across the urban area. The GTS includes the following aims for the cycle network:

- To provide a primary 'trunk' cycle network which will provide a convenient and safe route for medium-distance radial commuter/leisure journeys;
- To provide a secondary cycle network which will provide a recognisable grid network for local journeys, and will be connected to the primary network for longer journeys.
- To provide feeder cycle links on streets and roads which are highly constrained or more suited to other modes, but need to cater for cyclists also. These are generally cycle-friendly advisory routes where traffic calming and management measures allow cyclists and motorists to mix safely; and
- To increase options for cycling in and across the city centre which will remove through traffic from the city centre. This will create a shared environment where cyclists can safely use the street network.

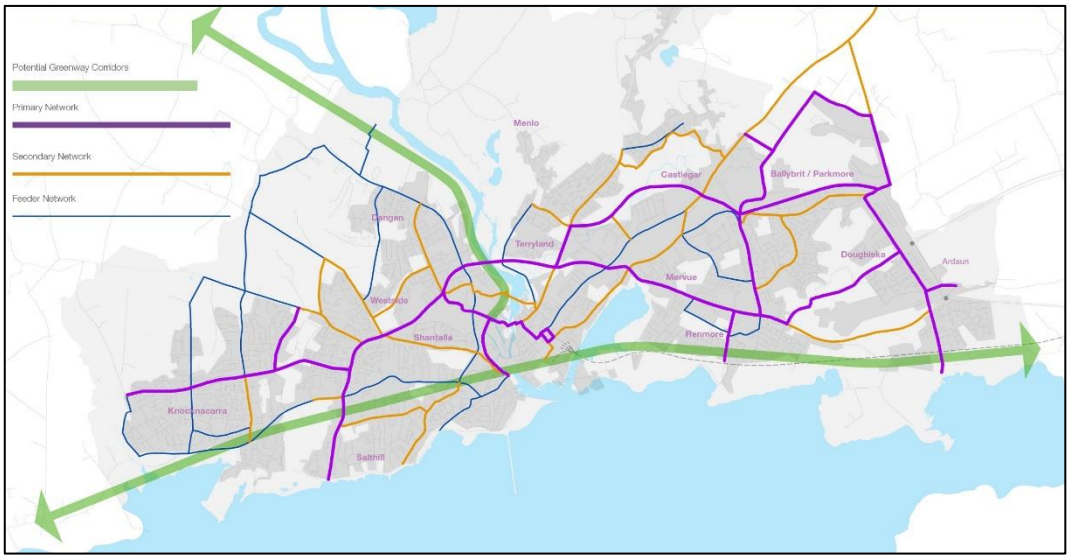

Diagram 2.3: Cycle Network proposed in the GTS (GTS, 2016)

The GTS identifies the infrastructure measures required to provide a continuous and safe cycle network. The aims for each category of cycle network and include:

- Greenway Corridors and primary routes are generally either segregated, off-road cycle only paths, or dedicated cycle lanes along new or existing roads. Wherever possible, these routes are separated from traffic by kerbs or edge markings.
- Secondary links are a combination of off-road cycle paths, cycle lanes along existing roads, shared bus and cycle lanes, and traffic-calmed roads. They often run parallel to primary routes, providing an alternative link.
- Feeder links are generally cycle-friendly advisory routes where traffic calming and management measures allow cyclists and motorists to mix safely.

The GTS also states that, in addition to this, proposed traffic management measures play a part in providing an environment that welcomes cyclists. The Proposed Scheme is an important element in this, by limiting access to parts of the city for private motorised vehicles, and thereby providing priority for cyclists, pedestrians and public transport vehicles.

The physical infrastructure measures identified in the GTS and proposed as part of the Proposed Scheme include the measures identified in Table 2.4.

Table 2.4: Cycling Infrastructure Measures (GTS, 2016) Relevant to the Proposed Scheme

Location	Cycling Infrastructure Measures proposed by GTS	Category
University Road	Limited access for private motorised vehicles provides priority for cyclists, pedestrians and public transport.	Primary
Salmon Weir Bridge	Cyclists and public transport only.	Primary

Location	Cycling Infrastructure Measures proposed by GTS	Category
St. Francis Street	Cyclists and public transport only.	Primary
Eglinton Street	Cyclists and public transport only.	Primary
Williamsgate Street	Cyclists and public transport only.	Primary
Eyre Square	Cyclists and public transport only.	Primary
Forster Street	Cyclists and public transport only.	Secondary
College Road	Limited access for private motorised vehicles provides priority for cyclists, pedestrians and public transport.	Secondary
Dublin Road	Two way segregated cycleway on southern side of the road in the vicinity of Moneenageisha, crossing the Dublin Road and continuing along the northern side of the road as far as the current entrance to Merlin Park Hospital.	Primary

In addition to the physical cycle infrastructure measures identified in Table 2.4 above, the GTS proposed cycle network will require traffic management measures to provide an environment that welcomes cyclists. The Proposed Scheme is an important element in achieving the aims of the GTS, by limiting access to parts of the core city centre for private motorised vehicles / through traffic, and thereby providing priority for cyclists, pedestrians and public transport vehicles.

Refer to Chapter 6 (Traffic and Transport) of this EIAR for an assessment of the Proposed Scheme for an assessment of the impact of the Proposed Scheme on the cycle network.

2.3.4 The Bus Network

The existing bus network within Galway City and suburbs is shown in Diagram 2.4. It can be clearly seen that Eyre Square is the focal point for the bus network and for interchange between routes.

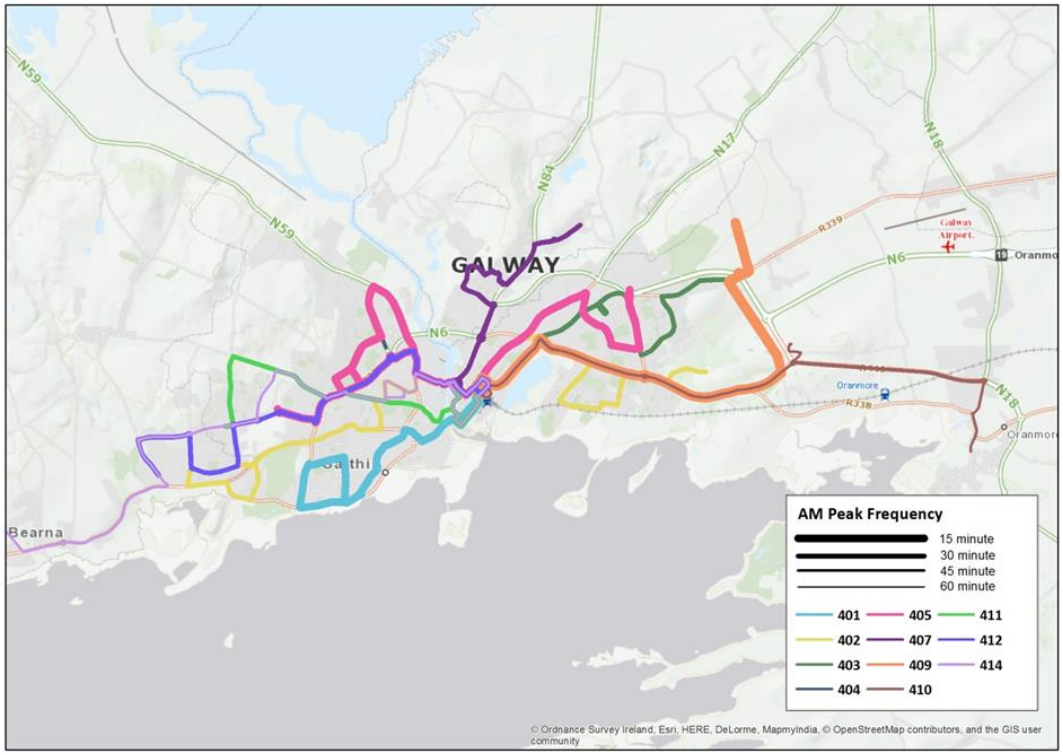

Diagram 2.4: Existing Bus Network (GTS, 2016)

The existing bus priority within Galway City and suburbs is shown in Diagram 2.5. There is a total of approximately 10.4km of dedicated bus lanes in Galway City (GTS, 2016) and suburbs of which, almost 30% are outside the city, near Baile Chláir. Sections of the existing network where there is no designated priority are therefore completely dependent on prevailing traffic conditions, with reliability of public transport services impacted by traffic congestion. Refer to Chapter 6 (Traffic and Transport) of this EIAR for an assessment of the Proposed Scheme on the bus network.

Diagram 2.5: Existing Bus Priority (GTS, 2016)

The absence of dedicated bus priority (both physical, e.g., bus lanes and / or supporting traffic management measures) compromises the reliability of the existing public transport service offering, and therefore reduces the appeal of the bus services available (local, regional and inter-city). In addition, congestion and delay on the road and street network quickly propagates and impacts on the bus service where there is no priority and the bus must merge with general traffic, undermining the public transport service further.

GTS Appendix C 'GTS Public Transport Network Development', presents the Galway City Bus Network (envisaged in 2016), which proposes several bus network routes (Diagram 2.6):

- Green Route: Knocknacarra – City Centre – Parkmore Industrial Estate (via Seamus Quirke Road and Dublin Road);
- Red Route: Knocknacarra – City Centre – Parkmore Industrial Estate (via Salthill and Ballybrit Industrial Estate);
- Blue Route: Clybaun Road – City Centre – Castlegar (via Dr Mannix Road and Tirellan);
- Yellow Route: Dangan – City Centre – Parkmore Industrial Estate (via Westside Shopping Centre and Castlepark); and
- Brown Route: Bearna – City Centre – Oranmore (via Seamus Quirke Road and Deerpark Industrial Estate).

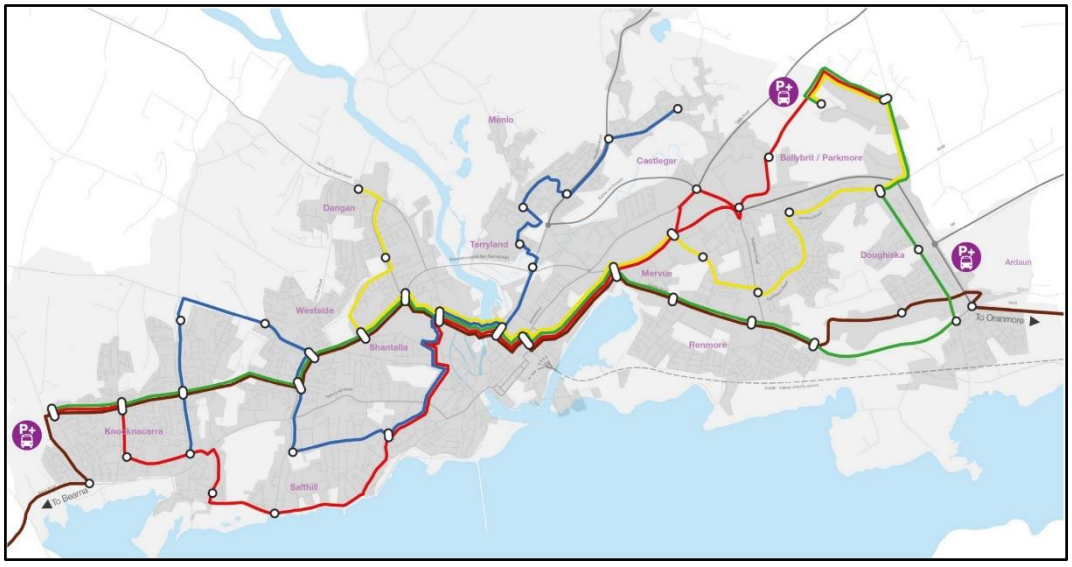

Diagram 2.6: Galway City Bus Network Proposed Routes (GTS, 2016)

While the future bus network will continuously be required to adapt to changing travel demands, as is the case with the majority of existing bus services, all the bus services routes identified in the GTS, are supported in terms of the infrastructure and traffic management measures provided by the Proposed Scheme.

The Galway City Bus Network (Diagram 2.6) has been developed on the basis of service frequency and catchment areas. The aspiration of GTS is that all routes will operate at a 15-minute frequency (or better) during the peak period. Within the GTS study area there are circa 35,000 properties, 90% of which are residential. It is the intention of the GTS to ensure that as many of these properties as possible are within 10 minutes walking distance of a bus service.

Diagram 2.7: Galway City Bus Network Bus Priority Infrastructure (GTS, 2016)

The physical infrastructure and traffic management measures identified in the GTS and proposed as part of the Proposed Scheme include the measures presented in Diagram 2.7 identified in Table 2.5.

The GTS states that it is intended that dedicated bus infrastructure will be developed to the greatest extent possible along the core routes in order to deliver continuous bus priority on the approaches to the city and through the core city centre area. However, the GTS also recognises that on some approaches, and certainly through the city centre, it is not practical to achieve this within the constraints of the current road layout and allocation of space, and hence there will be an increasing emphasis on overall traffic management and the removal of through-traffic on the Proposed Scheme. Furthermore, the GTS acknowledges that a consequence of this alteration of traffic networks and bus routes, the current bus lane on Bóthar Bhreandáin Uí hEithir and Forster Street will be removed. As a result, Forster Street will be restricted to use by public transport and for local access only and the Bóthar Bhreandáin Uí hEithir will be converted for use by general traffic as part of the city centre access network.

Table 2.5: Galway City Bus Network Bus Priority Infrastructure Measures proposed by the GTS (GTS, 2016)

Location	Bus Priority Infrastructure Measures proposed by GTS
University Road	Limited access for private motorised vehicles.
Salmon Weir Bridge	Public transport and cyclists only.
St. Francis Street	Public transport and cyclists only.
Eglinton Street	Public transport and cyclists only.
Williamsgate Street	Public transport and cyclists only.
Eyre Square	Public transport and cyclists only.
Forster Street	Public transport and cyclists only.
College Road	Limited access for private motorised vehicles.
R338 Dublin Road	Bus lane inbound on approach to Moneenageisha Cross.
R338 Dublin Road	Extension of existing bus lane outbound as far as Skerrit Roundabout.

Refer to Chapter 6: (Traffic and Transport) of this EIAR for an assessment of the Proposed Scheme for an assessment of the impact of the Proposed Scheme on the bus network.

2.4 Benefits of the Proposed Scheme

The Proposed Scheme has been designed to facilitate improved efficiency of the transport network through the improvement of the infrastructure for active (walking and cycling) and public transport modes making them attractive alternatives to car-based journeys. Central to the design is the optimization of roadway space with a focus on the movement of people rather than vehicles along the route and through the junctions. A typical double-deck bus takes up the same road space as three standard cars but typically carries 50-100 times the number of passengers.

On average, a typical double-deck bus carries approximately 60-70 passengers making the bus typically 20 times more efficient in providing people movement capacity within the equivalent spatial area of three cars. These efficiency gains can provide a significant reduction in road network congestion where the equivalent car capacity would require 50 or more vehicles based on average occupancy levels. Consequently, by prioritising the movement of bus over cars, significantly more people can be transported along the limited road space available. Similarly, cyclists and pedestrians require significantly less roadway space than general traffic users to move safely and efficiently along the route. Making space for improved pedestrian and cycle infrastructure can significantly benefit these sustainable modes and encourage greater use of these modes.

A key objective of the Proposed Scheme is to enhance the potential for cycling along the route. Without the provision of safe cycling infrastructure, intended as part of the Proposed Scheme the Quality of Service along the route would be insufficient to attract new cyclists. Currently within the existing extents of the Proposed Scheme there are no segregated cycle tracks on the route outbound or inbound. This will increase to 95% of the route overall with some sections being fully segregated. The Proposed Scheme is implementing safe, segregated infrastructure throughout and as such is greatly enhancing the potential for cycling along the route in line with the objectives set out in Section 2.1.

The Proposed Scheme will make significant improvements to pedestrian infrastructure through the provision of increased signal crossings, introduction of traffic calming measures, improved accessibility, increased pedestrian directness and wider footpath and crossing. The scheme design has been developed in accordance with the relevant accessibility guidance.

It is anticipated that the overall quality of pedestrian infrastructure will improve as a result of the Proposed Scheme. This aligns with the overarching aim to provide enhanced walking infrastructure on the corridor. The improved walking and cycling measures that the Proposed Scheme will provide will enhance the potential to grow these modes into the future.

An assessment of transport impact arising from the delivery of the Proposed Scheme is presented in Chapter 6 (Traffic &Transport) of this EIAR.

The Proposed Scheme will address sustainable mode transport infrastructure constraints while contributing to an overall integrated sustainable transport system as proposed in the Galway Transport Strategy. It will increase the effectiveness and attractiveness of bus services operating along the corridor and will result in more people benefiting from faster journey times and improved journey time reliability.

This in turn will facilitate the increase in the bus network capacity of services operating along the corridor and thereby further increase the attractiveness of public transport. In addition, the significant segregation and safety improvements to walking and cycling infrastructure that are a key feature of the Proposed Scheme will further maximise the movement of people travelling sustainably along the corridor and will therefore cater for higher levels of future sustainable population and employment growth.

In the absence of the delivery of the Proposed Scheme, growth along this key corridor would continue to contribute to increased traffic congestion and operational issues on the road network. The Proposed Scheme delivers a reliable alternative to car-based travel that can support future sustainable growth and contribute positively towards reducing carbon emissions.

In the absence of the Proposed Scheme bus services will operate in a more congested environment, leading to higher journey times for bus and lower reliability which will lead to reduced levels of public transport use, making the bus system far less attractive and less resilient to higher levels of growth. The absence of walking and cycling measures that the Proposed Scheme will provide would significantly limit the potential to grow those modes into the future. In addition to the public transport benefits, the Proposed Scheme will also improve the existing streetscape/urban realm setting along the corridor. This will include the introduction of new and improved landscaping provisions along the corridor. A complimentary planting regime and streetscape improvements at key locations will also enhance the character of the surrounding built environment along the corridor.

The Proposed Scheme and its objectives fit within the current planning frameworks that are described in Section 2.3. The Proposed Scheme will help deliver many of the objectives on an international, national, regional and local level.

Overall, the Proposed Scheme will make a significant contribution to the overall aims and objectives of BusConnects, the Galway Transport Strategy and allow the city to grow sustainably into the future, which would not be possible in the absence of the Proposed Scheme.

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Chapter 03
Consideration of Reasonable Alternatives

Contents

3 Consideration of Reasonable Alternatives

3.1 Environmental Impact Assessment Requirements

Article 5(1)(d) of Directive 2011/92/EU, as amended by Directive 2014/52/EU "the EIA Directive") requires that an Environmental Impact Assessment Report (EIAR) contains 'a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and the main reasons for the option chosen, taking into account the effects of the project on the environment'.

In addition, Annex IV to the EIA Directive provides that the EIAR shall include:

> *"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."*

In addition, given the proposed road development for which approval is sought in this instance, section 50(2)(b)(iv) of the Roads Act 1993, as amended ("the Roads Act") states that that the EIAR shall contain the following information:

> *'…a description of the reasonable alternatives studied by the road authority or the Authority, as the case may be, which are relevant to the proposed road development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed road development on the environment'*

Section 50(2)(b)(vi) of the Roads Act also requires that "any additional information specified in Annex IV [quoted above] that is relevant to the specific characteristics of the particular proposed road development or type of proposed road development and to the environmental features likely to be affected" also be included in the EIAR.

Accordingly, this Chapter of the EIAR describes the reasonable alternatives studied and the main reasons for the selection of the proposed BusConnects Galway: Cross-City Link (University Road to Dublin Road) Scheme (hereafter referred to as the "Proposed Scheme") considering the effects on the environment.

It considers the alternatives at three levels:

- Strategic Alternatives;
- Route Alternatives; and
- Design Alternatives.

The reasonable alternatives studied which are relevant to the Proposed Scheme and its specific characteristics are described in the subsequent sections of this chapter.

3.2 Strategic Alternatives

3.2.1 Galway Transport Strategy

The Galway Transport Strategy (GTS) was introduced in Section 2.2.5.1 of Chapter 2 (Need for the Scheme) of this EIAR3.6, including the seven principles adopted to guide the measures needed to be implemented to support integrated transport solutions (both infrastructure and transport services) to allow Galway City and environs to continue to grow in a sustainable manner. In planning for the future, the GTS also took cognisance of existing development patterns within the city and environs.

While Galway has a compact walkable core, outside of the city centre, the suburbs have developed as a succession of low density residential and employment areas, which has led to a predominance of private car usage as a means of travel. As a result, the transport difficulties experienced across the city, particularly at peak travel times, have a significant effect on the quality of life of residents and are also impacting on the economic functionality of the city.

The major proposals to be implemented under the GTS were also set out in Section 2.2.5.1 of Chapter 2 (Need for the Scheme) of this EIAR, including the Proposed Scheme. These were formulated as part of the transport strategy development process and through the assessment of travel demands generated by existing and future land use planning requirements.

The approach undertaken in developing the GTS is presented in Diagram 3.1 and summarised as being:

- to initially establish strategic objectives;
- to develop and test strategy options; and
- to develop specific proposals which are brought together under the overall strategy.

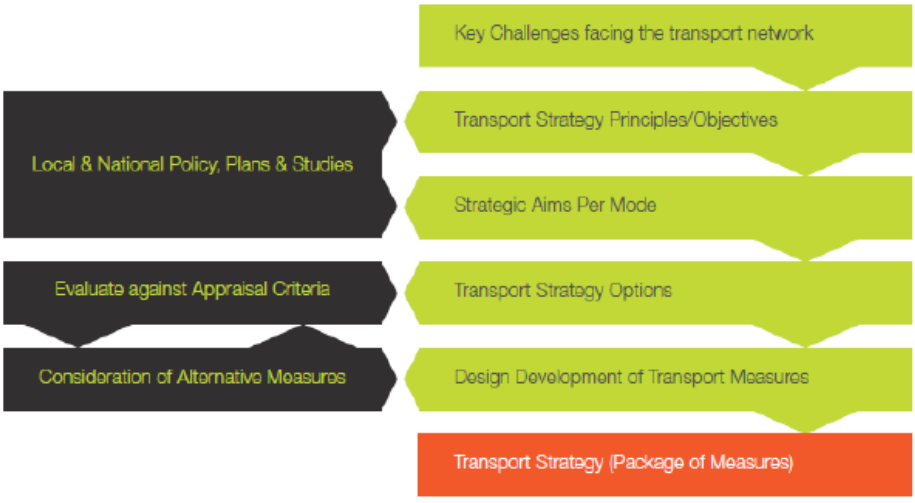


Diagram 3.1: GTS Strategy Development Process

More detail on the consideration of alternatives by mode as part of the GTS is presented in subsequent sections of this chapter. As illustrated in Diagram 3.1, each was evaluated against set appraisal criteria in line with the (then) Department of Transport Guidelines on a Common Appraisal Framework (CAF) for Transport Projects and Programmes. These include the 'Environment', to *'encourage better integration between transport and urban form, thereby minimizing harmful transport emissions'.*

In formulating the overall GTS, and the infrastructure and services needed to support it, the most suitable means of travel (travel modes) to address the travel demand for each type of journey were assessed, and as illustrated in Diagram 3.2.

Diagram 3.2: Trips to, within and across Galway

This diagram illustrates the wide variety of trip types currently within and through the study area and suggests the appropriate modes to serve these travel demands. These can be classified into the following broad categories:

- **A-A – within the City Centre** – for example, Eyre Square to Dominick Street. These types of journeys should generally be made on foot or by bicycle. Journeys across the centre by car should be discouraged and drivers should be encouraged to either use public transport or park their car before travelling across the central area;
- **B-B – Outer City << >> City Centre** – for example, Knocknacarra to Eyre Square. Journeys on radial corridors should be possible by bus (or other forms of public transport) – provided that the service provision is of a high frequency. Safe cycle routes are also essential to encourage cyclists;
- **C-C – Outer City << >> External Areas** (not crossing River Corrib) – for example, Ballybrit to Tuam. These journeys are difficult to cater for by public

transport and are often not practical on foot or by bicycle. Use of Park & Ride bus services could however be attractive if the service is of a high quality and frequency;

- **D-D – City Centre << >> External Areas** – for example, Eyre Square to Loughrea. These journeys are difficult to attract in large numbers to public transport, as travellers have a wide range of origins outside the city which cannot all be served by frequent public transport. Provision of Park & Ride bus services could however be attractive if the service is of a high quality and frequency;
- **E-E – Outer City << >> Outer City** (crossing River Corrib and via the City Centre) – for example, Salthill to GMIT. At present, these journeys are generally made by car. However, safe and direct dedicated cycle routes would encourage cycling for this type and length of journey, and if a reliable public transport service was provided and operated via the city centre, some drivers would consider these options to be a reasonable alternative. Frequent and reliable bus services on a few radial corridors would allow passengers to transfer between services with a short wait.
- **F-F – External << >> Outer City** (crossing River Corrib but not via the City Centre) – for example, Maigh Cuilinn to Parkmore. These journeys are difficult to attract to public transport, as travellers have a wide range of origins outside the city which cannot all be served by frequent public transport. An alternative to travel by car could be Park & Ride bus services if the service is of a high quality and frequency.
- **G-G – Outer City << >> Outer City** (crossing River Corrib but not via the City Centre) – for example, Westside to Mervue. Journeys between peripheral areas can be difficult to serve by public transport, as orbital public transport is generally not financially viable, and public transport via the city centre can often be much slower than travel by car if not on connecting public transport routes. Some travellers will however use public transport via the centre if it is of sufficient frequency and reliability. In addition, the provision of safe dedicated cycle routes could facilitate cycling for this type of journey;
- **H-H – External Area << >> External Area** (crossing River Corrib but not via the City Centre) – for example, An Spidéal to Headford. These journeys are the most difficult to attract to public transport, as travellers have a wide range of origins and destinations outside the city which cannot all be served by frequent public transport. Travel by car is often the only practical mode; and
- **I-I – Short travel in Outer City Areas** – for example, Renmore to Merlin Park. These types of journeys can often be made on foot or by bicycle and are generally difficult to make by public transport unless the journey is on a main radial bus corridor.

The assessment of travel demand and journey types concluded that, given the low-density nature of land-use development in Galway City and environs, the continued need for improvement in bus services as part of the overall GTS would be required.

This requirement was also assessed in combination with what needed to be done to:

- The traffic networks (traffic management, the road and street network, parking, and HGV management);
- Integrate with other local public transport measures;
- Integrate with regional public transport needs;
- Support walking and cycling; and
- Combine with other supporting transport measures (i.e. smarter mobility solutions, land-use integration, behavioural change, and demand management measures).

The GTS also looked at a phasing approach to the implementation of supporting and infrastructure and services in the short, medium, and longer-term over a 20-year period.

3.2.2 'Do Nothing' Alternative

The impact of traffic congestion, limited public transport services and their reliability because of this congestion, has been a significant constraint to the growth and development of Galway for some considerable time. These significant problems and inefficiencies with respect to the movement of people and goods were set out in the GTS as being:

- An over-reliance on private cars;
- Peak hour congestion and journey time unreliability for all motorised transport;
- Safety concerns as a result of traffic congestion;
- Many key junctions within the city operating at, or over capacity;
- Connectivity issues on the National and Regional road network resulting in significant volumes of cross-county and strategic travel demand between east and west Galway being concentrated and funnelled through the city area in order to cross the River Corrib;
- The pattern of residential development in the area, along with the location of employment destinations, generating a large amount of cross-city as well as city-bound travel demand;
- Large amounts of residential development located proximate to major employment and educational destinations city-wide, but not readily accessible by walking, cycling or public transport, thereby encouraging travel by private car;
- The short distance between Lough Corrib and Galway Bay, two significant natural physical constraints impacting upon the city;

- A natural barrier to cross-city and cross-county travel formed by Lough Corrib, the River Corrib and Galway Bay, with the three principal river crossings experiencing heavy traffic flows, leading to congestion and delay;
- The position of Galway City as a major regional centre for employment and education for a large geographical area, leading to large numbers of long-distance commuters for whom public transport is not currently a viable option, which leads to greater numbers of cars entering the city;
- The impact of traffic congestion on the City's reputation, particularly with regard to inward development;
- The suburban nature of much of the residential areas, and the wide distribution of jobs across a number of central and non-central locations, which lead to a situation where travel by public transport is not a viable option at this point for many journeys;
- Long journey times and delays on the current bus network, due in part to the limited available road space in the city centre for introducing bus priority which both reduces its attractiveness to passengers and increases costs of operating; and
- Limited road space on most of the principal roads, which reduces opportunities for safe and comfortable cycling.

Prior to the onset of the COVID-19 pandemic (the 'pandemic'), and as set out above, congestion throughout Galway City and environs was particularly high and increasing year on year. While traffic levels reduced considerably at times over the last two years as and when public health restrictions were either imposed or relaxed by Government, we have seen a more recent rebound effect in terms of traffic volumes increasing with resulting congestion again. Diagram 3.3 below presents count data gathered from a Transport Infrastructure Ireland traffic counter located on the N6 Bothar na dTreabh between the N83 and N84 junctions. This demonstrates a significant reduction on traffic on this route from March 2020. Traffic volumes fell to as low as 35% of the March 2019 levels, however as the graph demonstrates, this has continued to increase since October 2021. Traffic volumes at this location in March 2022 are trending towards those levels experienced prior to the pandemic.

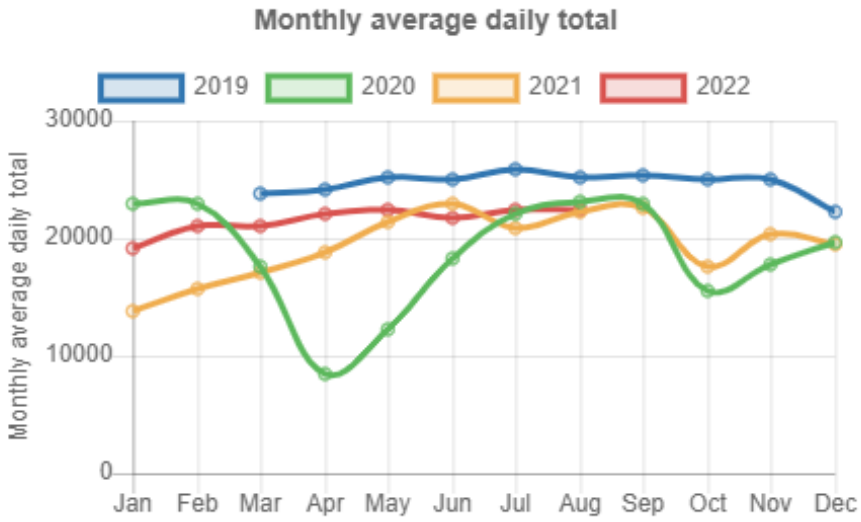


Diagram 3.3: Transport Infrastructure Ireland Traffic Counter Data – N6, Galway City

Without appropriate planning for a return to a more normal levels of travel demand, and an improved quality of life beyond the pandemic, potential impacts could worsen for the city and environs including:

- Continued growth in traffic congestion;
- Continued impacts on the ability of the region to grow economically due to said increased congestion;
- Longer journey times and increased travel stress diminishing quality of life; and
- Environmental emissions targets will not be met.

Specifically, in relation to existing bus services in the region, in terms of the out-workings of a strategic "Do Nothing" alternative, currently, the bus network is characterised by discontinuity, whereby buses on routes have very limited dedicated bus lanes and / or supporting priority measures.

This means that for most of the journey, buses and cyclists are competing for space with general traffic and are negatively affected by congestion. This results in delayed buses, unreliable journey times for passengers and safety risk for cyclist.

This is illustrated best by the journey time information for an existing bus service which for the most part traverses the route of the Proposed Scheme. This data was obtained from the NTA utilising their Automatic Vehicle Location (AVL) system. A sample was taken for the 404 bus route in the month of November in 2019 between two stops which correspond to the start and end points of the proposed scheme (i.e., to the west on R863 University Road, near the junction with R864 Newcastle Road and to the east on the R338 Dublin Road via the Lakeview School).

The data was analysed for the average weekday in November 2019 for both eastbound and westbound services and a profile across the 7:00-19:00 period was generated. Diagram 3.4 and Diagram 3.5 present the journey time data for both the westbound and eastbound directions respectively.

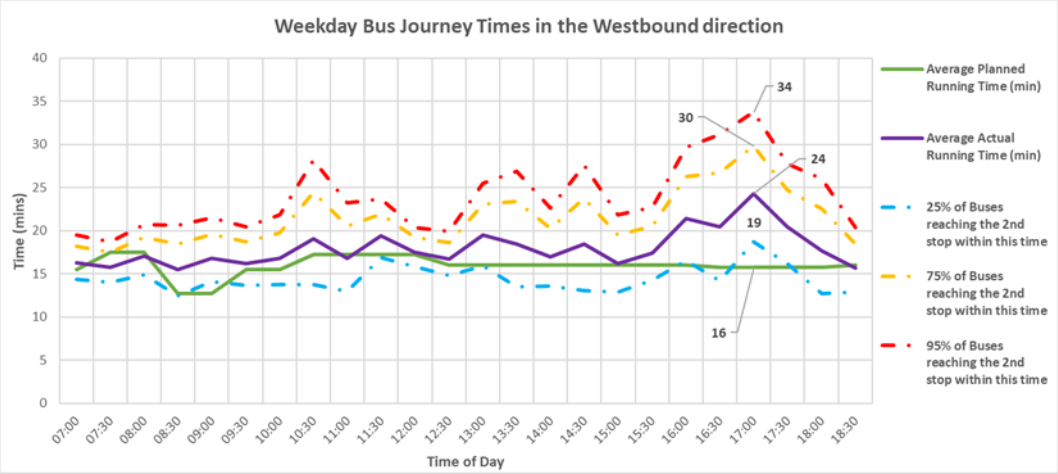


Diagram 3.4: Average Weekday Bus Journey Time Profile on Cross-City Link Route (Westbound Services)

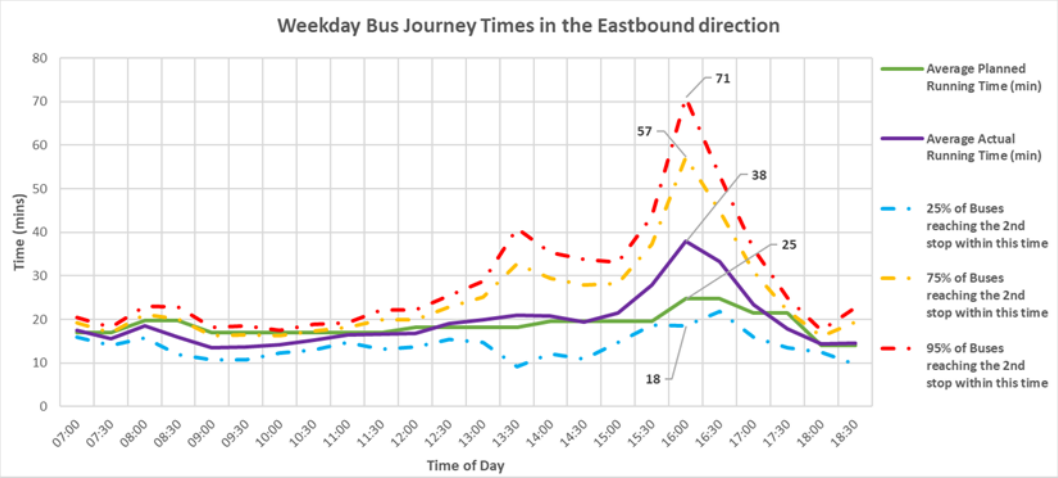


Diagram 3.5: Average Weekday Bus Journey Time Profile on Cross-City Link Route (Eastbound Services)

For the westbound services, the AVL data shows a high degree of variability in journey times across the entire day with the worst periods occurring around 10:30 and from midday onwards, with the peak occurring in the evening around 17:00 At this time, we see the average planned running time is expected to be 16 minutes between the two stops (on the R338 Dublin Road and on R863 University Road) but the average is actually 24 minutes (a 54% increase), with 75% of buses reaching the 2nd stop within 30 minutes (89% increase) and 95% of buses reaching the 2nd stop within 34 minutes (114% increase).

For the eastbound services, the AVL data shows a high degree of variability in journey times from midday onwards with the peak occurring in the evening around 16:00.

At this time, we see the average planned running time is expected to be 25 minutes between the two stops (on R863 University Road and on the R338 Dublin Road) but the average is actually 38 minutes (a 53% increase), with 75% of buses reaching the 2nd stop within 57 minutes (131% increase) and 95% of buses reaching the 2nd stop within 71 minutes (187% increase). This data demonstrates that 1 in 4 buses take approximately an hour or more to complete a scheduled 25-minute journey in the evening peak hour.

The above diagrams demonstrate the volatility of Galway City Centre traffic patterns. This level of uncertainty is currently a barrier to mode shift due to the high degree or variability around a potential journey time.

Adopting a Do-Nothing approach to infrastructure improvements would therefore most likely result in an exacerbation of the problems arising from bus priority discontinuity – such as delayed buses and unreliable journey times. The capacity and potential of the public transport system would remain restricted by the existing deficient and inconsistent provision of bus lanes and the resulting sub-standard levels of bus priority and journey-time reliability. As such, in addition to the continuation of issues relating to existing bus services, all future bus services, including the proposed Galway Bus Network Redesign, would also suffer from the same lack of journey-time reliability. This would severely impact the attractiveness of public transport as an alternative to private car usage for those who need to travel to/from various locations into and through Galway City.

Similarly, without appropriate investment in the provision of safe cycling infrastructure and a congestion free, traffic calmed street network in the core city centre area, cycling uptake in Galway, which was previously regarded very much as a cycling city, will continue to stagnate.

The same applies to the need for sufficient investment in public realm and facilities for pedestrian movement. With a “Do Nothing” Alterative, there would not be significant strategic investment in improvements to the pedestrian environment. Rather, improvements would be limited to relatively limited interventions, for example, ongoing maintenance of existing footpaths and adjacent public spaces. The “Do Nothing” alternative would not result in improvements to encourage more journeys generally at a local level by active travel, including connecting to and from bus stops for all pedestrians, and in particular improving facilities for the mobility and visually impaired.

For all these reasons, a Do-Nothing alternative is not considered to be a viable alternative relative to the outcomes which can be realised by the Proposed Scheme.

3.2.3 Transport Options

3.2.3.1 System Choices

While there is considerable orbital daily travel demand around the city centre, for example between residential areas to the west of Galway and employment centres such as Ballybrit and Parkmore to the east, there are also very significant generators of travel demand within, and in proximity to the city centre area including the city centre retail core itself and social amenities such as the Hospital, NUIG and the Sports Grounds. It is therefore clear that a public transport network of services is required to provide for sufficient attractive accessibility to public transport for the widest population catchment possible.

The GTS utilised the Western Regional Model (WRM) to look at the potential for use of public transport services along the busiest movement corridors in Galway. This exercise identified that with high-frequency (and unconstrained) services in place, the maximum single direction passenger-demand generated was approximately 1,000 trips over a 1-hour period, equivalent of 80-90% of a high frequency bus service or less than 25% of the capacity of a frequent light rail service.

Any new public transport network proposed for Galway also needs to be cognizant of the vibrant nature of the city centre, to allow it to 'breath' by removing traffic congestion and to create an attractive environment for people to access and move around. This is the concept behind the 'Cross-City Link' identified in the GTS and as illustrated in Diagram 3.6. The 'Cross-City Link' is denoted as the blue Bus Priority / Bus Only Route in the diagram.

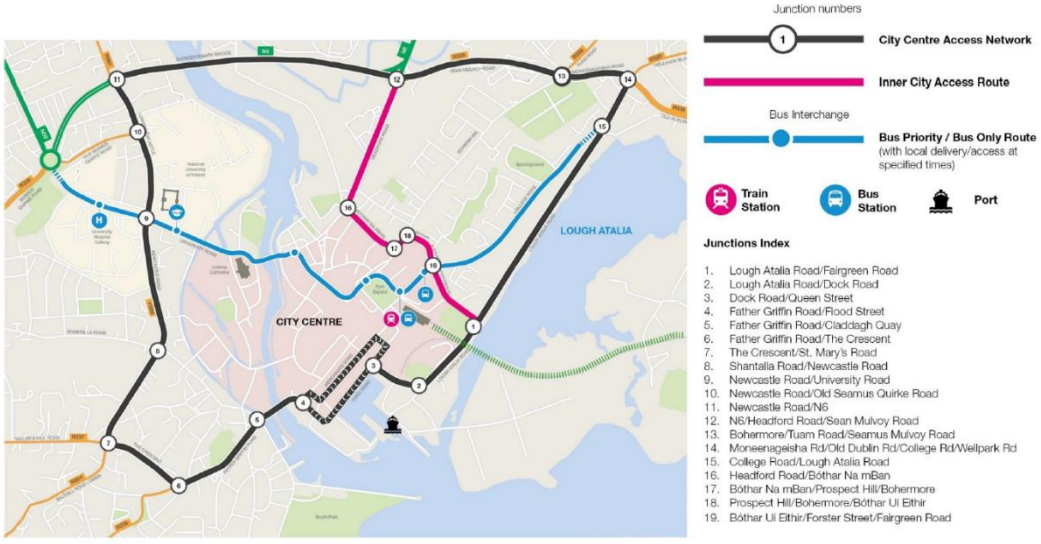


Diagram 3.6: Cross-City Link and City Centre Routes identified in Galway Transport Strategy

3.2.3.2 Bus Alternatives

Current bus services along routes serving Galway City and its environs are presented in Diagram 3.7 with further detail provided in Section 6.4.2 of Chapter 6 (Traffic and Transport) of this EIAR.

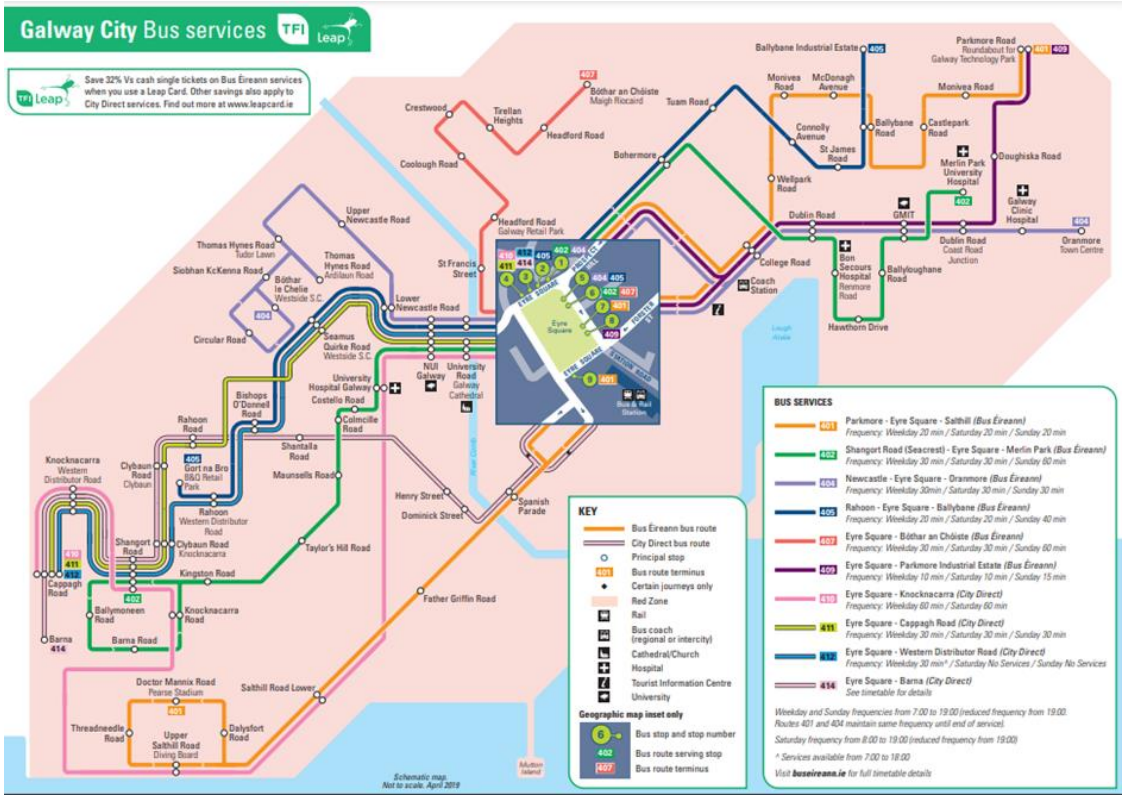


Diagram 3.7: Existing Galway City Bus Services (Source: Transport for Ireland)

The GTS identifies proposals for a revised future rationalized network of higher frequency bus services as illustrated in Diagram 3.8.

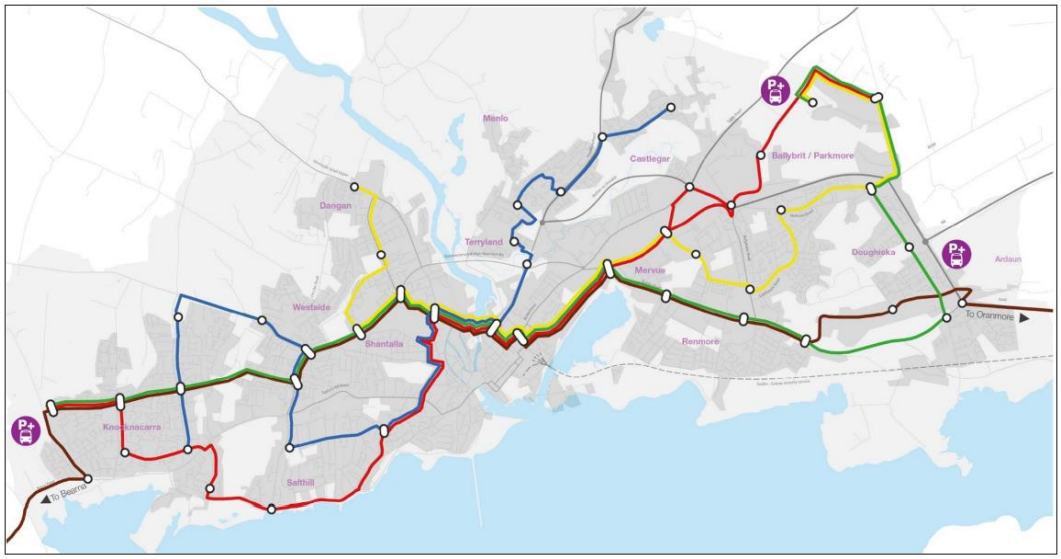


Diagram 3.8: Proposed Galway City Bus Services (Source: Galway Transport Strategy)

The bus network identified in the GTS was seen to deliver up to 70% of residential, and between 72-93% coverage of commercial and primary and post primary schools with access to a high-frequency bus service.

These services, any variations thereof or further new services which route through the city centre, need to be supported by measures which ensure improved journey times and journey time reliability throughout the day. In doing so, measures adopted for bus services through the city centre do not preclude the potential for other services and supporting journey time reliability measures on other routes to cater for public transport demands into the future.

The concept for the Cross-City Link therefore was to focus on the provision of infrastructure and supporting traffic management measures necessary to cater for existing and future bus services, which either approach and terminate in the city centre from the east and west or run through the city centre from either direction.

In terms of bus service alternatives, Bus Rapid Transit (BRT) has emerged in recent years as an effective, cost efficient and high-quality public transport system. As BRT is a relatively new mode of transport, there are various definitions and interpretations as to what BRT comprises and there are many different forms of BRT systems in operation worldwide. Definitions of BRT range from a Quality Bus Corridor (QBC) to being a fully guided, fully segregated bus system.

The Proposed Scheme is therefore required to be sufficiently flexible to support different bus vehicle types, although there are no current plans in terms of the public bus fleet to provide either guided or fully segregated bus systems. These may require further additional infrastructure provision later should they ever be required to service changes in travel demand into the future.

3.2.3.3 Light Rail Alternatives

As Set out in Section 3.2.3.1 of this chapter, the GTS identified a core need for the delivery of a public transport network with coverage to provide accessibility to alternative sustainable transport services to a significantly greater percentage of the low-density population catchments of the city and environs.

The appropriate type of public transport service provision is predominately determined by the likely quantum of passenger demand along any public transport route. The relatively low levels of demand to be served on routes, as also set out in Section 3.2.3.1, results in the clear need for bus services to be a key part of any integrated transport network for Galway currently, and into the future.

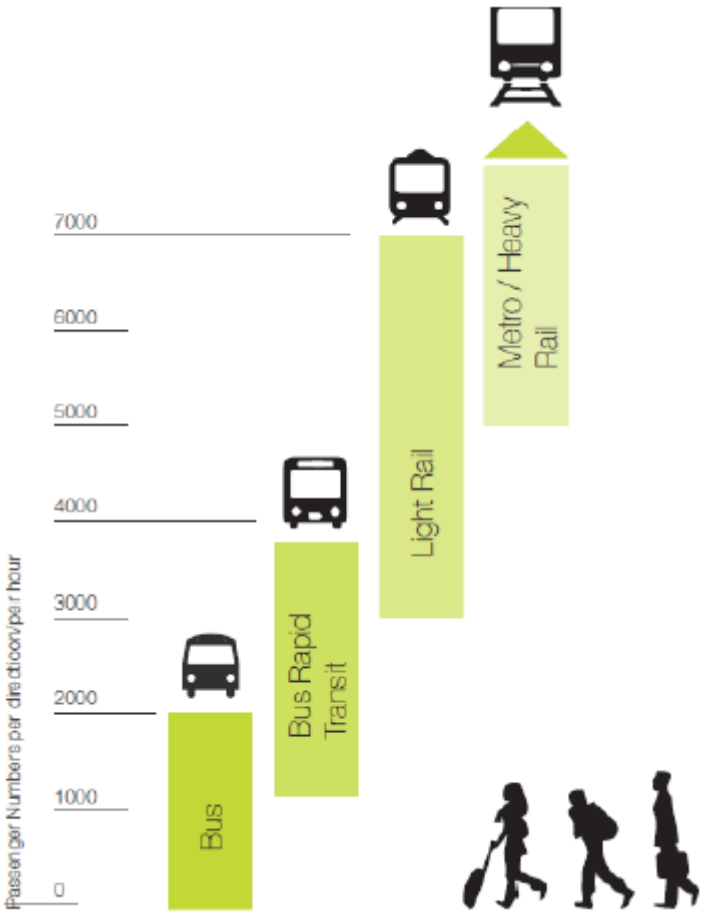


Diagram 3.9: Public Transport Mode Capacities (Source: GTS)

As illustrated in Diagram 3.9, for urban transport systems, bus-based transport is the appropriate public transport mode for passenger demand levels of up to 4,000 passengers per hour per direction (UITP 2009). Light rail provision would generally be appropriate to cater for higher passenger demand of between 3,500 and about 7,000 passengers per hour per direction. Passenger demand levels above 7,000 passengers per hour per direction would generally be catered for by heavy rail or metro modes, which would usually be expected to serve numerous major origins or destinations along a particular corridor.

In the case of both the bus and light rail modes, higher levels of passenger demand than the above stated diagrams can be accommodated under specific conditions.

The GTS recognised this when looking at network options versus linear mass transit options. This does not preclude the potential for corridor approaches to emerge into the future, linked to more intense land-use development planning which would give rise to the potential to be served by light rail.

Therefore, based on existing population demographics and any future development likely to emerge from current statutory land-use plans (i.e., the Galway City and County Development Plans), there would be insufficient demand to justify the provision of a light rail network alternative, particularly given the low to medium density nature of development along, and from existing corridors

feeding into city centre. The same reasoning also applies to even higher mass transit options such as metro or heavy rail.

3.2.3.4 Rail Integration

Galway is serviced be heavy rail, with inter-city and regional services connecting into Ceannt Station. The rail line extends east to Athenry, with a stop at Oranmore / Garraun. From Athenry, rail lines continue towards Dublin and to Limerick.

Irish Rail intend to carry out an upgrade to the rail network serving Galway City through the provision of a second rail line between Galway and Athenry to provide a twin-track along this section. At the time of writing a feasibility study is in the process of being prepared for this proposed project.

In considering options for the Cross-City Link in the GTS, a key objective was to deliver improved transport integration between regional and local bus services and the rail station in the city centre at Ceannt Station.

3.2.3.5 Demand Management Alternatives

One of the key overarching objectives of the GTS is to significantly reduce the reliance on private car usage to meet travel demand, particularly during the commuter peaks, and to encourage use of walking, cycling and public transport. One of the mechanisms to achieve such a reduction of private vehicle use is the introduction of measures to discourage travel by car – i.e., demand management.

Demand management can take many different forms, from restricting car movement or car access through regulatory signage and access prohibitions, to parking restrictions and fiscal measures (such as tolls, road pricing, congestion charging, fuel/vehicle surcharges and similar). All these approaches discourage car use through physical means or by adding additional costs to car use, such that it becomes more expensive and alternative modes become more attractive. A key success factor of demand management is greater use of alternative travel modes, in particular public transport. This assumes of course that alternative reliable public transport services exist.

Applying this to Galway City Centre, there is also a balance to be struck in terms of retaining accessibility to the city centre area for cars, while increasing accessibility by public transport, and in doing so, also planning for and facilitating the overall increased accessibility and economic activity in the city. The strategic traffic management aims identified in the GTS relating to the city centre therefore are:

- To reduce through-car movement and traffic speeds in the city centre; and
- To prioritise public transport movements in the city centre.

To achieve this, the GTS identifies the need for an improvement in orbital routes around the core city centre area to both reduce through travel by cars and HGVs while at the same time retaining access to city centre car parks combined with a

reduction in on-street parking in some locations to allow for improved public realm.

The resulting the Galway City Centre Access Network identified in the GTS is presented in Diagram 3.10.

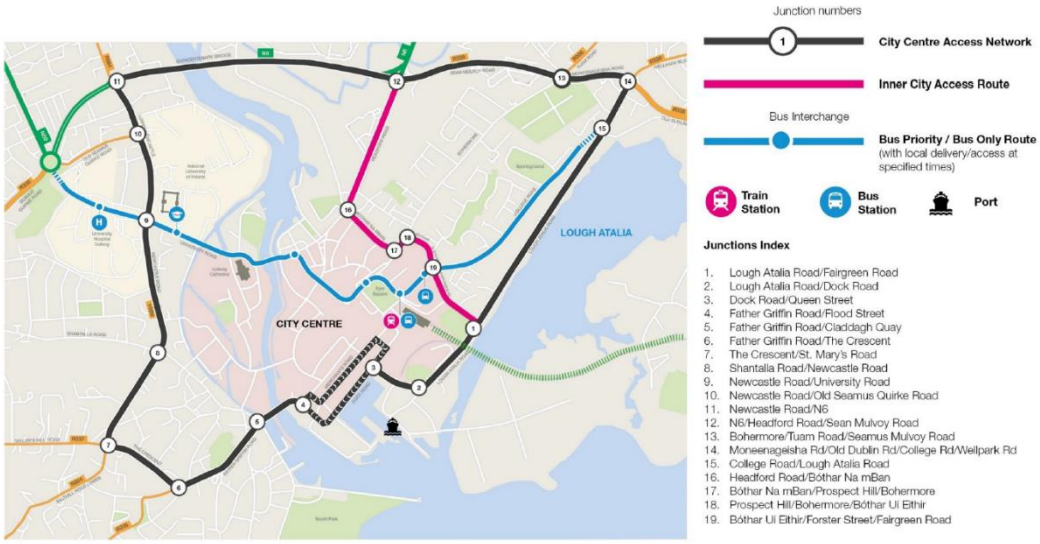


Diagram 3.10: City Centre Access Network (Black Route) and Inner City Access Route (Pink Route) (Source: GTS)

In delivering elements of the GTS related to the city centre through a phased approach, it is clear therefore that some demand management measures will be needed in combination with, and to support enabling infrastructure projects. In the case of the Cross-City Link therefore, there is a need to include elements of the 'Inner City Access Route' to improve orbital movement and retain or improve access to key city centre car parks.

3.2.3.6 Technological Alternatives

Technological advances have opened-up new areas of potential in the delivery of transportation infrastructure. Driverless trains and smart highways are two examples. Some of these initiatives, such as driverless trains, are now in use.

However, there is no evidence that such developments will displace the need for mass transit, which is essential to the operation of a modern city. Accordingly, the need to improve the overall bus system will remain.

In addition, the spectrum of potential technological capabilities does not obviate the need for the provision of safe cycling facilities and improved public realm and walking routes for pedestrians.

Overall, while certain technological advances do provide new opportunities in the transport area, particularly around information provision, they do not yet provide viable alternatives to the core need to provide for the movement of more people by non-car modes, including the provision of safe, segregated cycling facilities. Accordingly, there are no viable technological alternatives on their own to meet the transport needs of Galway city and environs.

The GTS identifies Smarter Mobility as how intelligent transport services are changing the way cities function. Intelligent Transport Solutions (ITS) use technology to increase efficiency, safety and co-ordination across transport networks. The GTS proposes Smarter Mobility policies and states that ITS will be used to support and future-proof proposed infrastructure, implement changes and add value to the operation of the transport network by maximising efficiency and ensuring the optimum performance of the entire network. The GTS categorises Smarter Mobility projects into three broad groups:

- Projects which provide additional capacity to the transportation network;
- Projects which incorporate demand management; and
- Projects which utilise intelligent systems to deliver overall efficiency and cost savings.

The Cross-City Link developed within the GTS is considered to be a project that falls into all three categories of Smarter Mobility.

3.3 Walking and Cycling Integration

3.3.1 Walking and Public Realm

The Cross-City Link is intended to be about much more than improving bus and integrated public transport services. It also needs to be a catalyst for the creation of a more walkable and cyclable city and to connect 'places' within the city centre area.

The GTS identifies a series of aims and measures to provide a basis for developing plans and infrastructure proposals to better provide for pedestrian movement. These aims are:

- To provide improvements for pedestrians along city centre public transport corridors;
- To increase priority given to pedestrians over road traffic;
- To increase legibility and wayfinding;
- To increase the quality, comfort and safety of the pedestrian facilities.

Consideration of alternatives for the Cross-City Link, both at GTS preparation stage, and in subsequent route and design development stages were required of these aims which ultimately shape the Proposed Scheme and all other projects emerging from the GTS.

Specifically in relation to public realm, Galway City Council is committed to delivering a public realm strategy.

The Galway Public Realm Strategy (GCC, 2019) explores the current condition of central Galway's townscape and network of public and green spaces and sets out a vision and strategy for improvements to guide investment and development in the future. The Strategy looks to further the previous innovative steps which have already been taken, such as creating the pedestrianised zone (Shop Street),

investment in the Fish Market and Eyre Square, and the opening of the Corrib riverside walk.

The Galway Public Realm Strategy provides a vision of place, design guidance and outline project proposals to improve Galway's streets and public spaces. The design response is specific to the location, history and character of Galway City. The overriding aim is that this strategy contributes to making the whole of Galway as good as its best parts, not just to improve the look and feel of the public realm but mainly to support liveability and through that the life and prosperity of the city.

Making the centre as welcoming and accessible to everyone as possible forms a fundamental layer within the strategy. The Galway Public Realm Strategy promotes universal design to help open up the city centre to all and make getting into and moving around the centre much easier. The strategy will help the city centre better cater for old and young in particular and include provision for more seating and more play opportunities.

The GTS seeks to redress the balance in favour of pedestrians and cyclists over vehicular traffic and the Galway Public Realm Strategy seeks to capitalise on this by creating a high-quality public realm, made possible by reducing the dominance of car traffic and upgrading the quality of the physical fabric, hard and soft. There are also a number of opportunities to create new space out of existing road / street and parking areas including at Woodquay and Small Crane which could be transformed to deliver much needed additional high quality and characterful public realm without significantly reducing the availability of car parking in the city centre. There are a number of major development initiatives on the edges of the city centre, including Ceannt Station and the Harbour Regeneration Area, through the Nun's Island masterplan, and the Headford Road Regeneration Area. These present opportunities to deliver new public spaces and public realm which individually, and certainly when considered together, will add significantly to the city's public realm. It is a key objective of the Public Realm Strategy to clearly set out the design context for these and to define the network of spaces and routes in which these new spaces will sit and interconnect with.

In the context of the Cross-City Link project and its ability to better connect places, when considering alternatives at design development stages, cognisance was given to the opportunities for public realm enhancement identified in the Galway Public Realm Strategy where appropriate to do so.

3.3.2 Cycling

The GTS identifies a series of aims and measures to provide a basis for developing plans and infrastructure proposals to better provide for cycling. These aims are:

- To provide a primary 'trunk' cycle network which will provide a convenient and safe route for medium-distance radial commuter / leisure journeys;

- To provide a secondary cycle network which will provide a recognizable grid network for local journeys, and will be connected to the primary network for longer journeys' and
- To increase options for cycling in and across the city centre.

Consideration of alternatives for the Cross-City Link, both at GTS preparation stage, and in subsequent route and design development stages took cognisance of these aims which ultimately shape the emerging Proposed Scheme and all other projects emerging from the GTS.

3.3.3 Initial High Level Route Alternatives

In the formulation and subsequent assessment of route options for the Cross-City Link as part of the GTS, as set out earlier, cognisance was taken of both existing and future planned bus routes and services. In terms of identifying a primary route though the city centre, high level options assessment concentrated on the existing limited bridge crossings over the River Corrib and the need to remove traffic congestion from the core city centre area while providing appropriate balanced alternatives for east-west orbital movement of traffic. The Quincentenary Bridge to the north of the city currently acts as the primary National and Regional Road link for east west traffic movement. By removing more traffic from the city centre, it pushes more onto this bridge and ultimately the proposed Galway City Ring Road (also proposed as a scheme under the GTS) further out. The relative changes in traffic volumes across the Corrib bridge crossings identified in the GTS are illustrated graphically in Diagram 3.11.

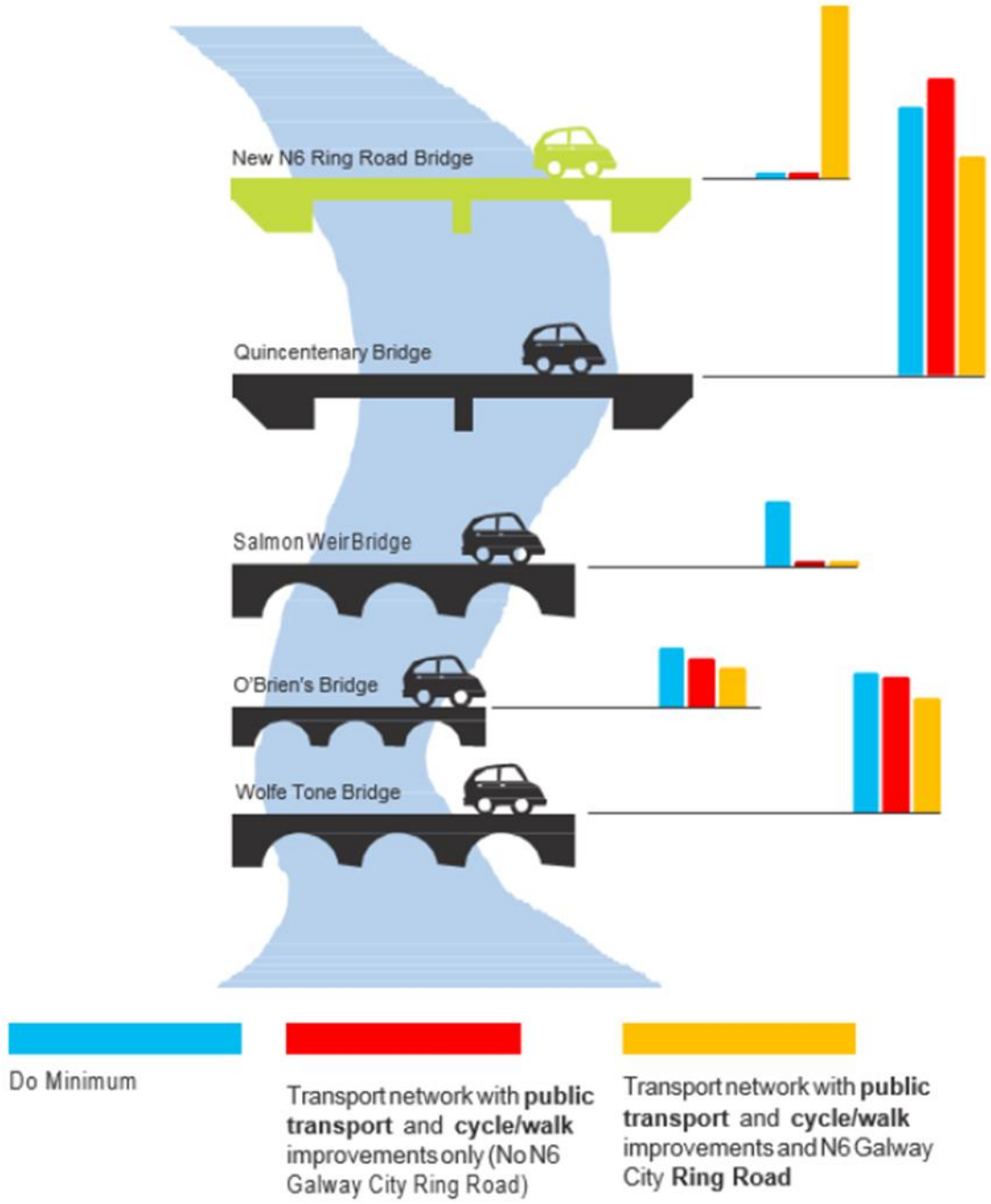


Diagram 3.11: Peak Hour Vehicle Flows across Corrib Bridges (Source: GTS)

Of the existing bridges in the city centre, the Salmon Weir bridge is considered as the most attractive for running most public transport services across and through the city centre, routing existing and new services in closest proximity to key trip attractors or generators including NUIG and University Hospital. An illustration of changes in movement across the Salmon Weir Bridge from the modelling undertaken in support of the GTS is presented in Diagram 3.12.

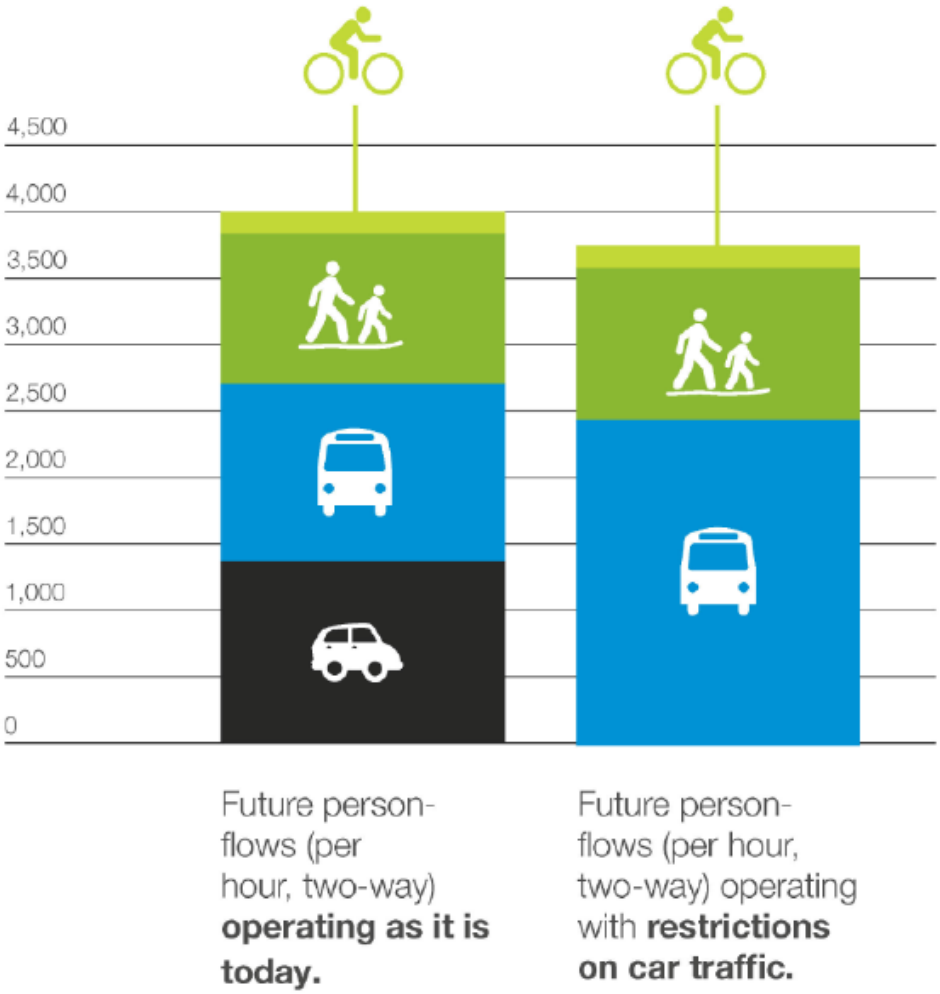


Diagram 3.12: Peak Hour Person Flows across Salmon Weir Bridge – existing vs proposed (Source: GTS)

3.3.4 Strategic Environmental Assessment of Alternatives

The preparation of the GTS was subject to Strategic Environmental Assessment (SEA). Article 1 of SEA Directive (2001/42/EC) states that the 'objective of this Directive is to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment.'

SEA is a process for evaluating, at the earliest appropriate stage, the environmental quality and consequences of Plans / Programmes (PP). The purpose is to ensure that the environmental consequences of Plans / Programmes are assessed during their preparation and prior to their completion and the effect of the implementation of Plans / Programmes may also be subject to monitoring.

The SEA process also gives interested parties an opportunity to comment on the environmental impacts of the proposed Plan / Programme and to be kept informed during the decision-making process.

The SEA Environmental Report included an assessment of various alternative approaches for the GTS, comprising:

- The do-minimum approach;
- Prioritisation of a road transport based approach;
- Prioritisation of a public transport based approach;
- An integrated transport-based approach.

The assessment of alternatives approaches found that the integrated transport-based approach as detailed in the GTS has the preferred outcome in terms of effectiveness and overall environmental benefit.

3.3.5 GTS Outcomes

The GTS identifies the outcomes by which the successful implementation of the strategy can be measured. These are:

- Future-proofing the city – to ensure Galway can continue to grow as an economic and cultural centre in the West of Ireland, the draft strategy frames the future transport needs of the city and its environs, in terms of walking, cycling, public transport and Strategic Road provision. Specifically listed under this outcome is the Cross-City Link and ensuring it is introduced to increase the amount of people able to access the heart of the city by public transport;
- Improved efficiency of the overall transport network by optimising the use of limited city centre road space, thereby facilitating a greater degree of access to the city;
- Improved environment, urban realm and ambience – enhancing the streetscape of the city centre, reducing noise and air pollution and freeing up more space where people can walk, shop, socialise and enjoy the city; and
- Tourism, commercial and retail benefits - improving the overall commercial/retail and tourist environment of Galway, with additional transport capacity for shoppers and visitors accessing the city centre and key tourist locations such as Salthill Promenade and Galway Racecourse.

3.4 Route Scheme Alternatives

3.4.1 Scheme Options Assessment Sections

With the GTS broadly establishing the route through the City Centre for the Cross-City Link, the next stage in the Proposed Scheme development process was to look in more detail at potential scheme level route variants.

For the purpose of development of route level scheme options and assessment of same, the Cross-City Link and Inner-City Access routes were sub-divided into a number of sub-sections. In addition to the Cross-City Link and the Inner-City Access Route, other city centre streets and routes were assessed in terms of impact and modifications needed arising from the creation of a bus priority corridor along the Cross-City Link.

The scheme study area considered comprises the Cross-City Link from R863 University Road to R338 Dublin Road and the Inner-City Access Route from Headford Road to Lough Atalia Road, together with impacted adjacent streets including Woodquay, Waterside, Newtownsmith, R336 Merchants Road and Forthill Street.

For the purposes of options assessment, these have been divided into the following sub-sections:

For the Cross-City Link:

- Sub-Section 1 - R863 University Road to R866 St. Francis Street;
- Sub-Section 2 - R866 St. Francis Street and R866 Eglinton Street;
- Sub-Section 3 - R866/R336 Eyre Square to R339 Forster Street;
- Sub-Section 4 - R339 College Road (R339 Forster Street to Lough Atalia Road);
- Sub- Section 5 - R339 College Road (Lough Atalia Road to Moneenageisha Junction);
- Sub-Section 6 - R338 Dublin Road.

For the Inner-City Access Route:

- Sub-Section 7 - Fairgreen Road;
- Sub-Section 8 - Bóthar Uí hEithir and R336 Prospect Hill;
- Sub-Section 9 - Bóthar na mBan / St. Brendan's Avenue / R866 Headford Road / Dyke Road.

For the impacted adjacent streets:

- Sub-Section 10 - Woodquay / Walsh's Terrace / Daly's Place / Mary Street; and
- Sub-Section 11 - Forthill Street / R336 Merchants Road / Queen Street.

The Proposed Scheme sections are illustrated in Diagram 3.13.

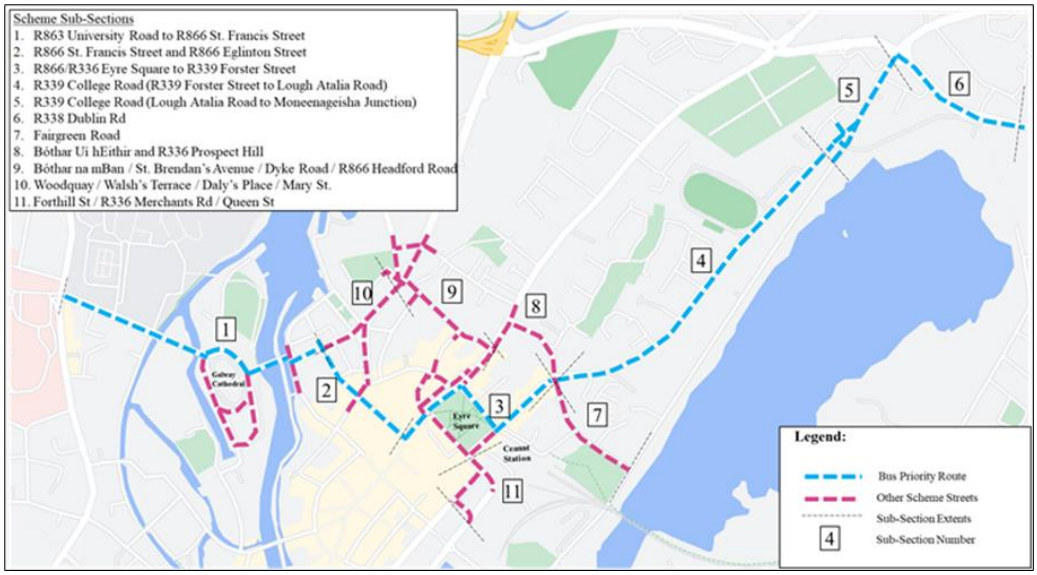


Diagram 3.13: Proposed Scheme Sections

The start and end points considered represent logical break points in the context of identifying the extremities of a Proposed Scheme and that of other projects which would follow and could be phased independently under the GTS.

The University Road / Newcastle Road junction was chosen as the extremity of the scheme to the west due to this being the location where all 5 GTS bus routes converge onto a single corridor and this represents a logical start point for the Cross-City Link. A future scheme is proposed to address connectivity from University Road to the Seamus Quirke Road, potentially via University Hospital Galway.

The Dublin Road was chosen due to constraints on the transport network at Moneenageisha junction. The Cross-City Link and the City Centre Access Network overlap along College Road, between Lough Atalia Road and Moneengeisha junction. However, regular delays are experienced for all vehicles passing through the Moneenageisha junction in all directions, with downstream queuing observed in particular in the PM peak. The benefits of the Cross-City Link will be maximised by providing bus priority through this junction. The GTS identified a bus priority corridor along the Dublin Road from Moneenageisha junction to the Martin Roundabout. By extending the Cross-City Link scheme onto Dublin Road, the Cross-City Link can avail of the bus journey time benefits that will be achieved through the Moneenageisha junction and provide an interface with any future scheme along the Dublin Road, however a future scheme would not be a pre-requirement for the Cross-City Link scheme to accrue benefits for public transport.

The Lough Atalia Road junction with Fairgreen Road represents one end of the Inner-City Access Route. This was chosen as the extent of the Cross-City Link scheme, due to the restrictions placed along the Cross-City Link for general traffic. It is expected the traffic volumes along Fairgreen Road and the Inner-City Access Route will increase with the introduction of the Cross-City Link.

The Headford Road / Dyke Road was chosen as the other end of the Inner-City Access Route to be included in this scheme. This was chosen due to the requirement to convert Fairgreen Road, Bothar Ui Eithir, Prospect Hill, Bothar na mBan and St. Brendan's Avenue a two-way link along its length, due to the restrictions placed along the Cross-City Link for general traffic. With the Cross-City Link in place, access to numerous car-parks along the Inner-City Access Route will be required to be maintained. The most significant current constraint on this route for traffic and pedestrians is at St. Brendan's Avenue and Headford Road. It is expected that the traffic volumes at this junction will increase with the introduction of the Cross-City Link. This is also the location where one of the GTS bus routes intersects with the Inner-City Access Network. The section of the Inner-City Access Route along Headford Road, between St. Bridgits Place and the N6 Bothar na dTreabh will likely be subject to another future scheme to be developed by Galway City Council to address the demands of all modes along that corridor.

The Merchants Road, Forthill Street and Dock Road junctions were chosen at the extremities of the scheme to the south west, as this is the location where access to Eyre Square and the Cross-City Link will be impacted. As Eyre Square will no longer be a through-route, vehicle demand to access Eyre Square will reduce significantly, requiring a realignment of Merchants Road onto Forthill Street onto Dock Road.

Similarly at Walsh's Terrace, Woodquay, Dalys Place, these streets will no longer form part of a through route and will become local access only, hence changes to the layout of these streets will be necessary to facilitate the implementation of the Cross-City Link.

3.4.2 Route Scheme Options Assessment Process

3.4.2.1 Assessment Criteria

Utilising the Common Appraisal Framework for Transport Projects and Programmes' (CAF) published by the Department of Transport, Tourism and Sport (DTTAS), (March 2016), assessment sub-criteria were developed and a Multi-Criteria Analysis (MCA) carried out on options to determine the preferred scheme option within each sub-section along the route of the Proposed Scheme.

The CAF requires schemes to undergo a MCA under the following criteria;

- Economy;
- Integration;
- Accessibility and Social Inclusion;
- Safety;
- Environment; and
- Physical Activity.

In addition to the CAF criteria above, an additional criterion was applied to the Proposed Scheme in order to examine how each option aligns with Galway City Council's policies as set out in the GTS. The addition criterion titled GTS Policies was developed.

Utilising the CAF assessment criteria, a number of assessment sub-criteria have been identified for each of the three elements. As any options selected for any of the elements will have a direct impact on the other elements, the same sub-criteria are proposed across each section (and sub-sections).

Table 3.1 presents a summary of the assessment criteria and sub-criteria used as part of the detailed route scheme options assessment process. An explanation of each sub-criteria utilised is provided in Section 3.4.2.2.

Table 3.1: Summary of Route Scheme Assessment Sub-Criteria

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1.a. Capital Cost
	1.b. Transport Reliability and Quality (Public Transport Journey Time)
	1.c. Transport Reliability and Quality (Pedestrian and Cyclist Journey Quality and Time)
	1.d Transport Reliability and Quality (All Vehicles Journey Time)
2. Safety	2.a. Pedestrian User Safety
	2.b. Cyclist User Safety
	2.c. Public Transport User Safety
	2.d. Other Road Vehicles User Safety.
3. Physical Activity	3.a. Promotion of Active Travel Modes
4. Environment	4.a. Archaeology and Cultural Heritage
	4.b. Architectural Heritage
	4.c. Flora & Fauna
	4.d. Soils and Geology
	4.e. Hydrology
	4.f. Landscape and Visual
	4.g Air Quality
	4.h. Noise & Vibration
	4.i. Land Use Character
5. Accessibility and Social Inclusion	5.a. Access to Key Trip Attractors (Education/Health/Transport/Commercial/Employment)
	5.b. Mobility Impaired User Benefits
6. Integration	6.a. Public Transport Network Integration
	6.b. Cycle Network Integration
	6.c. Road Network Integration
7. GTS Policies	7.a. Efficient and Reliable public transport to and through the city centre
	7.b Enable Traffic to access and move around the city centre.

Assessment Criteria	Assessment Sub-Criteria
	7.c. Provision of Access to existing facilities
	7.d. Safe and efficient movement of Pedestrians and Cyclists on and crossing the route.
	7.e. Removal of non-essential motorised traffic from core city centre.

3.4.2.2 Assessment Sub-Criteria

A set of sub-criteria were used to comparatively evaluate the options. A brief outline of each of the sub-criteria identified in Table 3.1 are provided in this section.

3.4.2.2.1 Capital Cost

This sub-criterion is established to assess design options for their likely capital infrastructure cost. Each route option will be assessed relative to the nature and extent of infrastructure works requirements to deliver the scheme objectives. Capital cost estimates consist of both the indicative infrastructure cost estimate and land acquisition costs.

3.4.2.2.2 Transport Reliability and Quality (PT Journey Time)

This criterion assesses options along the Cross–City Link in terms of the degree to which public transport reliability and quality of service is likely to be achieved. The assessment considers journey time and the number of major junctions.

3.4.2.2.3 Transport Reliability and Quality (Pedestrian and Cyclist Journey Quality and Time)

This criterion assesses options in terms of the degree to which pedestrian infrastructure and cyclist quality of service is likely to be achieved. The assessment considers the following:

- The width of pedestrian footways;
- The frequency of pedestrian crossings;
- The control type of pedestrian crossings;
- The level of service for cyclists;
- The necessary interactions between pedestrians, cyclists, buses and vehicles.

3.4.2.2.4 Transport Reliability and Quality (All Vehicles Journey Time)

This criterion assesses options in terms of the degree to which private traffic journey time consistency is likely to be achieved.

The assessment will consider the delay associated with traffic volumes along these routes based on link and junction options and estimated traffic volumes associated with alterations to the entire transport network.

3.4.2.2.5 Pedestrian User Safety

All route and scheme options would be designed to a similar standard where possible (e.g. footpaths throughout, pedestrian crossings at junctions and in the vicinity of bus stops). However, as pedestrians are the most vulnerable road users and would include those with impaired mobility, it is prudent to analyse each action in terms of the impact upon pedestrian safety.

For example, where road widening may be required for the provision of bus lanes, additional traffic lanes, or on-street parking/loading, if this is to be at the expense of footpath width it would impede pedestrian accessibility. Similarly, such works could result in wider crossing widths for pedestrian at controlled and/or uncontrolled pedestrian crossings.

3.4.2.2.6 Cyclist User Safety

Given the overall objective along the Cross-City Link being improved bus priority, there will likely be cases of reallocation of road space from private car to public transport or the provision of new bus lanes through road widening. In either case it is likely that cyclists will end up sharing the roads with both vehicular and bus traffic.

Therefore, for the purposes of comparing options, the number of conflicting road users along the route has been used as a proxy for road safety. The number of conflicting road users is effectively a measure of the number of potential conflicts on the route and therefore a measure of the potential for a collision. Similarly, the number of instances whereby a cyclist may have to change between cycle lanes, traffic lanes, and bus lanes would also be a safety consideration due to the requirement to merge with other road users.

Benefits to be considered would generally relate to provision of full cycle facilities along routes, cyclist friendly junction types (e.g. fully signalised junctions or protected cycle lanes), and dedicated toucan or cyclist crossing facilities at junctions and key cyclist desire lines.

3.4.2.2.7 Public Transport User Safety

With the overall objective along the Cross-City Link being improved bus priority, there will likely be cases of reallocation of road space from private car to public transport, and the number of conflicting road users is effectively a measure of the potential for collisions.

Therefore, the number of instances whereby buses will be required to change between bus lanes and traffic lanes would be a safety consideration due to the requirement to merge with other road users.

Similarly, with increased emphasis on bus priority there will likely be more cases of two-way bus corridors, and as such the geometry of the existing roads and junctions must be taken into consideration to ensure the required movements are feasible.

Along with the safety considerations associated with buses on the road, this element must also consider the safety of the public transport users in getting to and from the bus stops. This will largely be linked to the Pedestrian User Safety considerations.

3.4.2.2.8 Other Road User Safety

Generally, with the introduction of improved bus priority on the Cross-City Link there is a potential for a reduction in road accidents due to people switching from private car to a better public transport offering. However, this cannot be guaranteed, and as stated, the number of conflicting road users is effectively a measure of the potential for collisions.

Therefore, for the purposes of comparing options, the number of conflicting road users along the route has been used as a proxy for road safety. The number of conflicting road users is effectively a measure of the number of potential conflicts on the route and therefore a measure of the potential for a collision.

As well as this, general safety benefits could be achieved through general traffic calming measures introduced at junctions and along routes. Similarly, with the increased bus priority it is likely that current through routes may be converted into local access routes, which in itself could act as a traffic calming measure.

3.4.2.2.9 Promotion of Active Travel

This criterion will assess the likelihood of options to encourage additional participants in active travel including:

- Those who would change their primary mode of travel from private car to walking;
- Those who would change their primary mode of travel from private car to cycling; and
- Those who would change their primary mode of travel from private car to public transport (and hence pedestrian for part of their journey).

3.4.2.2.10 Environmental

The scope and methodology proposed for the environmental assessment was established by considering what environmental aspects are likely to be impacted and are therefore of importance in evaluating the options. Based on this, the following environmental parameters were scoped out of the Environmental Assessment:

- Agronomy: Given the urban/suburban nature of the proposed scheme and the assumption that most interventions will likely take place on existing road infrastructure this aspect is not considered to be relevant to the assessment;
- Hydrogeology: Hydrogeology is not considered to be a determining factor in the selection of the preferred options;
- Property/Land Acquisition: This aspect has been considered separately as part of the Economy criterion in the overall multi-criteria analysis commensurate with the information available at the route option assessment stage; and
- Socio-economics: Elements of socio-economics such as journey times, catchment analysis, transport integration, quality of service for cyclists etc. are assessed under other non-environmental criteria and are therefore considered and captured elsewhere as part of the multi-criteria analysis.

3.4.2.2.11 Archaeological, Architectural and Cultural Heritage

The provision of transport infrastructure has the potential to impact on the archaeological, architectural and cultural heritage environment. At the options assessment stage of the assessment, the exact nature and extent of potential impacts cannot be fully determined for all options assessed.

For the purposes of this assessment heritage features of archaeological, architectural and cultural heritage significance along or immediately adjacent to the route are identified and mapped. Impacts associated with each option are then compared and ranked in order of preference.

- Features considered included the following:
- Sites recorded on the Record of Monuments and Places (RMP sites);
- Sites recorded on the Record of Protected Structures (RPS);
- Sites recorded on the National Inventory of Architectural Heritage (NIAH);
- Areas of Archaeological and Cultural Heritage Merit;
- Architectural Conservation Areas (ACAs) and other sites / areas of Architectural Heritage Merit;
- Sites/areas of archaeological potential and recently identified archaeological sites;
- Conservation Areas; and
- Greenfield areas with unknown archaeological potential.

3.4.2.2.12 Flora and Fauna

The provision of transport infrastructure has the potential to impact on flora and fauna. A broad assessment of the likely impacts of each of the options on the key ecological receptors will be undertaken, with an indication as to which, if any, of these are likely to be significant, and at what geographical level. The impacts will be compared to allow an order of preference to be determined. Features to be considered include the following:

- Records of rare or protected plant species;
- Records of protected fauna;
- Identified designated ecological areas and other areas of ecological importance, including ecological corridors and areas of green infrastructure; and
- Watercourses and fisheries waters.

3.4.2.2.13Soils and Geology

The provision of transport infrastructure has the potential to impact on soil and geology as a result of land-take and possible ground excavation (including potential to encounter ground contamination).

Attributes and impacts to be assessed for each route option include the following (where relevant):

- Historic land use and potential contamination;
- Geology/Areas of geological significance;
- Soil quality, drainage characteristics and range of agricultural uses of soil along each route corridor; and
- Potential implications for existing quarrying or mining activities and future extractable reserves.

3.4.2.2.14Hydrology

The provision of transport infrastructure has the potential to impact on surface water bodies as a result of land-take (with particular emphasis on floodplains and flood zones).

Attributes (and impacts) to be assessed for each route option include the following (where relevant):

Watercourses crossed by each element, and potential impact on water quality arising from any re-alignment works;

- Discharge to receiving waters and drainage network;
- Aquatic ecological sites close to and downstream of water crossings;
- Surface water abstraction close to and downstream of water crossings;
- Established amenity value of surface waters traversed by each route corridor, and
- Potential increase (or reduction) in flood risk to existing properties.

3.4.2.2.15 Landscape and Visual

The provision of transport infrastructure has the potential to impact the townscape/streetscape along the routes. The assessment will comprise the compilation of a desktop understanding of:

- The landscape/townscape, its character and features;
- The visual environment, including the location of residential and other properties and views over the landscape;
- The landscape planning context, including landscape designations, open spaces, identified views and prospects, etc.; and
- The relationship with protected structures, conservation areas, national monuments etc.

3.4.2.2.16 Air Quality

The provision of transport infrastructure has the potential to impact the air quality along the route. The assessment will consider each option, in terms of sensitive receptors, density of development and traffic, in order to identify the most suitable option from an air quality perspective.

TII guidelines on air quality define sensitive receptor locations as: residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present.

3.4.2.2.17 Noise and Vibration

The provision of transport infrastructure has the potential to impact the noise environment along the route. The assessment will consider each option, in terms of sensitive receptors and density of development, in order to identify the most suitable option from a noise and vibration perspective. TII guidelines on noise and vibration define sensitive receptor locations as residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present.

3.4.2.2.18 Land-Use Character

The provision of transport infrastructure has the potential to impact on land-use character through land-take, severance or reduction of viability, which prevents or restricts it from being used for its intended use. This criterion assesses the intended scheme along a particular route with regard to its potential impact on land-use.

3.4.2.2.19 Access to Key Trip Attractors (Education/Health/Transport/Commercial/Employment)

This assessment criterion identifies key trip attractors located along the Cross-City Link, City Centre Access Network and Inner-City Access Route which generate significant transport demand. The accessibility of each trip attractor for public transport users, pedestrians, cyclists and motorists will be examined and compared. For the purposes of this assessment, the following land-uses have been considered as key trip attractors.

- Education (secondary schools and universities);
- Commercial centres (shopping centres, town centres etc.);
- Transport hubs (bus and rail stations)
- Healthcare (hospitals);
- Leisure (sport stadiums, theatres, cinemas etc.); and
- Employment (business parks, large office developments etc.)

3.4.2.2.20 Mobility Impaired User Benefits

This assessment criterion will compare the accessibility of each option for mobility impaired users including the provision of safe crossing locations, dropped kerbs, adequate footpath widths, provision of designated disabled parking spaces and vehicular access to key trip attractors for disabled users.

3.4.2.2.21 Public Transport Network Integration

This criterion identifies the extent to which options would facilitate bus priority and facilities along the proposed core bus routes identified in the GTS. It will also assess the level of integration with wider public transport modes (e.g. regional bus services and rail services).

3.4.2.2.22 Cycle Network Integration

This criterion will identify, examine and compare options in relation to the Galway Cycle Network as identified in the GTS. Where the primary, secondary and feeder cycle network intersect with the Cross-City Link, City Centre Access Network and Inner-City Access Route, options will be assessed based on their ability to provide an adequate level of service for cyclists.

3.4.2.2.23 Road Network Integration

This criterion identifies the extent to which options will facilitate the movement of all traffic on the overall road network as envisaged in the GTS and the impact on road traffic as a result of the reallocation of road space will be considered and compared.

3.4.2.2.24 Efficient and Reliable Public Transport to and through the City Centre

The criterion will be assessed on the ability to guarantee efficiency and reliability of public transport journey time both through the city centre on the Cross-City Link and also on the approaches to the Cross-City Link along each proposed core bus route.

3.4.2.2.25 Enable Traffic to Access and move around the City Centre

Each option will be assessed based on the ability of motorised private traffic to circumnavigate the city centre and access key destinations in the city centre primarily via City Centre Access Network and the Inner-City Access Route.

3.4.2.2.26 Provision of Access to Existing Facilities

This criterion will assess the accessibility of existing facilities for essential modes including public transport, pedestrians, cyclists, motorists (where appropriate) and delivery vehicles (where appropriate).

3.4.2.2.27 Safe and Efficient Movement of Pedestrians and Cyclists on and Crossing the Route.

The criterion will examine options in terms of level of service for pedestrians and cyclists in terms of proposed infrastructure quality (e.g. footpath provision, surface, width, crossings, desire lines and potential delay, cycle level of service, safety and delay).

3.4.2.2.28 Remove Non-Essential Motorised Traffic from Core City Centre

This criterion applies to the Cross-City Link. Each sub-section will be assessed based on the anticipated level of removal of non-essential (those that do not have a destination in the core city centre) motorised traffic including private cars, delivery truck and public transport vehicles including taxis and buses from the core centre.

3.4.2.3 Option Assessment Methodology

Where feasible, three options for each route sub-section have been considered. These three options can be broadly considered in terms of the level of land take requirements and physical intervention. These categories of interventions are defined as follows:

- Option 1: Minor Interventions - Requiring no land acquisition and minimal works;
- Option 2: Moderate Interventions - Minimising land acquisition and moderate works; and

- Option 3: Major Interventions - Maximising segregated bus priority

Detail on any additional route scheme alternatives which were explored but not put forward for full assessment due to their unsuitability is provided for each route sub-section.

For each sub-section where options were available to compare, an options summary table was prepared which collates and summarises the appraisal of each option under each of the assessment criterion. For each individual assessment criterion considered, options were compared against a 'do-nothing' scenario based on a five-point scale, ranging from having significant advantages to having significant disadvantages compared to a 'do nothing' option.

For each route sub-section, where options are available to compare, an options summary table has been prepared which collates and summarises the appraisal of each option under each of the assessment criterion.

Route scheme options were compared based on a five-point scale, ranging from having significant advantages to having significant disadvantages over other options. Route scheme options could also be considered neutral when no apparent advantages or disadvantages are identified across all scheme options.

For illustrative purposes, this five-point scale is colour-coded as presented in Table 3.2, with advantageous options graded towards dark green and disadvantageous options graded towards dark red.

Table 3.2: Route Scheme Options Comparative Assessment Scale

Colour	Description
	Significant advantages over the current (do nothing) scenario
	Some advantages over the current (do nothing) scenario
	Neutral compared to the current (do nothing) scenario
	Some disadvantages over the current (do nothing) scenario
	Significant disadvantages over to the current (do nothing) scenario

A qualitative appraisal of, and conclusion from, the options assessment was then provided, highlighting the key issues considered in determining preferred route sub-section scheme options ('preferred' and in some instances, and where applicable 'next preferred'). It should be noted that a balanced approach was taken when assessing scheme options, whereby a lower ranking on one criterion, for example, will not necessarily mean that the option is not suitable.

The emerging preferred scheme options from each route sub-section were then put together to provide an overall scheme option for the Proposed Scheme. The outcome of this assessment process is summarised in subsequent sections of this EIAR Chapter.

3.4.3 R863 University Road to R866 St. Francis Street Junction (Route Section 'UR')

3.4.3.1 Extent of Route Section UR

Diagram 3.14 illustrates the extent of the route sub-section being considered. The blue dashed line represents the Cross-City Link alignment, while the pink dashed line shows adjacent streets which were considered as potentially needing additional modification to facilitate the Cross-City Link.

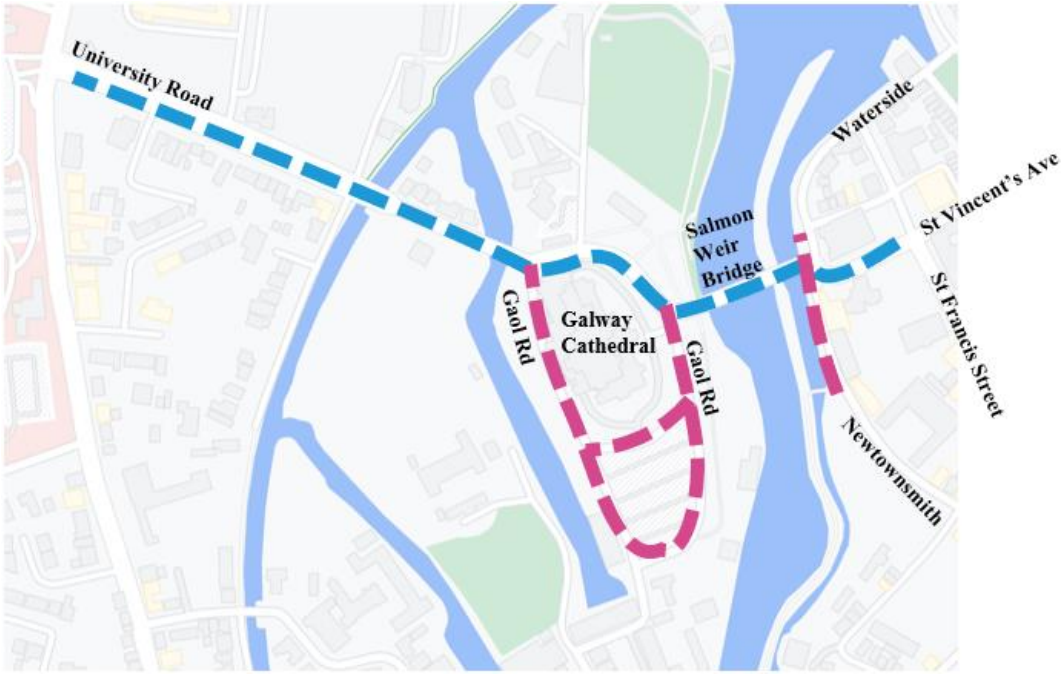


Diagram 3.14: R863 University Road to R863 St. Francis Street Junction Route Sub-section

The route sub-section and Proposed Scheme commences at the junction of R864 Newcastle Road and R863 University Road, thereby accommodating existing and future bus services feeding from R864 Newcastle Road. Longer-term, the Cross-City Link as envisaged in the GTS extends through and directly serves the University Hospital Galway Campus from the R338 Seamus Quirke Road. It is envisaged that such a route will be developed in partnership with University Hospital Galway as part of their future development planning for the campus.

3.4.3.2 Option UR1: Minor Interventions

Interventions considered under this option primarily comprise of:

- Upgrading and widening pedestrian footways and crossing points to improve pedestrian accessibility along R863 University Road;
- New public realm space to be created in front of Galway Cathedral with Gaol Road to the west of the Cathedral to be converted to 2-way general traffic movements;

- Improved bus priority achieved along R863 University Road through demand management at traffic signals at R863 University Road and Bóthar na mBan;
- Re-configured bus and car parking within existing Cathedral car park;
- Newtownsmith and Waterside to be closed off onto St. Vincent's Avenue; and
- Reconfiguration of footpaths on Salmon Weir Bridge.

This option involves achieving improved bus priority through demand management at traffic signals at R863 University Road and Bóthar Na mBan. This option requires restrictions on the volume of general traffic travelling along R863 University Road and over Salmon Weir bridge through control of 'green time' offered to traffic. To provide bus priority through these junctions, segregations for buses approaching the R863 University Road and Bothar na mBan junctions would be necessary. No dedicated bus priority measures are proposed along R863 University Road or the Salmon Weir Bridge. On the Salmon Weir Bridge, the existing narrow footpath on the southern side of the bridge will be removed and replaced with a rubbing strip, while the northern footpath will be widened to a 1.8m wide footpath, retaining an iconic view of the weir for pedestrians.

An additional proposal within this option is the conversion of Gaol Road (west) into a two-way street alongside the Cathedral to the west and south, with the Gaol Road (east) junction to R863 University Road being closed off to all public transport and vehicular traffic. This creates a natural 'gateway' whereby general traffic is diverted from R863 University Road in advance of Salmon Weir Bridge and facilitates local access to Nun's Island and the environs of Galway Cathedral.

The diversion of general traffic onto Gaol Road (west of the Cathedral) affords an opportunity to enhance the public realm in the Galway Cathedral area, including improved pedestrian facilities and a main plaza area. In tandem with these works, the existing car park to the south of Galway Cathedral is also proposed to be amended, to provide additional coach parking facilities, with a reduction in the number of general parking spaces as a result.

3.4.3.3 Option UR2: Moderate Interventions

Interventions considered under this option primarily comprise of:

- Upgrading and widening pedestrian footways and crossing points to improve pedestrian accessibility along R863 University Road;
- Improved bus priority achieved along R863 University Road through removal of vehicular traffic demand;
- New public realm space to be created in front of Galway Cathedral with Gaol Road to the west of the Cathedral to be converted to 2-way general traffic movements;
- Re-configured bus and car parking within existing Cathedral car park;
- Salmon Weir Bridge to be restricted to a Bus Gate, closed to general traffic and redesignated for bus use only;
- Newtownsmith and Waterside to be closed off onto St. Vincent's Avenue; and

- Bus only lane inbound provided on St. Vincent's Avenue.

This option examines closing the Salmon Weir Bridge to general vehicular traffic, and re-designating to allow for bus-use only. No dedicated bus priority measures are proposed along R863 University Road. Bus priority would be achieved through the removal of through traffic from R863 University Road and Salmon Weir Bridge.

In conjunction with the closure of the bridge, this option would include widening footways along the route and the rationalisation of on-street parking. Traffic calming features are proposed along the route entailing the provision of raised tables and signalised pedestrian crossings on R863 University Road. These works would likely impact upon the existing on-street parking provision with a potential reduction in parking spaces.

Proposals within this option around Gaol Road (West) and Gaol Road (east) create a natural 'gateway', whereby general traffic is diverted from R863 University Road in advance of Salmon Weir Bridge and facilitates local access to Nun's Island and the environs of Galway Cathedral. The diversion of general traffic onto Gaol Road (west of the Cathedral) affords an opportunity to enhance the public realm in the Galway Cathedral area, including improved pedestrian facilities and a main plaza area. Additional coach parking facilities will be provided in the carpark to the south of Galway Cathedral, which will reduce the number of general parking spaces as a result

In addition to these proposals, Newtownsmith is to be converted to a cul-de-sac, with only to a one-way northbound egress permitted at specified times, while it is also proposed to close the junction of Waterside/St. Vincent's Avenue (adjacent to Galway Courthouse) to control the flow of traffic onto the Cross-City Link.

3.4.3.4 Option UR3: Major Interventions

Interventions considered under this option primarily comprise of:

- Road widening along R863 University Road to provide inbound and outbound bus lanes. Property frontage acquisition;
- Segregated cycle tracks along R863 University Road;
- No restrictions on Salmon Weir Bridge;
- No changes to circulatory around Galway Cathedral;
- No changes to Newtownsmith and Waterside; and
- Significant accommodation works to retain access to existing properties.

This option examines the potential to achieve bus priority along R863 University Road without the closure of the Salmon Weir Bridge to general traffic. This option therefore would involve the provision of discontinuous bus lanes along R863 University Road where possible to do so on the approach to the existing bridge.

These bus lanes would be provided in both directions, with an inbound bus lane provided from the Eglinton Canal Bridge to the Salmon Weir Bridge, and the outbound bus lane provided from the Eglinton Canal Bridge to R864 Newcastle Road. On approach to the Salmon Weir Bridge, the section of R863 University Road to the north of the Cathedral would be for buses only, with vehicular traffic to be routed along Gaol Road and around Galway Cathedral before crossing the bridge. Salmon Weir Bridge would remain open to all traffic; however public transport priority would be strengthened on the approach from R863 University Road.

This option would result in on-street parking being removed along the entirety of R863 University Road. Segregated cycle tracks in both directions along R863 University Road would also be required. Consequently, footpath widths would need to be altered in places to facilitate implementation of bus lanes. Land acquisition along the majority of R863 University Road would be necessary for this option.

3.4.3.5 Section UR Alternative Options Considered

Other options considered along this section of the route but not carried forward to assessment stage are outlined below:

- An option of providing inbound and outbound bus lanes along R863 University Road - This option was examined and sifted out as this option, including the construction of cycle tracks, would require a cross-section of a minimum of 20m. This would require the replacement of two bridges over the Eglinton Canal, the acquisition of frontage from 24 properties including removal of driveways and the demolition of part of the NUIG boundary wall. It was considered that this option would not provide any significant benefits over options UR2 and UR3 while requiring significantly more land acquisition, infrastructure provision and disruption during construction;
- An option of widening or replacing the Salmon Weir Bridge to facilitate bus lanes. This could permit buses and general traffic the utilise this river crossing, however the pinch point would remain along St. Vincent's Avenue were a 12m cross-section only is available. The acquisition and demolition of Galway Courthouse and / or part of the Franciscan Abbey buildings was not considered to be feasible. As such, widening the Salmon Weir bridge would not provide sufficient bus priority relative to the infrastructure required.

3.4.3.6 Route Section UR Multi-Criteria Assessment

A summary of the MCA undertaken is presented in Table 3.3.

Table 3.3: Route Section UR MCA Summary

Assessment Criteria/sub-criteria		Option		
Criterion	**Assessment Sub-Criterion**	**UR1**	**UR2**	**UR3**
Economy	1.a. Capital Cost			
	1.b. Transport Reliability and Quality (PT Journey Time)			
	1.c. Transport Reliability and Quality (Pedestrian and Cyclist Journey Quality and Time)			
	1.d Transport Reliability and Quality (All Vehicles Journey Time)			
Safety	2.a. Pedestrian User Safety			
	2.b. Cyclist User Safety			
	2.c. Public Transport User Safety			
	2.d. Other Road User Safety			
Physical Activity	3.a. Promotion of Active Travel			
Environment	Archaeological, Architectural and Cultural Heritage			
	Flora & Fauna			
	Soils and Geology			
	Hydrology			
	Landscape and Visual			
	Air Quality			
	Noise & Vibration			
	Land Use Character			
Accessibility and Social Inclusion	5.a. Access to Key Trip Attractors			
	5.b. Mobility Impaired User Benefits			
Integration	6.a. Public Transport Network Integration			
	6.b. Cycle Network Integration			
	6.c. Road Network Integration			
GTS Policies	7.a. Efficient and Reliable public transport (to and through the city centre)			
	7.b Enable Traffic to access and move around the city centre.			
	7.c. Provision of Access to existing facilities			
	7.d. Safe and efficient movement of Pedestrians and Cyclists on and crossing the routes.			
	7.e. Remove non-essential motorised traffic from core city centre			

The MCA concluded that Option UR2 provides the most benefits relative to achieving the scheme objectives, while also recognising that there is the potential for negative impacts, primarily related to general traffic redistribution.

The closure of Salmon Weir Bridge to private car traffic is clearly the most beneficial in terms of the performance of the Cross-City Link; however, the wider area impacts on the traffic network are also the most wide reaching under this option due to the re-routing of traffic onto alternative bridge crossings.

Notwithstanding the negatives with regard to private traffic, the removal of through traffic along this section will provide significantly improved pedestrian environment, an improved and safety cycle environment and provide bus priority along the length.

It was therefore recommended that option UR2 becomes the preferred route scheme option along R863 University Road and onwards as far as R866 St. Francis Street Junction.

3.4.4 R866 St. Francis Street and R866 Eglinton Street (Route Section 'FS')

3.4.4.1 Extent of Route Section FS

Diagram 3.15 illustrates the extent of the route sub-section being considered. The blue dashed line represents the Cross-City Link alignment.

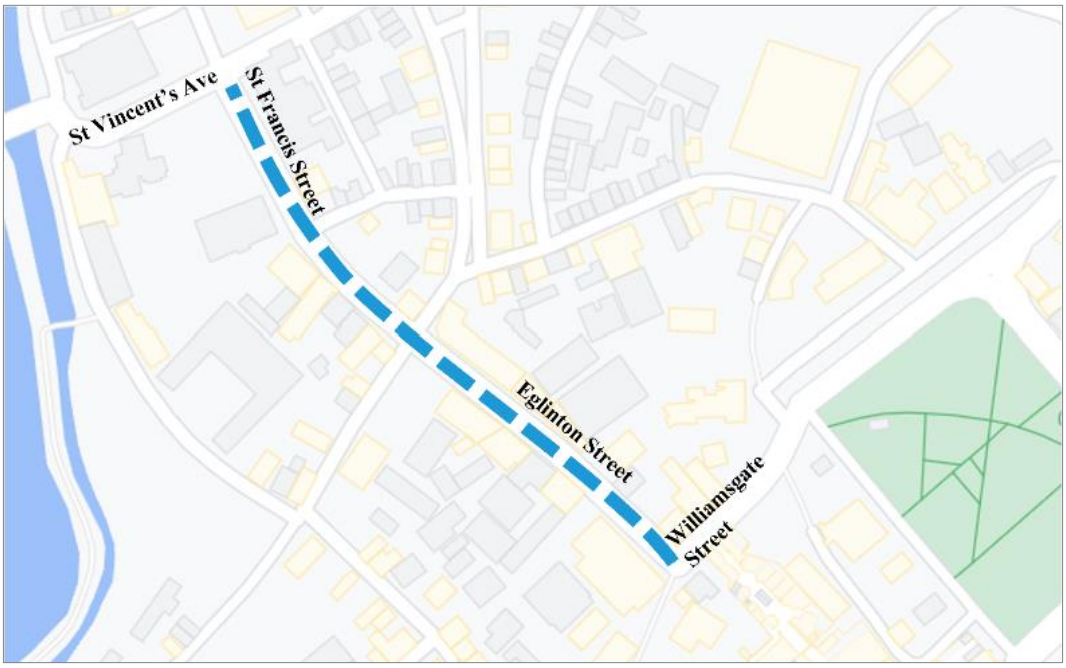


Diagram 3.15: R866 St. Francis Street and R866 Eglinton Street Route Sub-section

3.4.4.2 Option FS1: Minor Interventions

Interventions considered under this option primarily comprise of:

- R866 St. Francis Street reconfigured to being bus lane only inbound;

- Eglington Street reconfigured to being bus lane only inbound;
- Footpath widening on R866 Eglinton Street;
- The provision of a signal-controlled pedestrian crossing on R866 St. Francis Street; and
- Signalisation of the junction of R866 St. Francis Street / R866 Eglinton Street / Mary Street / Daly Place.

This option involves converting the inbound lane of both R866 St. Francis Street and R866 Eglinton Street into a bus-only lane while maintaining the outbound lanes as general traffic lanes. This option also proposes reversing the one-way direction of traffic on Daly's Place from Woodquay to R866 Eglinton Street to retain access to R866 St. Francis Street from the Headford Road direction. All traffic from Mary Street, will be required to turn left onto R866 St. Francis Street unless permitted to enter a bus lane, while all traffic from Daly's Place will be required to turn right unless permitted to enter a bus lane.

Local access to R866 Eglinton Street will remain possible via Eyre Street and R866 Eyre Square, however R866 Eglinton Street outbound will effectively be removed as a through route, thereby providing bus priority over general traffic. Footpaths along R866 Eglinton St. and parts of R866 St. Francis Street in the vicinity of the new signalised junction will be replaced and widened.

Due to the constraints along R866 St. Francis Street and R866 Eglinton Street, road widening for the construction of bus segregation or cycle segregation is not considered a feasible option. As such, no alternate infrastructure options have been assessed for this section.

3.4.4.3 Route Section FS Alternative Options Considered

Other options considered along this section of the route but not carried forward to assessment stage are outlined below:

- Option of converting both inbound and outbound lanes along R866 St. Francis Street and R866 Eglinton Street to bus lanes. This option was examined and sifted out as this would remove opportunities to access properties and car parks along this street during the hours of operation of the bus lane. Existing premises requiring vehicular access include the Mercy Primary School, The Franciscan Abbey grounds, Galway Post Office and the car park and delivery access to the rear of the Imperial Hotel.

3.4.4.4 Route Section FS Options Assessment

As only one feasible option was considered as part of the route section scheme options assessment, no MCA was necessary for this part of the Cross-City Link.

It was therefore recommended that option FS1 becomes the preferred route scheme option along R866 St. Francis Street and R866 Eglinton Street.

3.4.5 R866/R336 Eyre Square to R339 Forster Street (Route Section 'ES')

3.4.5.1 Extent of Route Section ES

Diagram 3.16 illustrates the extent of the route sub-section being considered. The blue dashed line represents the Cross-City Link alignment, while the pink dashed line shows adjacent streets which were considered as potentially needing additional modification to facilitate the Cross-City Link.

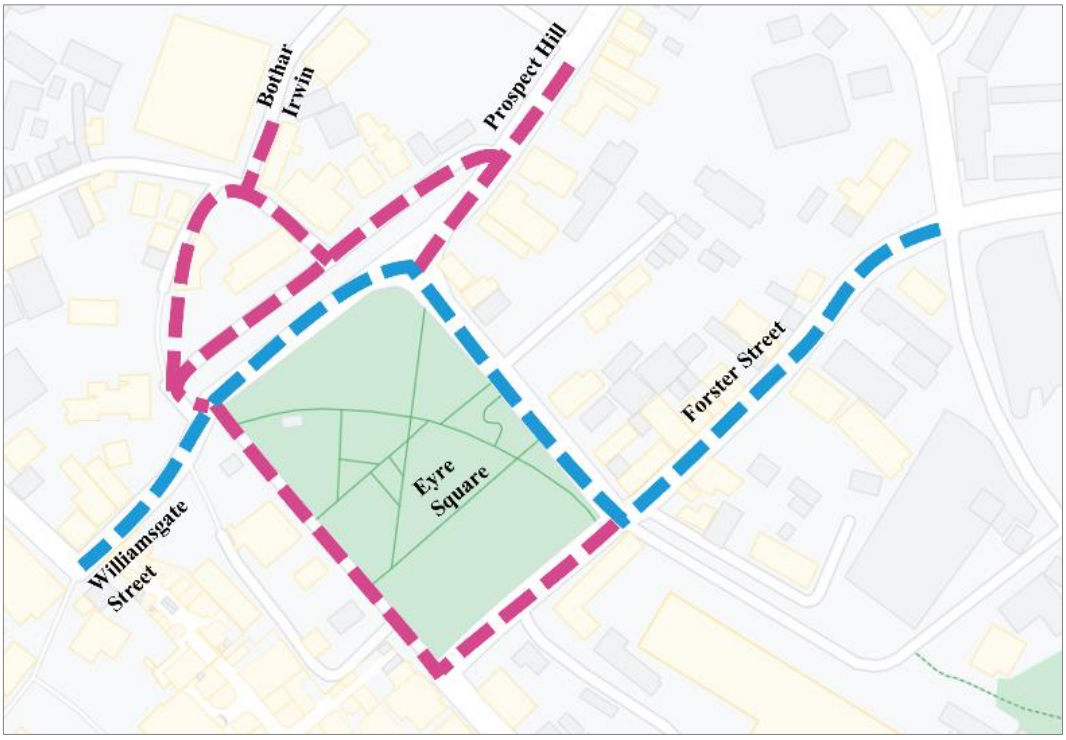


Diagram 3.16: R866/R336 Eyre Square to R339 Forster Street Route Sub-section

3.4.5.2 Option ES1: Minor Interventions

Interventions considered under this option primarily comprise of:

- R866/R336 Eyre Square north and east becoming two-way bus only;
- R339 Forster Street being reconfigured to two-way bus only;
- Access from Prospect Hill to R866/R336 Eyre Square removed with access only permitted onto Shop Street via bollard control at designated times;
- Vehicular access permitted from Eyre Street to R866 Eyre Square North, with traffic required to exit R866 Eyre Square via Williamsgate Street/Eglington Street;
- Vehicular access permitted from R336 Eyre Square south to St. Patricks Avenue and Frenchville Lane; and
- Removal of vehicular access to the northern section of Eyre Square and the creation of an expanded public realm space.

This option involves converting R339 Forster Street and R336 Eyre Square East into two-way public transport-only streets, as well as Williamsgate Street (in the eastbound lane only). Vehicular access would be permitted from Eyre Street to R866 Eyre Square North for private vehicles, however in the proposed arrangement this vehicular traffic would be required to exit R866 Eyre Square via Williamsgate Street/Eglington Street (i.e., no left-turn would be permitted from Eyre Street onto R866 Eyre Square North). To route on to Prospect Hill, right-turning movements would be permitted to R866 Eyre Square North only).

Due to physical constraints at Garvey's Corner, two buses could not pass in either direction simultaneously, therefore traffic signals would be required to operate on a shuttle basis to allow buses from each direction to run one at a time.

The restricting of traffic to buses and authorised vehicles only includes the removal of traffic from the northern section of R866 Eyre Square. This provides the opportunity to expand the public realm space at the north end of Eyre Square. Local access to St. Patricks Avenue and Frenchville Lane would be maintained, while access to and from R866 Eyre Square from Eyre Street and Rosemary Avenue would be controlled via bollards.

Along R339 Forster Street, footpath widening is proposed along with the removal of on-street parking, relocated the loading zone and increased public realm space.

Due to the constraints along R866/R336 Eyre Square and R339 Forster Street, road widening for the construction of bus segregation or cycle segregation is not considered a feasible option. As such, no alternate infrastructure options have been assessed for this section.

3.4.5.3 Route Section ES Alternative Options Considered

Other options considered along this section of the route but not carried forward to assessment stage are outlined below:

- An option where R339 Forster Street, R866/R336 Eyre Square, Prospect Hill and Bothar Ui hEithir remain one-way and one lane of dedicated bus lane is provided along its entirety. This option was examined and sifted out as this would introduce unnecessary traffic onto the Cross-City Link. Traffic with no origin or destination on the Cross-City Link could route along R339 Forster Steet and R336 Eyre Square East to cross the city centre, resulting in delay to public transport services;
- An option of R339 Forster Street becoming a two-way public transport only street. R866 Eglinton Street southbound and Williamsgate Street eastbound becoming public transport only. R866 Eyre Square North and R336 Eyre Square East would be closed and Eyre Square West reopened to vehicles. This option was examined and sifted out as although it would provide continuous public realm space connectivity between Eyre Square North, East and Kennedy Park, new bus stop facilities would be required along Eyre Square West and South and access for taxis and deliveries would also be required. This was considered to remove any benefits of opening Eyre Square West to traffic.

3.4.5.4 Route Section ES MCA

As only one feasible option was considered as part of the route section scheme options assessment, no MCA was necessary for this part of the Cross-City Link.

It was therefore recommended that option ES1 becomes the preferred route scheme option traversing R866/R336 Eyre Square and along R339 Forster Street.

3.4.6 R339 College Road from R339 Forster Street to Lough Atalia Road (Route Section 'CR')

3.4.6.1 Extent of Route Section CR

Diagram 3.17 illustrates the extent of the route sub-section being considered. The blue dashed line represents the Cross-City Link alignment.

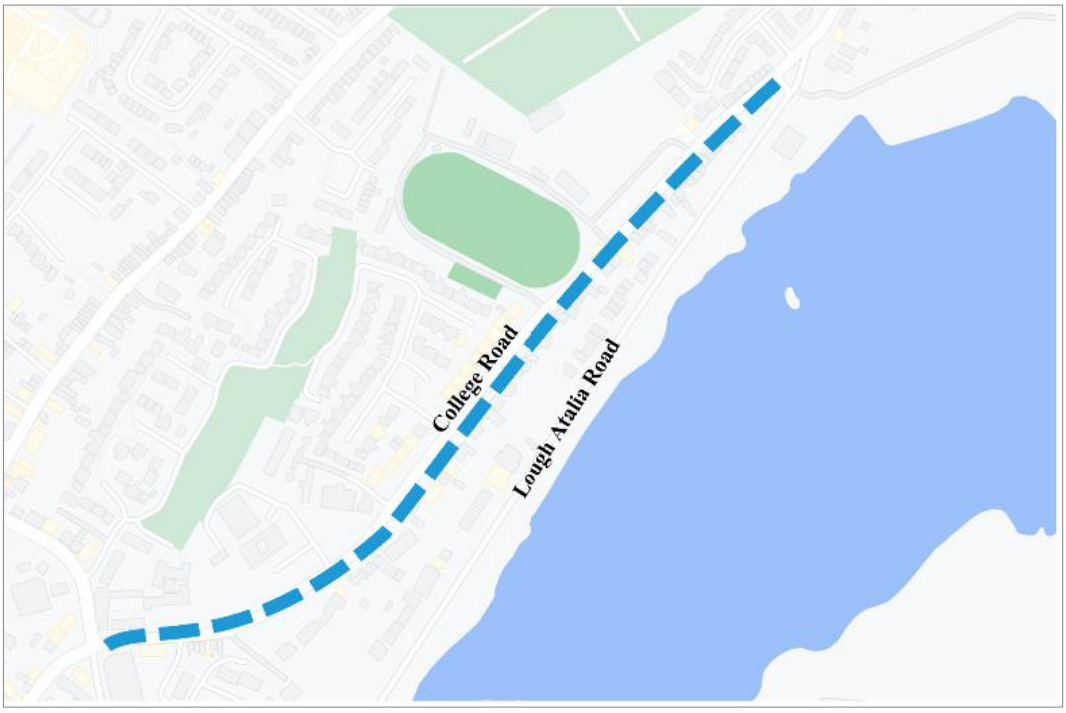


Diagram 3.17: R339 College Road (R339 Forster Street to Lough Atalia Road) Route Sub-section

3.4.6.2 Option CR1: Minor Interventions

Interventions considered under this option primarily comprise of:

- A 'Bus Gate' provided on R339 College Road (between City Hall and R339 Forster Street);
- Upgrading of pedestrian footways and crossing points to improve pedestrian accessibility;

- Amendments to the junction of R339 College Road and Lough Atalia Road to permit vehicles to turn right from R339 College Road to Lough Atalia Road; and
- Maintaining current on street parking and access arrangements.

This option includes the provision of a bus gate on R339 College Road to restrict through-movement for vehicular traffic, whilst facilitating the movement of public transport vehicles directly to and from R339 Forster Street. This bus gate would take the form of a short section of bus lane so that only pedestrians, cyclists, buses and vehicles are permitted to pass through by means of prioritised alternate movements. Local access to all properties would be maintained via one end of R339 College Road or the other, depending on a property's location relative to the bus gate. Bus priority and a traffic-calmed street environment supporting cycle priority would be established through the removal of all through traffic on R339 College Road.

This option would also involve upgrading pedestrian footways and crossing points to improve pedestrian amenity along the route. This would include widening footways to at least 1.8m where possible. Pedestrian crossings would be installed in the vicinity of the Connacht Rugby sportsgrounds and in the vicinity of Yeats College (close to Galway City Hall).

As the proposal contained in Option CR1 meets the requirements of both a minor and moderate intervention, without the need for land acquisition, no additional moderate interventions were considered.

3.4.6.3 Option CR2: Major Interventions

Interventions considered under this option primarily comprise of:

- Road widening along R339 College Road to provide inbound and outbound bus lanes;
- Provision of inbound and outbound segregated cycle tracks;
- Property frontage acquisition and demolition of 2 no. residential properties; and
- The removal of all on-street parking.

This option achieves the provision of dedicated bus lanes on R339 College Road. The bus lanes would be continuous along both sides of the entire length of the road. As no traffic removal would be achieved in this option, segregated cycle tracks would also be required.

Pedestrian crossings would be installed in the vicinity of bus stops, and at other key pedestrian desire lines. This option would require the removal of all on-street car parking along R339 College Road.

Significant land acquisition would be necessary to achieve the minimum (20m) cross section necessary from properties along the road, including the Magdalene Convent, the Sportsground, frontage from a minimum of 16 residential properties and the acquisition and demolition of a minimum of 2 no. residential properties.

3.4.6.4 Route Section CR Alternative Options Considered

Other options considered along this section of the route but not carried forward to assessment stage are outlined below:

- An option of creating a one-way system around Lough Atalia Road and R339 College Road with a bus lane on each road. This option was examined and sifted out. This option would result in either bus services utilising a route not on the Cross-City Link meaning inbound bus services would not serve key destinations including City Hall, Yeats College and the Sportsground or, alternatively, city bus services would continue to utilise College Road and no benefits would be gained by the provision of bus priority on Lough Atalia Road;
- Providing back-to-back inbound and outbound bus lanes on R339 College Road with the direction of the bus lane changing at approximately at City Hall. This option was examined and sifted out as queueing of traffic on R339 College Road has been regularly observed to extend beyond this point in both directions. This option would therefore not provide the bus priority necessary for the Cross-City Link.

3.4.6.5 Route Section CR Options Assessment

A summary of the MCA undertaken is presented in Table 3.4.

Table 3.4: Route Section CR MCA Summary

Assessment Criteria/sub-criteria		**Options**	
Criterion	**Assessment Sub-Criterion**	**CR1**	**CR2**
Economy	1.a. Capital Cost		
	1.b. Transport Reliability and Quality (PT Journey Time)		
	1.c. Transport Reliability and Quality (Pedestrian and Cyclist Journey Quality and Time)		
	1.d Transport Reliability and Quality (All Vehicles Journey Time)		
Safety	2.a. Pedestrian User Safety		
	2.b. Cyclist User Safety		
	2.c. Public Transport User Safety		
	2.d. Other Road User Safety		
Physical Activity	3.a. Promotion of Active Travel		
Environment	Archaeological, Architectural and Cultural Heritage		
	Flora & Fauna		
	Soils and Geology		
	Hydrology		
	Landscape and Visual		
	Air Quality		

Assessment Criteria/sub-criteria		Options	
Criterion	**Assessment Sub-Criterion**	**CR1**	**CR2**
	Noise & Vibration		
	Land Use Character		
Accessibility and Social Inclusion	5.a. Access to Key Trip Attractors		
	5.b. Mobility Impaired User Benefits		
Integration	6.a. Public Transport Network Integration		
	6.b. Cycle Network Integration		
	6.c. Road Network Integration		
GTS Policies	7.a. Efficient and Reliable public transport (to and through the city centre)		
	7.b Enable Traffic to access and move around the city centre.		
	7.c. Provision of Access to existing facilities		
	7.d. Safe and efficient movement of Pedestrians and Cyclists on and crossing the routes.		
	7.e. Remove non-essential motorised traffic from core city centre		

The MCA concluded that both options could feasibly meet the objectives of the Cross-City Link, however Option CR1 provides a less intrusive option for local residents as it doesn't require widening of the existing carriageway, while positively removing through traffic, creating a better environment for pedestrians and cyclists.

It was therefore recommended that option CR1 becomes the preferred route scheme option along R339 College Road.

3.4.7 R339 College Road from Lough Atalia Road to Moneenageisha (Route Section 'CRM')

3.4.7.1 Extent of Route Sub-Section CRM

Diagram 3.18 illustrates the extent of the route sub-section being considered. The blue dashed line represents the Cross-City Link alignment.

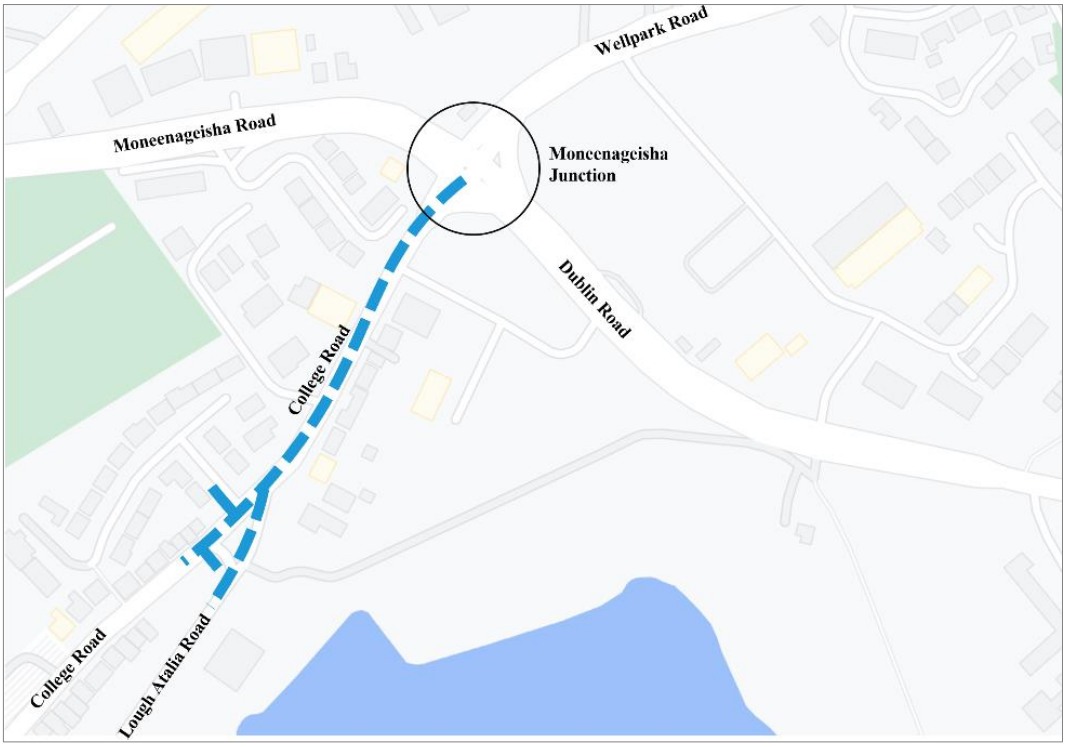


Diagram 3.18: R339 College Road (Lough Atalia Road to Moneenageisha) Route Sub-section

3.4.7.1.1 Option CRM1: Minor Interventions

Interventions considered under this option primarily comprise of:

- Maintaining R339 College Road, between Lough Atalia Road and Moneenageisha Road at its current width;
- One outbound lane to be converted to a bus lane;
- Localised flaring being provided at Loyola Park to allow for a right turning lane; and
- Minor amendments to Moneenageisha Junction.

This option proposes maintaining the existing road width, converting one of the existing outbound general traffic lanes to a bus only lane. This option would require an upgrading of the junction with Lough Atalia Road and R339 College Road to accommodate changes to traffic movements and bus priority.

Outbound bus priority on R339 College Road approaching Moneenageisha junction would be achieved through the provision of this bus lane. All other traffic would be required to use the remaining single lane approach to Moneenageisha junction. Some minor amendments to Moneenageisha junction would be required to provide bus priority signals from the bus lane on R339 College Road through the junction. No cycle facilities are proposed as part of this option.

3.4.7.2 Option CRM2: Moderate Interventions

Interventions considered under this option primarily comprise of:

- R339 College Road, between Lough Atalia Road and Moneenageisha Road being widened to provide an additional inbound raised cycle track and an outbound bus lane;
- Major amendments to Moneenageisha and Lough Atalia Junctions; and
- The provision of a 'bus gate' to allow outbound buses to turn right on to the R338 Dublin Road bus lane or to continue straight to Wellpark Road.

The provision of a new outbound bus lane on R339 College Road between Lough Atalia Road and Moneenageisha under this option requires road widening to the northern aspect of R339 College Road. At the junction with Moneenageisha, a bus gate is proposed to allow outbound buses to turn right on to the R338 Dublin Road bus lane or to continue straight to Wellpark Road.

The existing two outbound traffic lanes are retained in addition to the new bus lane, while inbound a single traffic lane is proposed. The inbound traffic lane would then flare locally to provide right-turning facilities to Loyola Park and R339 College Road. This option also includes the provision of an inbound raised adjacent cycle lane from Moneenageisha junction to R339 College Road/Lough Atalia Road junction

This option would require a degree of land acquisition on R339 College Road in order to provide the necessary infrastructure for the various transport modes using the route.

3.4.7.3 Option CRM3: Major Interventions

Interventions considered under this option primarily comprise of:

- Significant widening along R339 College Road between Lough Atalia Road and Moneenageisha Road to provide inbound and outbound bus lanes;
- The provision of an inbound and outbound segregated cycle track;
- Associated major amendments to the Moneenageisha and Lough Atalia Junctions; and
- Property frontage land acquisition.

This provides dedicated inbound and outbound bus lanes and cycle tracks on R339 College Road between Lough Atalia Road and Moneenageisha requiring significant road widening. The two existing outbound and one existing inbound traffic lanes are proposed to be retained. At the junction at Moneenageisha, a bus gate is provided to allow outbound buses to proceed through the junction to the R338 Dublin Road/R339 Wellpark Road.

Inbound, a single traffic lane is retained, which widens locally to provide a right-turning lane to the Loyola Park and to R339 College Road.

3.4.7.4 Route Section CRM Alternative Options Considered

Other options considered along this section of the route but not carried forward to assessment stage are outlined below:

- An option of providing signal-controlled bus priority between the R339 College Road Lough Atalia Road junction and the Moneenageisha Junction. This option was examined and sifted out. It is not considered feasible to gate outbound traffic on Lough Atalia sufficiently in one lane to keep the downstream lane clear for bus priority as this storage capacity is required on the City Centre Access Network due to redistribution of traffic arising from the Cross-City Link. For this option to work, it would likely reduce the anti-clockwise capacity of the City-Centre Access Network in half, while not guaranteeing bus priority;
- An option of providing the cross-section proposed in Option CRM2 with road widening to predominately take place on the eastern side of the road. This option was examined and sifted out due to the alignment of R339 College Road approaching the Moenneageisha junction and also due to the relative proximity of 11 residential properties to the road edge. Widening in this direction would result in the removal of entire private frontages to properties resulting in doors opening directly onto footpaths and would not provide sufficient width to negate the requirement for land acquisition from the western side of the road. For these reasons, this option was not considered further.

3.4.7.5 Route Section CRM MCA

A summary of the MCA undertaken is presented in Table 3.5.

Table 3.5: Route Section CRM MCA Summary

Assessment Criteria/sub-criteria		**Option**		
Criterion	**Assessment Sub-Criterion**	**CRM 1**	**CRM 2**	**CRM 3**
Economy	1.a. Capital Cost			
	1.b. Transport Reliability and Quality (PT Journey Time)			
	1.c. Transport Reliability and Quality (Pedestrian and Cyclist Journey Quality and Time)			
	1.d Transport Reliability and Quality (All Vehicles Journey Time)			
Safety	2.a. Pedestrian User Safety			
	2.b. Cyclist User Safety			
	2.c. Public Transport User Safety			
	2.d. Other Road User Safety			
Physical Activity	3.a. Promotion of Active Travel			
Environment	Archaeological, Architectural and Cultural Heritage			

Assessment Criteria/sub-criteria		Option		
Criterion	**Assessment Sub-Criterion**	**CRM 1**	**CRM 2**	**CRM 3**
	Flora & Fauna			
	Soils and Geology			
	Hydrology			
	Landscape and Visual			
	Air Quality			
	Noise & Vibration			
	Land Use Character			
Accessibility and Social Inclusion	5.a. Access to Key Trip Attractors			
	5.b. Mobility Impaired User Benefits			
Integration	6.a. Public Transport Network Integration			
	6.b. Cycle Network Integration			
	6.c. Road Network Integration			
GTS Policies	7.a. Efficient and Reliable public transport (to and through the city centre)			
	7.b Enable Traffic to access and move around the city centre.			
	7.c. Provision of Access to existing facilities			
	7.d. Safe and efficient movement of Pedestrians and Cyclists on and crossing the routes.			
	7.e. Remove non-essential motorised traffic from core city centre			

The MCA identifies that options CRM2 and CRM3 could feasibly meet the objectives of the Cross-City Link, while option CRM1 provides little benefit over the existing scenario.

It should be noted that this section of the Cross-City Link also forms part of the City Centre Access Network and as such, is also required to meet the needs of this strategic route in terms of catering for general traffic movements, particularly orbital movements around the City Centre.

While both options CRM2 and CRM3 demonstrate benefits, regarding the extent to which options meet the objectives of the scheme, the benefits presented by CRM3 are higher than those demonstrated by CRM2. This is due to CRM3 providing segregated bus priority and cycle facilities in both directions. However, this is offset by the potential negative environmental impacts associated with CRM3 resulting from the 5m of additional road widening that would be required. This would also likely require land acquisition from an additional 12 no. properties.

It was therefore recommended that option CRM2 becomes the preferred route scheme option along R339 College Road, balancing the extent to which scheme objectives are met with the potential to mitigate any impacts arising.

3.4.8 R338 Dublin Road (Route Section 'DR')

3.4.8.1 Extent of Route Sub-Section DR

Diagram 3.19 illustrates the extent of the sub-section being considered. The blue dashed line represents the Cross-City Link alignment.

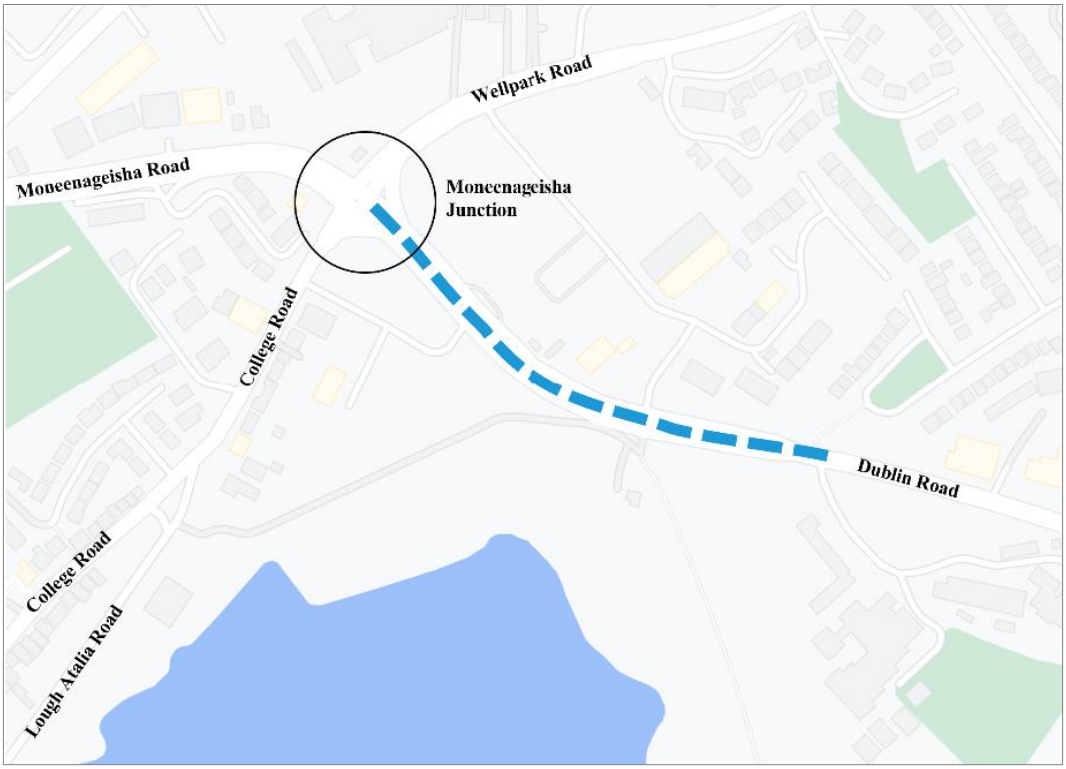


Diagram 3.19: R338 Dublin Road Route Sub-section

The extent of the route along the R338 Dublin Road to be incorporated within the Proposed Scheme is intended to ensure that in the outbound direction, there is continuous bus priority provided between the Moneenageisha Junction connecting to where the existing bus lane operates. On the inbound approach to the Moneenageisha Junction, it is considered beneficial to provide bus priority to bypass queuing general traffic during peak commuter periods. Further, more comprehensive public transport and active travel infrastructure along the R338 Dublin Road is envisaged as part of the GTS and will be delivered under a separate project by GCC.

3.4.8.2 Option DR1: Minor Interventions

Interventions considered under this option primarily comprise of:

- Converting one inbound traffic lane to a bus lane;
- Maintaining the existing road width; and
- No additional segregated cycle facilities being provided.

This option maintains the existing road width along R338 Dublin Road. On the inbound approach, from the access junction to Wellpark Retail Park to the Moneenageisha junction, one existing traffic lane will be converted to a bus only lane. The existing outbound configuration of an outbound bus lane and outbound general traffic lane will be maintained.

At the Moneenageisha junction, a bus gate with bus priority signals will be provided for the inbound bus lane. Straight ahead, and left turn traffic will complete their manoeuvres from a single lane.

No segregated cycle facilities are proposed as part of this option.

3.4.8.3 Option DR2: Moderate Interventions

Interventions considered under this option primarily comprise of:

- R338 Dublin Road is widened between 'Brothers of Charity' and Moneenageisha junction to provide a bus lane in both directions;
- The existing number of general traffic lanes is maintained in both directions;
- A bus gate is provided at the Moneenageisha junction on approach from R338 Dublin Road to permit left turning for buses in advance of general traffic; and
- A segregated cycle track is provided in both directions.

In this option, a bus lane is provided in both the inbound and outbound directions. In the inbound direction, the existing two general traffic lanes are proposed to be retained as a straight-ahead lane and a right turn lane. The inbound bus lane will have a bus priority signal at the Moneenageisha junction.

In the outbound direction, the existing configuration is proposed to be maintained, with two vehicular lanes from Moneenageisha Road merging into a single outbound traffic lane. The outbound bus lane is proposed to be extended back to begin at the Moneenageisha junction.

Segregated cycle tracks are proposed on both the inbound and outbound directions. At the Moneenageisha junction, the inbound cycle track, located to the left of the bus lane and the left turn traffic lane, will enter onto a shared space and a 'toucan crossing' for straight ahead cyclists to continue onto Moneenageisha Road.

As the proposals contained in Option DR2 meets the requirements of both a moderate and major intervention, as it provides fully segregated bus lanes, cycle tracks and pedestrian footpaths, while maintaining the existing number of general traffic lanes, no additional major interventions were considered.

3.4.8.4 Route Section DR Alternative Options Considered

No substantiative alternative options were assessed for this route sub-section of the Proposed Scheme.

3.4.8.5 Route Section DR MCA

A summary of the MCA undertaken is presented in Table 3.6.

Table 3.6: Route Section DR MCA Summary

Assessment Criteria/sub-criteria		**Options**	
Criterion	**Assessment Sub-Criterion**	**DR1**	**DR2**
Economy	1.a. Capital Cost		
	1.b. Transport Reliability and Quality (PT Journey Time)		
	1.c. Transport Reliability and Quality (Pedestrian and Cyclist Journey Quality and Time)		
	1.d Transport Reliability and Quality (All Vehicles Journey Time)		
Safety	2.a. Pedestrian User Safety		
	2.b. Cyclist User Safety		
	2.c. Public Transport User Safety		
	2.d. Other Road User Safety		
Physical Activity	3.a. Promotion of Active Travel		
Environment	Archaeological, Architectural and Cultural Heritage		
	Flora & Fauna		
	Soils and Geology		
	Hydrology		
	Landscape and Visual		
	Air Quality		
	Noise & Vibration		

	Land Use Character		
Accessibility and Social Inclusion	5.a. Access to Key Trip Attractors		
	5.b. Mobility Impaired User Benefits		
Integration	6.a. Public Transport Network Integration		
	6.b. Cycle Network Integration		
	6.c. Road Network Integration		
GTS Policies	7.a. Efficient and Reliable public transport (to and through the city centre)		
	7.b Enable Traffic to access and move around the city centre.		
	7.c. Provision of Access to existing facilities		
	7.d. Safe and efficient movement of Pedestrians and Cyclists on and crossing the routes.		
	7.e. Remove non-essential motorised traffic from core city centre		

The MCA identifies that option DR2 clearly provides higher benefits that option DR1 and better meets the objectives required of the Proposed Scheme. DR1 has less environmental impact than DR2 as a result of not widening outside of the road curtilage. The extent of any such potential impacts were considered to be addressable through the EIA process and therefore not a reason to eliminate DR2 from the assessment process.

It was therefore recommended that option DR1 becomes the preferred route scheme option along R338 Dublin Road, balancing the extent to which scheme objectives are met with the potential to mitigate any impacts arising.

3.4.9 Fairgreen Road (Route Section 'FR')

3.4.9.1 Extent of Route Sub-Section FR

Diagram 3.20 illustrates the extent of the Inner-City Access Route sub-section being considered where modifications are required to accommodate the delivery of the Cross-City Link.

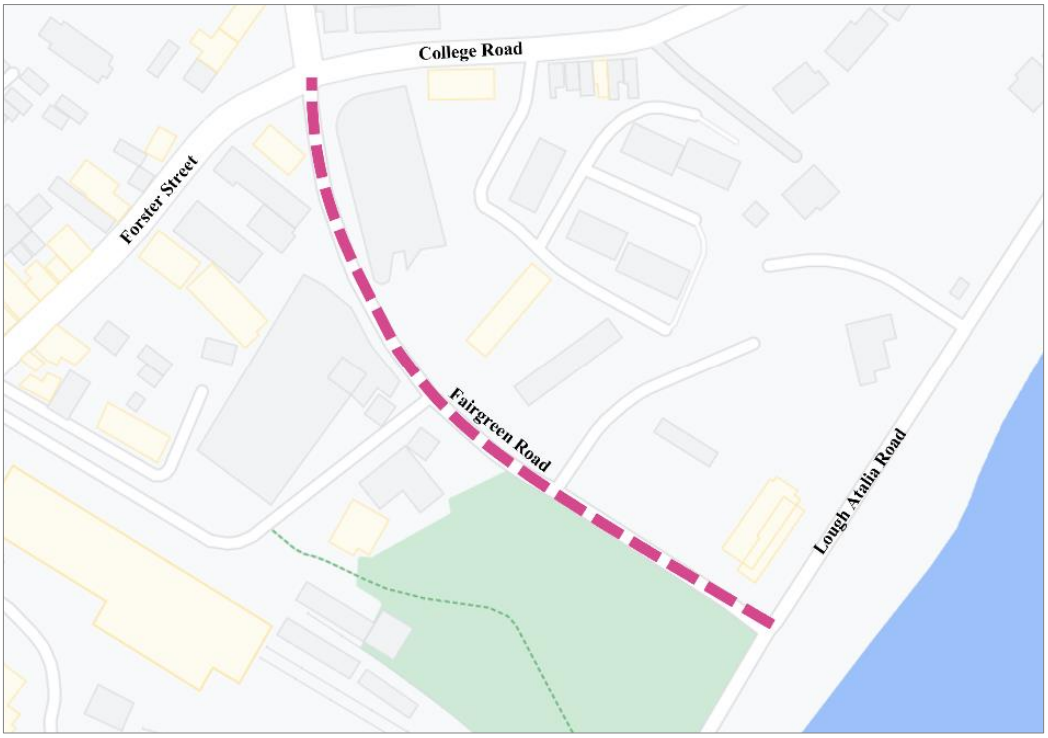


Diagram 3.20: Fairgreen Road Inner City Access Route Sub-section

3.4.9.2 Option FR1: Minor Interventions

Interventions considered under this option primarily comprise of:

- Fairgreen Road being retained as one lane in both directions with a central turning lane at the northern and southern ends of the route; and
- The provision of enhanced pedestrian facilities.

Fairgreen Road forms part of the Inner-City Access Route. The GTS does not propose that any of the revised bus network route utilise this street, however the access to Galway bus station and exit from Galway Coach station are both located on Fairgreen Road.

At the end of Fairgreen Road, at its junction with R339 Forster St, the Inner-City Access Route intersects with the Cross-City Link. With the introduction of the Cross-City Link, vehicular movement is expected to be required along the Inner-City Access Route. It is therefore proposed to maintain the existing two-lane vehicle configuration of Fairgreen Road.

In relation to traffic capacity, there would be minimal impact at the R339 Forster Street junction, as turning movements onto the Cross-City Link (either at R339 Forster Street or R339 College Road) would be discouraged at specific times (for R339 Forster Street) or restricted to local access (on R339 College Road).

As Fairgreen Road forms part of the Inner-City Access Route, this route is proposed to be maintained as a two-way general traffic route in all Options considered. As such, no alternate infrastructure options have been assessed for this section.

3.4.9.3 Route Section FR Alternative Options Considered

Other options considered along this section of the route but not carried forward to assessment stage are outlined below:

- An option of converting Fairgreen Road, R339 College Road and Lough Atalia Road into a one-way circulatory as described in Section 3.4.5.4. This option was examined and sifted out as Fairgreen Road forms part of the Inner-City Access Route and it was not considered feasible to alter this street into a one-way route given its importance and function going forward providing an orbital route around the city centre for general traffic and to facilitate access routes to city centre car parks.

3.4.9.4 Route Section FR MCA

As only one feasible option was considered as part of this options assessment, no MCA was undertaken for this route section of the Proposed Scheme.

It was therefore recommended that option FR1 becomes the preferred route scheme option along Fairgreen Road.

3.4.10 Bóthar Uí hEithir and R336 Prospect Hill (Route Section 'BEPH')

3.4.10.1 Extent of Route Sub-Section BEPH

Diagram 3.21 illustrates the extent of the Inner-City Access Route sub-section being considered where modifications are required to accommodate the delivery of the Cross-City Link.

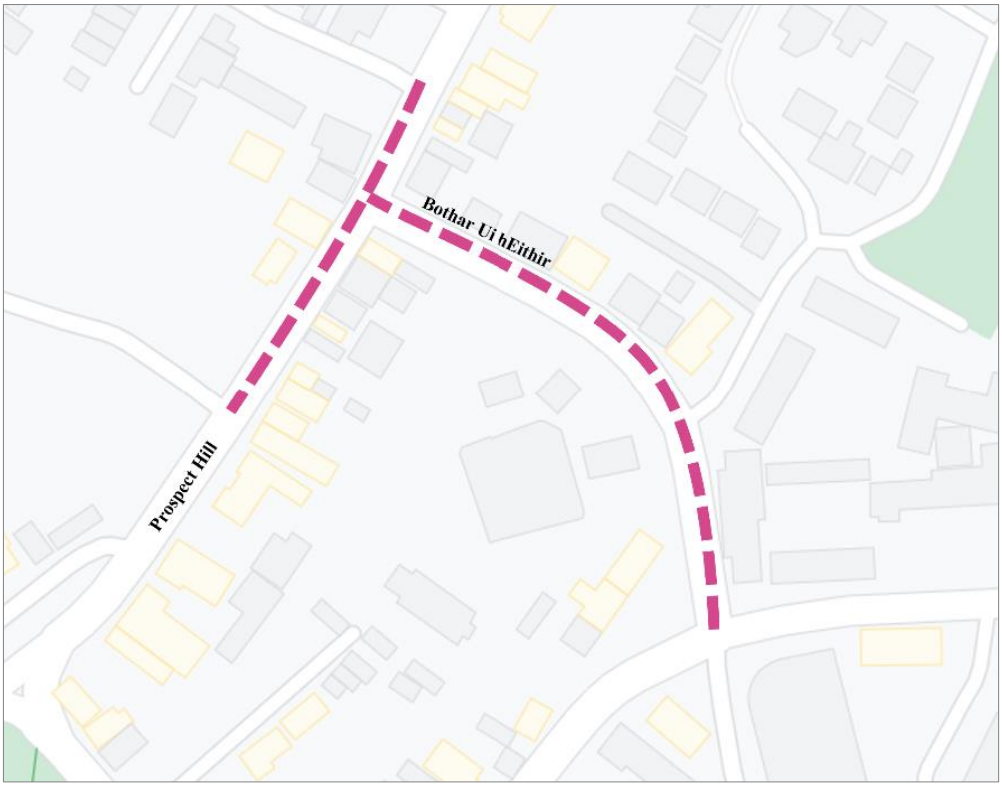


Diagram 3.21: Bóthar Uí hEithir and Prospect Hill Route Inner City Access Route Sub-section

3.4.10.2 Option BEPH1: Minor Interventions

Interventions considered under this option primarily comprise of:

- Prospect Hill being converted to a two-way street;
- Bóthar Uí hEithir being converted to a two-way street; and
- The signalisation of the junction of Prospect Hill and Bóthar Uí hEithir.

As all options assessed for the Cross-City Link require the conversion of R336 Eyre Square East and R339 Forster St to a two-way bus route, the existing one-way, clockwise circulatory of Prospect Hill, Bóthar Uí hEithir, R339 Forster Street and R336 Eyre Square East would no longer be accessible to traffic. Therefore, to facilitate movement along the Inner-City Access Route, both Prospect Hill and Bóthar Uí hEithir are required to be converted to two-way general traffic routes, connecting Fairgreen Road to Bothar na mBan. This in turn connects the Headford Road to Lough Atalia Road via the Inner-City Access Route.

Due to the constraints of building frontages at the junction of Prospect Hill and Bóthar Uí hEithir this junction must be signalised to control movements. Footpath enhancements are proposed along the length of this route.

No alternate infrastructure options have been assessed for this section.

3.4.10.3 Route Section BEPH MCA

As only one feasible option was considered as part of this options assessment, no MCA was undertaken for this sub-section of the Proposed Scheme.

It was therefore recommended that option BEPH1 becomes the preferred route option for this part of the Inner-City Access Route required to facilitate the delivery of the Cross-City Link.

3.4.11 Bóthar Na mBan / St. Brendan's Avenue / R866 Headford Road / Dyke Road (Route Section 'BA')

3.4.11.1 Extent of Route Sub-Section BA

Diagram 3.22 illustrates the extent of the Inner-City Access Route sub-section being considered where modifications are required to accommodate the delivery of the Cross-City Link.

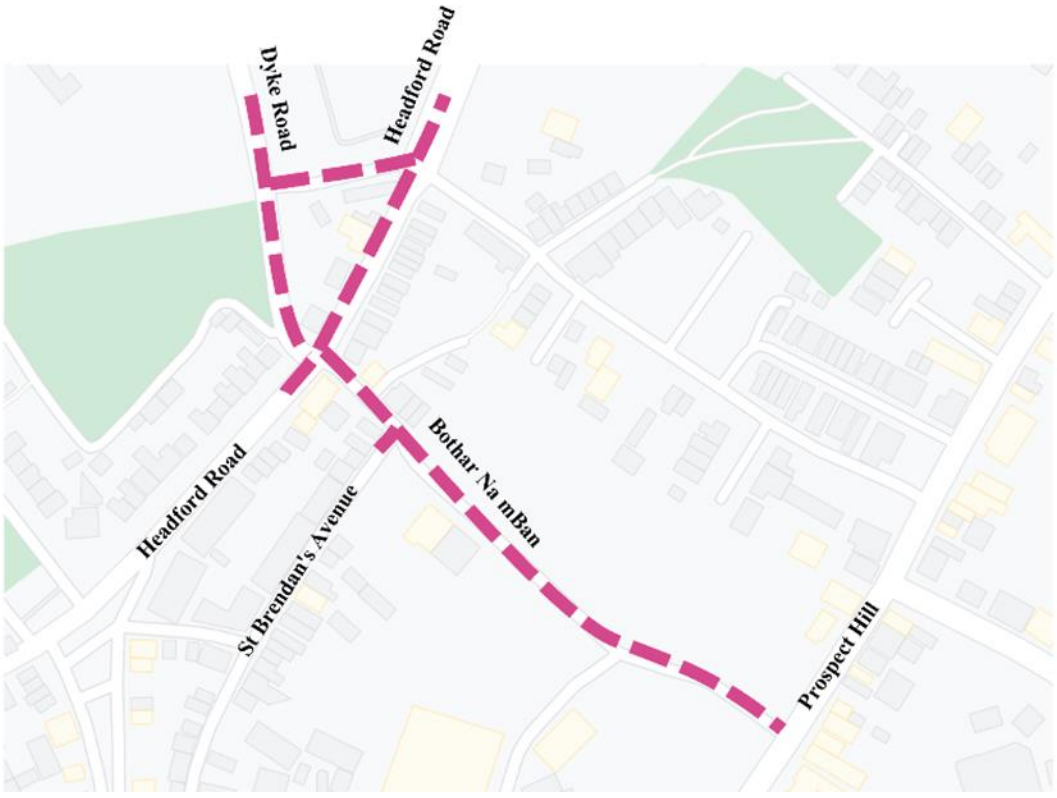


Diagram 3.22: Bóthar na mBan / St. Brendan's Avenue / Headford Road / Dyke Road Inner-City Access Route Sub-section

3.4.11.2 Option BA1: Minor Interventions

Interventions considered under this option primarily comprise of:

- The provision of a pedestrian footpath on the eastern side of St. Brendan's Avenue;

- The relocation of existing traffic signals and the STOP line further from the junction with Headford Road; and
- A reduction in available carriageway width, which would require traffic flow along a section of St. Brendan's Avenue to operate on a shuttle-type system.

This option proposes to provide an additional pedestrian footpath on the eastern side of St. Brendan's Avenue between Bóthar Na mBan and Headford Road. Currently this road corridor is only 7.3m wide and contains a single sub-standard footpath on its western side. Providing a full standard footpath on both sides of the road would require setting back the stop line for traffic on St. Brendan's Avenue back to its junction with Bóthar Na mBan, a set-back of approximately 40m. This would result in a traffic shuttle system over a distance of approximately 45m. The proposed additional footpath would create a greatly-enhanced pedestrian environment. However, the relocation of signals and the stop line would also require alterations to the control of the traffic signalling to provide sufficient inter-green time to allow cars turning left from Headford Road to pass by the traffic waiting on St. Brendan's Avenue / Bóthar Na mBan. The requirement for such a 'shuttle' situation would have a significant impact on the overall capacity of the junction. Due to the existing width, it would not be possible to provide cycle tracks along this shuttle system.

No amendments to the Headford Road or Dyke Road configurations are proposed as part of this option. The proposed city bus route that runs along Headford would not therefore receive any additional physical priority.

3.4.11.3 Option BA2: Moderate Interventions

Interventions considered under this option primarily comprise of:

- New footpath being provided on both sides of the road on St. Brendans Avenue between Bóthar Na mBan and Headford Road;
- Major changes to the Headford Road / Dyke Road junction to provide outbound bus lane contraflow on Headford Road, two lanes outbound from Bóthar Na mBan;
- The implementation of a one-way traffic circulation system clockwise around the Headford Road/Dyke Road 'triangle';
- The provision of a two-way cycle track along Dyke Road connecting the Dyke Road to The Plots and Headford Road;
- The acquisition of 2 no. residential properties; and
- The realignment of Bóthar Na mBan at its junction with Prospect Hill to prioritise movement along the Inner-City Access Road.

This option proposes to widen St. Brendan's Avenue/Bóthar Na mBan as it approaches the junction with Headford Road in order to provide footpaths on both sides and two vehicle lanes for left turn and straight ahead movements. This would require the acquisition and demolition of 2 no. residential properties along the south-western side of St. Brendan's Avenue to enable the works.

The existing width of 7.3m on St. Brendan's Avenue is insufficient to provide a standard footpath on both sides of the road and retain two-way traffic along the Inner-City Access Route.

This option would also implement a one-way traffic circulation system clockwise around the Headford Road/Dyke Road 'triangle' (and hence no right-turn from Bóthar Na mBan directly onto Headford Road). Traffic from St. Brendan's Avenue, seeking to turn right to Headford Road would route north to Dyke Road and then east to Headford Road. This would permit traffic to travel along both directions of the Inner-City Access Route simultaneously.

The resultant free space on Headford Road would allow for an outbound bus lane to be provided between the junction with St. Brendan's Avenue and the junction with St. Bridget's Place, which would ensure that outbound bus services on the Headford Road are afforded a degree of priority over general traffic from St. Brendan's Avenue/Bóthar Na mBan (which would route on the clockwise loop outlined above).

Due to the implementation of a one-way vehicle circulatory, a contra-flow cycle track connecting the Dyke Road to The Plots is proposed to maintain cyclist priority as part of this option.

In order to provide a two-way cycle track and realigned footpaths and traffic signals at Dyke Road, road widening into The Plots and the Dyke Road car park would be necessary.

At the junction of Bóthar Na mBan with Prospect Hill, realignment of Bother na mBan is proposed, in order to provide priority for two-way movements along the Inner City Access Route. This would require land acquisition from Galway County Council's County Hall.

As the proposal contained in Option BA2 meets the requirements of both moderate and major intervention, and provides new footpaths along St. Brendan's Avenue, contra flow bus lane along Headford Road, a contra flow cycle track at Dyke Road, while providing two-way movement along the Inner-City Access Route, no additional major intervention is considered.

3.4.11.4 Route Section BA Alternative Options Considered

Other options considered along this section of the route but not carried forward to assessment stage are outlined below:

- An option similar to BA2, however, road widening to occur on the opposite side of St. Brendan's Avenue. This option was examined and sifted out. This option would result in the acquisition of 6 no. residential properties and would further exacerbate the 'swan-neck' alignment of the road approaching the junction. Furthermore, it would create a staggered junction with Headford Road and Dyke Road rather than a crossroad junction;

- An option of making St. Brendan's Avenue between Headford Road and Bothar na mBan one-way in either direction. This option was examined and sifted out.
  As this street forms part of the Inner-City Access Network, diversions (likely onto St. Bridget's Place or St. Brendan's Avenue to Woodquay) would not meet the objectives of the Inner-City Access Route and would likely result in strategic traffic movements diverting onto residential streets; and
- A Do-Nothing Option. Due to the requirement of residential property acquisition at this location for Option BA2, a do-nothing option was also examined to fully establish the need for works at this section. As the proposed Inner-City Access Route will play a key role in managing traffic movements around the city centre once traffic is displaced by the Cross-City Link, including retaining and improving access to city centre car parks, it is important that an appropriate level of service for general traffic movement is provided for. Similarly, as the GTS envisages Galway as a 'walking city' and identified the need to improve and update pedestrian networks, adequate provision for pedestrians needs to be considered as part of the implementation of the Inner-City Access Route. As the footpath on eastern side of St. Brendan's Avenue is currently only 1.2m wide, which is further restricted to an effective width of 0.6m in places, and there is a 23m section of road on the eastern side of St. Brendan's Avenue with no footpath present, a do-nothing option in this location was not considered feasible based on achieving the Proposed Scheme and GTS objectives.

3.4.11.5 Route Section BA MCA

A summary of the MCA undertaken is presented in Table 3.7.

Table 3.7: Route Section BA MCA Summary

Assessment Criteria/sub-criteria		**Options**	
Criterion	**Assessment Sub-Criterion**	**BA1**	**BA2**
Economy	1.a. Capital Cost		
	1.b. Transport Reliability and Quality (PT Journey Time)		
	1.c. Transport Reliability and Quality (Pedestrian and Cyclist Journey Quality and Time)		
	1.d Transport Reliability and Quality (All Vehicles Journey Time)		
Safety	2.a. Pedestrian User Safety		
	2.b. Cyclist User Safety		
	2.c. Public Transport User Safety		
	2.d. Other Road User Safety		
Physical Activity	3.a. Promotion of Active Travel		
Environment	Archaeological, Architectural and Cultural Heritage		

Assessment Criteria/sub-criteria		Options	
Criterion	**Assessment Sub-Criterion**	**BA1**	**BA2**
	Flora & Fauna		
	Soils and Geology		
	Hydrology		
	Landscape and Visual		
	Air Quality		
	Noise & Vibration		
	Land Use Character		
Accessibility and Social Inclusion	5.a. Access to Key Trip Attractors		
	5.b. Mobility Impaired User Benefits		
Integration	6.a. Public Transport Network Integration		
	6.b. Cycle Network Integration		
	6.c. Road Network Integration		
GTS Policies	7.a. Efficient and Reliable public transport (to and through the city centre)		
	7.b Enable Traffic to access and move around the city centre.		
	7.c. Provision of Access to existing facilities		
	7.d. Safe and efficient movement of Pedestrians and Cyclists on and crossing the routes.		
	7.e. Remove non-essential motorised traffic from core city centre		

The MCA identifies that option BA2 clearly provides higher benefits that option BA1 and better meets the objectives of the scheme. This is largely due to the significant traffic capacity reductions on the Inner-City Access Route that would be experienced in option BA1 due to the shuttle system between Bóthar na mBan and Headford Road. This shuttle system would likely result in the Inner-City Access Route failing to function as required, resulting in congestion and delay likely across the city centre, potentially impacting on the operation of the Cross-City Link. Therefore, based on the MCA results, option BA2 was identified as the preferred route option for this part of the Inner-City Access Route required to facilitate the delivery of the Cross-City Link.

3.4.12 Woodquay / Walsh's Terrace / Daly's Place / Mary Street (Route Section 'WWDM')

3.4.12.1 Extent of Route Sub-Section WWDM

Diagram 3.23 illustrates the extent of the Inner-City Access Route sub-section being considered where modifications are required to accommodate the delivery of the Cross-City Link.

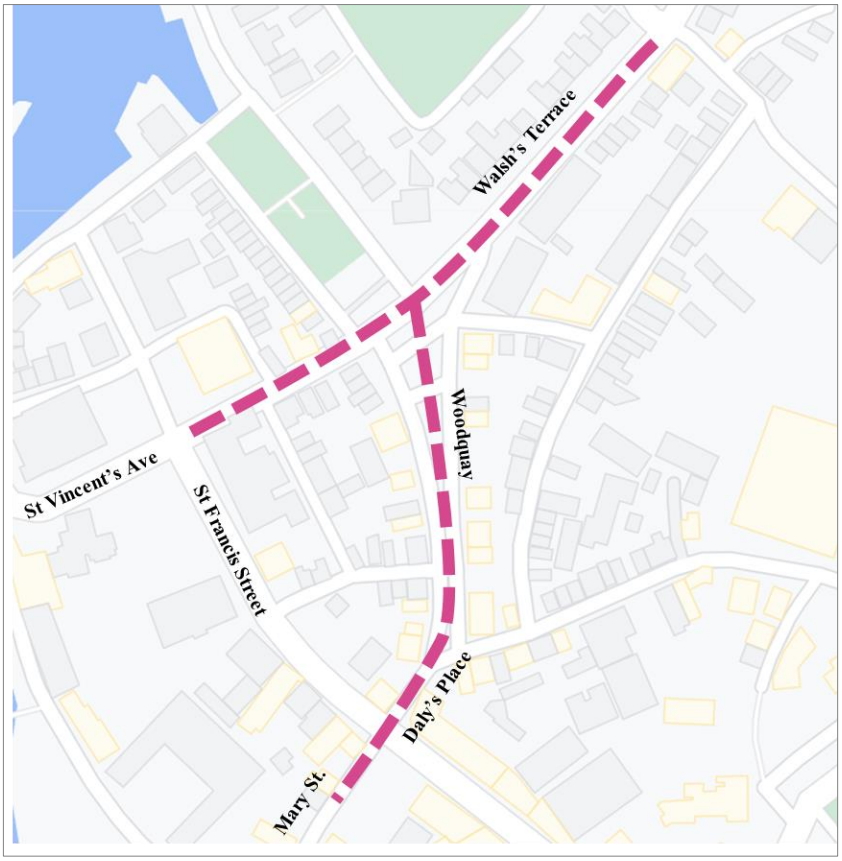


Diagram 3.23: Woodquay / Walsh's Terrace / Daly's Place / Mary Street Inner-City Access Route Sub-section

3.4.12.2 Option WWDM1: Minor Interventions

Interventions considered under this option primarily consist of:

- Wood Quay upgraded to provide a single, southbound traffic lane to connect to Eyre Street;
- Rationalisation of on-street parking along Walsh's Terrace and Wood Quay;
- Daly's Place converted from a one-way northbound route to a one-way southbound route;
- Walsh's Terrace west of Woodquay reconfigured to being bus lane only outbound;
- Upgrading and widening pedestrian footways and crossing points to improve pedestrian accessibility along Walsh's Terrace; and
- New public realm space to be created along Wood Quay.

This option looks at the conversion of Wood Quay to provide a single southbound traffic lane to connect to Eyre Street. West of the junction with Bóthar na mBan, along Walsh's Terrace it is proposed to rationalise on-street parking and carry out localised footpath widening. Walsh's Terrace will also have a new signalised pedestrian crossing installed to the east of Wood Quay.

The on-street parking within Wood Quay would be reduced from 66 to 22 (with some parking provided alongside the southbound traffic lane) and the remaining area to be converted to a public space. Thus, instead of continuing to the Salmon Weir Bridge, westbound traffic would be diverted south via Wood Quay. This traffic will continue south along Daly's Place (also converted from a northbound route to a southbound route) to the junction with Mary Street/Eglinton Street. This junction would be signalised, with pedestrian crossings provided on all arms. The junction to Corrib Terrace would be closed (vehicles will instead access from the Riverside junction to the east). To the east of the junction with Wood Quay, Walsh's Terrace would have on-street parking rationalised.

West of the junction with Wood Quay, on Walsh's Terrace it is proposed to designate the westbound carriageway as a time-regulated bus lane (similar to the approach to the Salmon Weir Bridge west of the junction with St. Francis Street. This would provide a mixture of virtual bus priority and full bus priority, improving bus speeds, reliability and punctuality. Bus stops along the route would be provided with shelters, where feasible.

This virtual bus priority and full bus priority along Walsh's Terrace and St. Vincent's Avenue will enable safer and more efficient cycling in the inbound and outbound travel lanes, due to traffic calming effects. A segregated cycle lane is also to be provided in the outbound direction along Woodquay.

No alternate infrastructure options have been assessed for this section.

3.4.12.3 Route Section WWDM MCA

As only one feasible option was considered as part of this options assessment, no MCA was undertaken for this route section of the Proposed Scheme.

It was therefore recommended that Option WWDM1 becomes the preferred route scheme option for this sub-section.

3.4.13 Forthill Street / R336 Merchants Road / Queen Street (Route Section 'FMQ')

3.4.13.1 Extent of Route Sub-Section FMQ

Diagram 3.24 illustrates the extent of the Inner-City Access Route sub-section being considered where modifications are required to accommodate the delivery of the Cross-City Link.

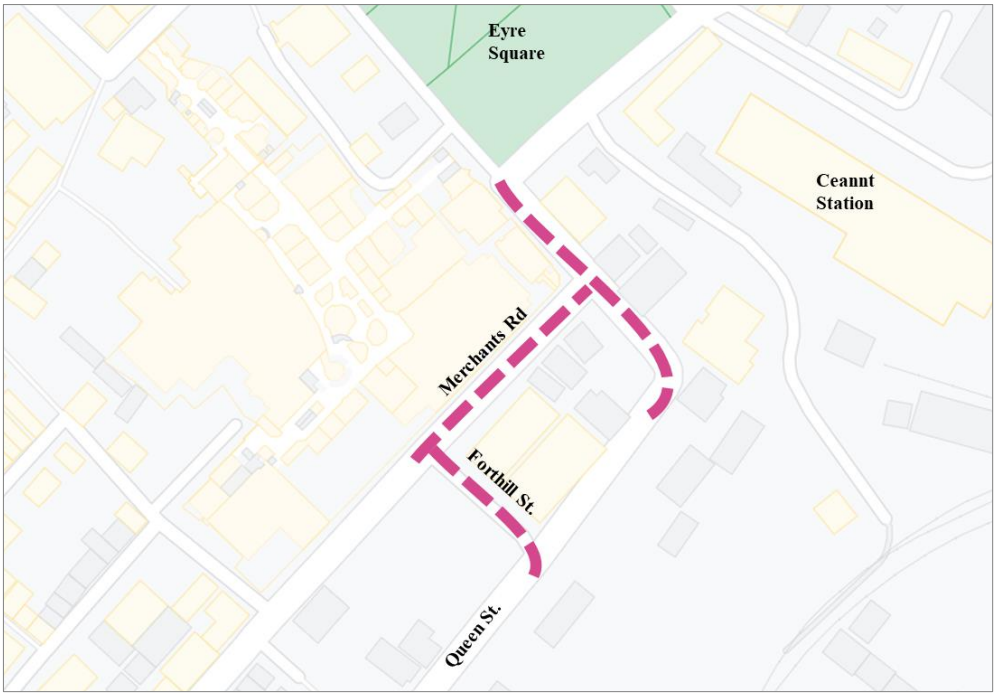


Diagram 3.24: Forthill Street / R336 Merchants Road / Queen Street Inner-City Access Route Sub-section

3.4.13.2 Option FMQ1: Minor Interventions

Interventions considered under this option primarily consist of:

- Provision of raised pedestrian crossings at both ends of Merchants Road;
- On-street parking rationalised and reduced on Forthill Road and the carriageway footprint reduced so as to provide wider footpaths;
- Provision of signalised pedestrian crossings on Merchants Road and Forthill Road.

This option involves converting the carriageway approaching from the south-west via Merchants Road, to provide two right-turning lanes onto Forthill Road (there is a single right-turning lane at present). Straight-ahead traffic would share a lane with right-turning traffic. Continuing east, raised, uncontrolled pedestrian crossings are proposed at both ends of Merchants Road (i.e. one to the east of the junction with Forthill Road and another to the west of the junction with Victoria Place).

Forthill Road would be improved, with on-street parking rationalised and reduced and the carriageway footprint reduced so as to provide wider footpaths. Signalised pedestrian crossings are proposed on Forthill Road at the junction with Merchants Road and also at the junction with Queen Street (four in total).

There is no bus priority or bus related infrastructure on this part of the scheme.

No segregated cycle lanes or cycle priority are to be provided on this part of the scheme.

3.4.13.3 Route Section FMQ Alternative Options Considered

No alternate infrastructure options have been assessed for this section.

3.4.13.4 Route Section FMQ MCA

As only one feasible option was considered as part of this options assessment, no MCA was undertaken for this route section of the Proposed Scheme.

It was therefore recommended that Option FMQ1 becomes the preferred route scheme option for this sub-section.

3.4.14 Emerging Preferred Scheme

Based on the Route Scheme Options Assessment undertaken an overall Emerging Preferred Scheme was identified.

This Emerging Preferred Scheme was then subject to a Public Consultation process prior to finalisation of the Proposed Scheme. Due to COVID-19 restrictions in place throughout 2020 and 2021, Galway City Council engaged in virtual and on-line non-statutory public consultation on the Cross-City Link project. In response to guidelines from the Irish Government and the National Public Health Emergency Team (NPHET), no information events were held in person. The first non-statutory public consultation on the Cross-City Link project commenced on October 22nd 2020, with an initial duration period of 6 weeks. Due to the relaxing of Public Health Restrictions by the Government in December 2021, and the ensuing busy period of time for the retail sector, Galway City Council extended the non-statutory public consultation on the Cross-City Link project, to allow the business community in the city to engage through January 2022.

Further detail on the Public Consultation process is presented in Section 3.5.1.

3.5 Design Alternatives

3.5.1 Consideration following Emerging Preferred Route Option Consultation

A total of 93 submissions were received as part of the Emerging Preferred Scheme Public Consultation. These submissions ranged from individual submissions by residents, commuters and local representatives, to detailed proposals from public bodies, various associations and private sector businesses.

While a variety of matters were raised in the submissions, the key issues emerging from the consultation related to the following themes:

1. Public Realm;
2. Deliveries;
3. Additional Traffic;

4. Loss of Access;
5. Cyclist Safety;
6. Pedestrian Safety;
7. Other Galway Transport Strategy Projects;
8. Loss of parking;
9. Devaluation of Property;
10. Land Acquisition;
11. Associated Bus Facilities; and
12. Noise Pollution.

Further detail on these can be found in the BusConnects Galway: Cross-City Link (University Road to Dublin Road) Public Consultation 2020-2021 Report (July 2021) available on the Galway City Council website at https://www.galwaycity.ie/busconnects-galway-cross-city-link.

The public consultation feedback didn't result in the need for any revisiting of alternative route options for the Proposed Scheme. The detail of the Emerging Preferred Scheme was however re-examined based on the submissions made and information received.

3.5.2 Development of the Preferred Scheme Option

Following the completion of the public consultation process in relation to the Emerging Preferred Scheme, various amendments were made to the scheme proposals to address, where practical to do so, the issues raised in submissions. Furthermore, additional design development along the proposed scheme taking into account additional information gathered. This additional design development took account of:

- New and updated topographical survey information;
- Ground investigation information;
- Landscape design amendments;
- Arboricultural design inputs;
- Further engagement with developers and owners of adjacent lands;
- Drainage design amendments;
- Ecologist inputs.

Changes to the design subsequent to those incorporated after the Public Consultation process include:

- The inclusion of additional cycle parking to encourage higher mode share for cycling, potentially reducing emissions;
- Improvements to cycle permeability to encourage higher mode share for cycling, potentially reducing emissions;

- Re-opening access to Walsh's Terrace and Corrib Terrace;
- Amendments to locations and designation of parking and loading bays;
- The provision of wider footpaths in some locations to encourage higher pedestrian usage, potentially reducing emissions and improving safety;
- Incorporation of landscaping design along R863 University Road;
- Inclusion of new drainage network along R863 University Road, petrol interceptor and outfall to Eglinton Canal to improve the quality of water discharge;
- Incorporation of landscaping design at Galway Cathedral and amendments to pedestrian crossings and plaza layout;
- Removal of outbound bus-lane on R863 Eglinton Street, to improve access to amenities including the post office;
- Relocation of pedestrian crossing and inclusion of raised table at R866 Eyre Square North to improve pedestrian connectivity between high quality public realm spaces;
- Incorporation of landscaping design at R866 Eyre Square North;
- Re-design of Prospect Hill area between Bóthar na mBan and R863/R336 Eyre Square to retain trees and improve public realm;
- Removal of Dock Road fronting Bonham Quay development from the scheme proposals to allow for integration between the two developments;
- Extension of raised table at Headford Road / Woodquay and relocation of pedestrian crossing to improve pedestrian connectivity;
- Realignment of Dyke Road at Dyke Road car-park;
- Inclusion of new drainage network along College Road including the provision of an attenuation tank, petrol interceptor and replacement outfall to Lough Atalia to improve the quality of water discharge and provide drainage control;
- Amendments to parking provision within Moneenageisha Court development;
- Widening of footpath / cycle track adjacent located between R338 Dublin Road and Lough Atalia to encourage higher pedestrian/ cyclist usage, potentially reducing emissions and improving safety.

3.6 Conclusion

The Proposed Scheme has been the subject of a systematic and comprehensive assessment of reasonable alternatives during the course of its development, informed by extensive engagement with residents, businesses, the local authority and other interested stakeholders, public representatives and the general public.

As described in this Chapter, a significant range of alternatives have been considered at three levels:

- Strategic alternatives, including mode and routes as part of the Galway Transport Strategy;
- Route Scheme alternatives; and
- Scheme Design alternatives, incorporating input from the public consultation process and detailed local level design development.

The assessment of alternatives took account of environmental impacts, alongside other relevant factors including economy, safety and accessibility, at all stages of the process.

It is considered that the examination of alternatives presented in this Chapter meets and exceeds the requirements of the EIA Directive and Section 50(2)(b)(iv) of the Roads Act (as amended), which states that an EIAR must contain *'a description of the reasonable alternatives studied by the road authority or the Authority, as the case may be, which are relevant to the proposed road development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed road development on the environment'.*

The Proposed Scheme is described in full in Chapter 4 (Proposed Scheme Description) of this EIAR.

3.7 References

EIA Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU

Directive 2001/42/EC — Strategic Environmental Assessment Directive (SEA)

The Roads Act 1993, as amended.

Galway City Council (2017). Galway City Development Plan (2017-2023);

Galway County Development Plan (2022-2028), including the Metropolitan Area Strategic Plan.

Draft Galway City Development Plan (2023-2029).

Galway City Council (2019) Galway Public Realm Strategy

Galway City Council (2021) Cross-City Link Public Consultation 2020-2021 Report (July 2021)

GTS (2016) Galway Transport Strategy: An integrated transport management programme for Galway City and environs.

TII (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes.

TII (2014) Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes

Chapter 04
Proposed Scheme Description

Contents

4 Proposed Scheme Description

4.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) provides a description of the BusConnects Galway: Cross-City Link (R863 University Road to R338 Dublin Road), hereafter referred to as the Proposed Scheme.

Article 5(1)(a) of the EIA Directive requires that the EIAR contains:

'a description of the project comprising information on the site, design, size and other relevant features of the project;….'

Section 50(2)(b)(i) of the Roads Act 1993 (as amended) states that that the EIAR shall contain the following information:

'a description of the proposed road development comprising information on the site, design, size and other relevant features of the development…'.

The layout of the chapter begins with the Proposed Scheme Overview (Section 4.2). This is followed by sections describing the design iteration process (Section 4.3) and the overall design principles applied to the Proposed Scheme (Section 4.4). Following this, there is a detailed description of the Proposed Scheme (Section 4.5) and a section describing the key infrastructure elements associated with the Proposed Scheme (Section 4.6). These sections should be read in conjunction with the scheme plans (listed in Table 4.1 below), which are contained in Chapter 3 (Consideration of Reasonable Alternatives) of the EIAR, to provide a full understanding of the Proposed Scheme and its associated infrastructure elements.

Table 4.1: List of Drawings

Drawing Series Number	Description
BCG-SP-00-9001	Site Map and Site Location Plan
BCG-GA-00-9001	General Arrangement
BCG-ML-00-9001	Mainline Plan and Profile
BCG-CS-00-9001	Typical Cross Sections
BCG-LA-00-9001	Landscaping General Arrangement
BCG-BW-00-9001	Fencing and Boundary Treatment
BCG-TS-00-9001	Traffic Signs and Road Markings
BCG-DN-00-9001	Proposed Surface Water Drainage Works
BCG-UT-01-9001	Combined Existing Utilities Records
BCG-UT-02-9001	IW Foul Sewer Asset Alterations
BCG-UT-03-9001	IW Water Asset Alterations
BCG-UT-04-9001	ESB Asset Alterations
BCG-UT-05-9001	GNI Asset Alterations
BCG-UT-06-9001	Telecommunications Asset Alterations
BCG-RW-00-9001	Retaining Structures

4.2 Proposed Scheme Overview

The Proposed Scheme comprises the 'Cross-City Link', supporting sections of the 'Inner-City Access Route' and other associated traffic management measures considered necessary to enable the introduction of the Cross-City Link. The Proposed Scheme has an overall length of approximately 6.7km, the extent of which is set out in Diagram 1.1 in Chapter 1 (Introduction) of this EIAR. The entirety of the Cross-City Link, Inner Access Route and City Centre Access Network are illustrated in Diagram 3.6 in Chapter 3 (Consideration of Reasonable Alternatives) of this EIAR.

The Cross-City Link is a public transport priority corridor, encompassing pedestrian crossings, upgraded footpaths, public realm improvements, enhanced cycle facilities and additional bus priority measures, from R863 University Road to R338 Dublin Road (east of the Moneenageisha junction).

In its totality, it is much more than a corridor for public transport. The Proposed Scheme also constitutes a significant investment in infrastructure aimed at improving the environment for walking and cycling in Galway. It supports the Galway Public Realm Strategy, provides strong linkages between existing and newly planned public realm spaces as part of the Proposed Scheme and, through the rebalancing of road and street space, will allow Galway City Centre to breathe again. In this regard it supports Galway's vision, as set out in the City Development Plan 2017-2023 and the Draft City Development Plan 2023-2029, for Galway City to be a successful, sustainable, socially inclusive regional capital which aspires to create prosperity while also being environmentally responsible.

The extent of the 'Inner-City Access Route' contained within the Proposed Scheme, from the Headford Road to Lough Atalia Road, is being delivered as part of the Proposed Scheme because of necessary changes to this route due to the introduction of the Cross-City Link, and in order to accommodate improved orbital traffic movement around the core city centre area, while maintaining and improving overall accessibility to key city centre car parks.

The Cross-City Link component of the Proposed Scheme begins on R863 University Road at the intersection of R864 Newcastle Road. It proceeds along R863 University Road, across the Salmon Weir Bridge and staying on the R863, before turning onto R866 St Francis Street / Eglinton Street, at the Galway Courthouse junction. The Proposed Scheme continues along the R866 on St. Francis Street and Eglinton Street and around the northern (R866) and eastern (R336) perimeter of Eyre Square and on to R339 Forster Street. It then continues through the Fairgreen Road Junction and along R339 College Road as far as the junction with Lough Atalia Road. From here, the Proposed Scheme continues on R339 College Road to Moneenageisha junction and terminates on R338 Dublin Road immediately prior to the entrance to the Woodlands Campus for Brothers of Charity.

The section of the Inner-City Access Route delivered by the Proposed Scheme comprises an upgraded two-way traffic route along St. Brendan's Avenue, Bóthar Na mBan, Bóthar Bhreandáin Uí Eithir and Fairgreen Road, thereby providing an additional inner orbital link from the Headford Road to Lough Atalia Road.

In effect, private motorised traffic will now be able to access the city centre from all directions, and to exit on the same side. In order to circulate within the city however, general traffic will have to use the orbital River Corrib crossings on the City Centre Access Network.

The Proposed Scheme includes an upgrade of the existing bus priority and cycle facilities associated with the corridor. The Proposed Scheme includes a substantial increase in the level of bus priority provided along the corridor, including the provision of additional lengths of bus lane, resulting in improved journey times and journey time reliability.

Bus priority will be achieved through a series of interventions. These vary throughout the proposed scheme and also vary throughout the time of day at certain locations. The hours of operation of the bus lanes and gates will be subject to on-going review based on prevailing traffic conditions and the goal of achieving the project objectives. Galway City Council and the NTA will co-operate in good faith to address any issues with the hours of operation that may arise during the lifetime of the scheme.

Bus priority along R863 University Road will be achieved through the introduction of bus lanes on the Salmon Weir Bridge, between the entrance to Fisheries Field and Galway Courthouse. These will function as an effective bus gate, only permitting buses and permitted vehicles to cross the Salmon Weir bridge in both directions. This will permit R863 University Road and Nuns Island to remain accessible to all vehicles during hours of operation of the bus lanes via Newcastle Road. The bus lanes on Salmon Weir Bridge are proposed to operate seven days a week (Mon – Sun) from 07:00-19:00.

Bus priority along R866 St. Francis Street, R866 Eglinton Street, R866/R336 Eyre Square and R339 Forster Street will also be achieved through the introduction of bus lanes. The proposed scheme provides for a southbound bus lane on R866 St. Francis Street and R866 Eglinton Street, an eastbound bus lane on R866 Eyre Square North, northbound and southbound bus lanes on R336 Eyre Square East (between Richardson's Corner and St. Patricks Avenue, and eastbound and westbound bus lanes along R339 Forster Street. These bus lanes are proposed to operate seven days a week (Mon – Sun) from 07:00 – 10:00 and between 13:00 – 19:00. These bus lanes are not proposed to operate between 10:00-13:00 in order to permit a window for access for deliveries along this corridor which cannot be serviced during the evening / night-time period between 19:00-07:00. Access to this section of the Cross-City Link during these time periods will be via the R866 Headford Road. Access to R866 St. Francis Street, R866 Eglinton Street and St. Patricks Avenue are maintained 24 hours, albeit in limited directions.

Bus priority along R339 College Road (between R339 Forster Street and the junction with Lough Atalia Road) will be achieved through the introduction of a bus gate, located between City Hall and R339 Forster Street. This will be provided through the installation of short sections of bus lane. While this will allow buses and permitted vehicles, including emergency services, taxis, and bicycles, to travel along the entire length of R339 College Road it will effectively remove all through traffic from using R339 College Road.

Local access to all locations will be maintained, however, vehicles will be required to enter and exit R339 College Road from the same direction, either side of the bus gate (dictated by the location of the origin/destination in relation to the bus gate).

Bus priority along R339 College Road (between the junction with Lough Atalia Road and Moneenageisha junction) will be achieved through the introduction of an outbound bus lane. This bus lane will terminate at the Moneengaeisha junction, where a bus priority signal is proposed to facilitate priority for buses moving through the junction. This bus lane is proposed to operate 24 hours a day Monday – Sunday. Segregated inbound bus priority is not considered necessary at this location due to the uncongested nature of this link.

Bus priority along R338 Dublin Road will be achieved through the introduction of bus lanes in both directions for the entirety of the R338 Dublin Road section of the Proposed Scheme. There is an existing outbound bus lane along the majority of this section, which will be extended to begin at the Moneenageisha junction. The inbound bus lane will terminate at the Moneenageisha junction, where a bus priority signal is proposed to facilitate priority for buses through the junction. These bus lanes are proposed to operate 24 hours a day, seven days a week (Monday – Sunday).

Outside of the Cross-City Link, some additional bus lanes are also proposed to either achieve enhanced bus priority or to ensure bus priority is maintained along the Cross-City Link. These include a short section of bus lane on Bóthar Uí hEithir approaching its junction with R339 Forster Street, comprising a right turn lane to permit authorised vehicles to access the Cross-City Link onto R339 Forster Street, but restrict unauthorised vehicles. Also proposed is a short section of Bus Lane on R 866 St. Vincent's Avenue in a westbound direction between Corrib Terrace and R866 St. Francis Street. This bus lane will provide priority for westbound buses from the Headford Road and also restrict unauthorised vehicles from accessing the Cross-City Link. These bus lanes are proposed to operate seven days a week (Monday – Sunday) from 07:00 – 10:00 and between 13:00 – 19:00.

A further outbound bus lane is proposed on the R866 Headford Road, between its junction with St. Brendan's Avenue and its junction with St. Bridget's Place. This will provide bus priority over general traffic on the Inner-City Access Network. These bus lanes are proposed to operate 24 hours a day, seven days a week (Monday – Sunday).

Throughout the Proposed Scheme bus stops will be enhanced to improve the overall journey experience for bus passengers.

Cycle facilities will be substantially improved throughout the Proposed Scheme, with segregated cycle tracks provided where practical to do so, or through the creation of low speed, low volume traffic calmed environments along sections of the Cross-City Link core city centre route.

A traffic calmed environment for cyclists will be accommodated along R863 University Road and R339 College Road, through the introduction of the proposed bus gates on these two streets.

These bus gates will remove all through traffic on R863 University Road and R339 College Road between the hours of 07:00 – 19:00, significantly reducing the volumes of traffic on these routes, transforming and reinforcing the character of these routes as more urban streets.

Similarly, the Cross-City Link travelling along R866 St. Francis Street, R866 Eglinton Street, R866/R336 Eyre Square and R339 Forster Street will also create a more comfortable environment for cycling through the introduction of bus lanes and the removal of through traffic.

On the Cross-City Link at R339 College Road, between Lough Atalia Road and Moneenageisha junction, cycle infrastructure will be improved through the provision of a segregated cycle track inbound along this section and the introduction of an outbound bus lane, which cyclists will be permitted to use.

On the R338 Dublin Road section of the Proposed Scheme, fully segregated inbound and outbound cycle tracks are proposed.

Furthermore, segregated contra-flow cycle tracks are proposed at two locations as part of the Proposed Scheme in locations where new one-way traffic systems are proposed to be introduced. These are located at Woodquay and Dyke Road, which will maintain directness for cyclists in these areas. Additionally, where vehicle movements are being removed or restricted, cycle permeability is proposed to be retained, at both Newtownsmith and Waterside, at their junctions with the Cross-City Link.

Pedestrian facilities will be upgraded, and additional signalised crossings will be provided throughout the route of the Proposed Scheme. Pedestrian footpaths will be widened as far as is feasible within existing boundaries, in areas of high pedestrian demand including along R863 University Road in front of NUIG and along R866 Eglinton Street and R339 Forster Street.

The removal of motorised general traffic from the city centre core will have a transformative impact on the city centre for all who live, work, and visit the city for essential services and leisure. This traffic being removed from the narrow streets will improve air and noise conditions, create a sense of space and allow the city centre to breath. The Proposed Scheme takes the opportunity to both connect places of interest and further enhance the public realm within the city centre through the creation of new spaces designed for people. This will be achieved through the incorporation of urban landscape design interventions and the use of high-quality materials, planting and street furniture in accordance with Galway City's Public Realm Strategy. The Proposed Scheme and the interventions planned reflect the choices which need to be made in the creation of a much more liveable city, providing an enhanced experience within the city centre for all who visit. Section 4.5.11 sets out the specific urban realm improvements for the Proposed Scheme including a mixture of hardscape and softscape proposals which will have a transformative effect on Galway City Centre.

Table 4.2 summarises the infrastructure changes which will be made to the existing road and street network as a result of the Proposed Scheme. These are described in detail in Section 4.6.

Table 4.2: Summary of Changes as a Result of the Proposed Scheme

Total Length of Proposed Scheme	**6.7km**	
Bus Priority	**Existing (km)**	**Proposed Scheme (km)**
Bus Lanes		
Eastbound	0.3	1.6
Westbound	0.3	0.9
Bus Priority through Traffic Management		
Eastbound	0	1.5
Westbound	0	2.2
Total Bus Priority (both directions)	0.6	6.2
Bus Measures		
Proportion of Cross-City Link with Bus Measures	10%	100%
Cycle Facilities – Segregated		
Inbound	0	0.7
Outbound	0	0.5
Cyclist Facilities – Non-segregated		
Inbound	0	2.3
Outbound	0	2.3
Cyclist Facilities – Overall		
Total Cyclist Facilities (both directions)	0	5.8
Other Features		
Number of Traffic Signal Controlled Junctions	5	10
Number of Signal Crossings	10	21

4.3 Design Iteration

The design of the Proposed Scheme has evolved through a comprehensive design iteration process, with particular emphasis on minimising the potential for environmental impacts where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme, described in Chapter 1 (Introduction) of this EIAR, undertaken throughout the option selection and design development process have been incorporated, where appropriate.

Chapter 3 (Consideration of Reasonable Alternatives) of this EIAR, Section 3.5.2, documents the ways in which the design developed from inception.

4.4 Design Principles

The design of the Proposed Scheme was developed with reference to the existing guidance documents/design standards relating to the design of urban streets, bus facilities, cycle facilities and public realm, which include the following:

- The Design Manual for Urban Roads and Streets (DMURS) (Government of Ireland 2013);
- The National Cycle Manual (NCM) (NTA 2011);
- Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors (PDGB)(NTA 2021)
- TII National Road Design Standards;
- The Traffic Signs Manual (TSM) (DoT 2019);
- Guidance on the use of Tactile Paving (UK DfT 2007); and
- Building for Everyone: A Universal Design Approach (NDA 2020).

The design principles to simplify and improve bus, cycle, and pedestrian access for all have been employed throughout design of the Proposed Scheme. Accessibility for mobility impaired users is a core element of the design approach and it has been specifically informed by the principles of:

- DMURS;
- Building for Everyone: A Universal Design Approach (NDA 2020), How Walkable is Your Town (NDA 2015);
- Shared Space, Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland (NDA 2012);
- Best Practice Guidelines, Designing Accessible Environments (Irish Wheelchair Association 2020);
- Inclusive Mobility (UK Department for Transport 2005);
- Guidance on the Use of Tactile Paving Surfaces (UK DfT 2007); and
- BS8300:2018 Volume 1 Design of an accessible and inclusive built environment - External Environment – code of practice.

Further detail on accessibility for mobility impaired users is given in Section 4.5.9.

Taking guidance from the design principles as set out, the Proposed Scheme seeks to adopt a consistency and uniformity of approach to infrastructure provision along its route where practical to do so. The key elements of this infrastructure provision to be provided are described in Section 4.5, with their application along the route of the Proposed Scheme set out in Section 4.6.

4.5 Key Infrastructure Elements

4.5.1 Cross-Section Provision

The roads and streets along the route of the Proposed Scheme are urban in location and setting. The typical cross-sections to be adopted were developed based on the guidance outlined in DMURS, NCM and DN-GEO-03036, details of which are summarised in Table 4.3 and described in subsequent sections. In many cases the cross-sections adopted by the Proposed Scheme are dictated by existing constraints presented by available road or street widths, or what can be achieved with land acquisition where practical to do so.

Table 4.3: BusConnects Galway Cross-City Link Cross-Section Design Parameters

Design Element	Desirable Minimum	Absolute Minimum	Permitted Reductions at Constraints
Footpaths	2.0m	1.8m	1.2m over a 2m length of path (1)
Cycle Tracks (one-way)	2.0m	1.5m	Local narrowing below 1.5m may be necessary over short distances to cater for local constraints
Cycle Tracks (two-way)	3.25m+ 0.5m (buffer)	3.0m	
Bus Lanes	3.0m	N/A	N/A
Traffic Lanes	Preferred Width: 3.0m where speed ⩽ 60 km/h 3.25m where speed limit > 60 km/h	2.75m (2)	Matches existing

(1) Building for everyone: A Universal Design Approach.

(2) Traffic lane widths of 2.75m are permissible but not desirable and should only be permitted on straight road sections with very low HGV percentage and where all desirable minimum widths for footpaths, cycle tracks, parking, bus lanes are not achievable without impacting on third-party lands.

4.5.2 Pedestrian Provision

4.5.2.1 Footpaths

The desirable minimum footpath widths as set out Table 4.3 should be increased in areas catering for significant pedestrian volumes where space permits. DMURS defines the absolute minimum footpath width for road sections as 1.8m based on the width required for two wheelchairs to pass each other. Building for Everyone: A Universal Design Approach (NDA 2020), defines acceptable minimum footpath widths at specific pinch points as being 1.2m wide over a two-metre length of path.

In line with the Road User Hierarchy designated within DMURS, at cross section pinch points, the width of the general traffic lane should be reduced first, then the width of the cycle track should be reduced before the width of the footpath is reduced, where practicable.

Throughout the Proposed Scheme, footpath widths of two metres or wider are proposed. Where this cannot be achieved, deviations from standards are required.

4.5.2.2 Pedestrian Crossings

Pedestrian crossings have been designed to accommodate the most direct crossings of roads and streets along the route of the Proposed Scheme, with a minimum crossing width of 2.4m provided at both signalised junctions and zebra crossings. Where pedestrians will share crossing locations with cyclists using 'Toucan' crossings, these crossings have been designed to be a minimum of 4m in width.

At signalised junctions and standalone pedestrian crossings, the footpath will be ramped down to carriageway level to facilitate pedestrians. At minor junctions, raised tables are proposed to raise the road level up to footpath level and facilitate unimpeded crossing. Tactile paving will be provided at the mouth of each pedestrian crossing, designed in accordance with the relevant standards as listed in Section 4.4. Audio units will be provided on each traffic signal push button.

4.5.3 Cycling Provision

The principal source for guidance on the design of cycle facilities is the National Cycle Manual (NCM), published by the National Transport Authority.

The National Cycle Manual recommends that designers consider the following steps in hierarchical order: (1) Traffic reduction, (2) Traffic Calming, (3) Junction treatment and traffic management, (4) Redistribution of carriageway, (5) Cycle lanes and cycle tracks, and (6) Cycleway (public roads for the exclusive use of cyclists and pedestrians).

The Proposed Scheme has adopted this approach along the length of the Cross-City Link. Along University Road, the introduction of a bus gate over the Salmon Weir Bridge, will significantly reduce the volume of traffic on University Road and St. Vincent's Avenue. The introduction of bus lanes on St. Francis Street, Eglinton Street, Eyre Square and Forster Street, together with the proposed traffic management interventions, will remove all through traffic along this corridor again significantly reducing the volume of traffic. Similarly, the introduction of a bus gate on College Road will remove all through traffic on College Road, between Forster Street and Lough Atalia Road. The removal of traffic from these links will create more cycle friendly streets in accordance with the hierarchy of interventions. Where the Cross-City Link overlaps with the City Centre Access Route, along College Road between Lough Atalia Road and Moneenageisha, and along the Dublin Road, reducing or managing traffic sufficiently to create a cycle friendly environment is not considered to be feasible, therefore redistribution of carriageway and cycle tracks have been proposed along these links.

The National Cycle Manual (NCM) indicates the desirable minimum width for a single-direction, with-flow, raised-adjacent cycle track is 2.0m which includes a 0.25m kerb. The minimum width is 1.5m, which, based on the NCM Width Calculator, allows for single file cycling. Localised narrowing of the cycle track below 1.5m may be necessary over very short distances to cater for local constraints. The desirable minimum width for a two-way cycle track is 3.25m with an absolute minimum width of 3.0m permitted.

4.5.3.1 Cycle Tracks

A cycle track is a segregated track which is physically segregated from the adjacent traffic lane and/or bus lane horizontally and/or vertically, as shown in Diagram 4.1.

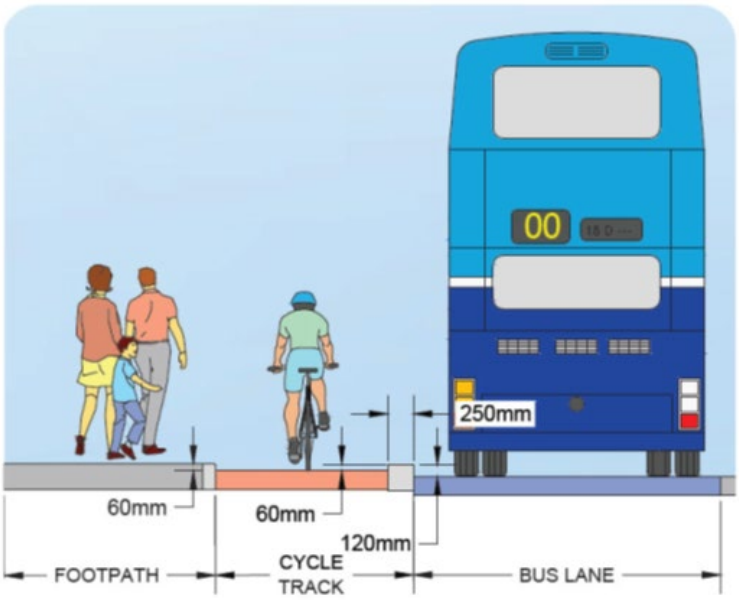


Diagram 4.1: Segregated Cycle Track

The desirable minimum width used throughout the Proposed Scheme for a single-direction, with-flow, raised-adjacent cycle track is 2m. In addition, a full height 120mm upstand kerb between the carriageway and the cycle track should be provided (120mm kerb height on the bus lane side and 60mm kerb height on the cycle track side). This provides increased protection of the cycle track as well as allowing for side entry drainage systems where applicable.

Cycle track construction guidance is given in Section 5.6 of the NCM. The use of machine laid asphalt for cycle tracks has proven to be an effective way of providing a high level of service with a safe, smooth and continuous surface.

4.5.4 Bus Services Provision

4.5.4.1 Dedicated Bus Priority

Provision for full priority for bus services, where practical to do so, along the route of the Proposed Scheme uses dedicated bus lane within the road or street carriageway enabling buses (and other vehicles, such as taxis, permitted to use us lanes) to travel unhindered from general traffic. In accordance with the guidance for traffic lane widths outlined in DMURS, a minimum 3m wide bus lane typically is provided for. Increased lane widths are needed in some instances where the swept path of a bus requires a greater width to undertake a manoeuvre.

4.5.4.2 Signal Controlled Bus Priority

Signal Controlled Bus Priority uses traffic signals to enable buses to get priority ahead of other traffic on single lane road sections, but it is only effective for short distances. This typically arises where the bus lane cannot continue due to obstructions on the roadway. An example might be where a road or street has cross section pinch-points where it narrows due to existing buildings or structures that cannot practically be demolished to widen the carriageway to make space for a bus lane. It works using traffic signal controls (typically at junctions) where the bus lane and general traffic lane must merge ahead and share the road space for a short distance until bus priority recommences downstream. The general traffic will be stopped at the signal to allow the bus pass through the narrow section first and when the bus has passed, general traffic will then be allowed through the lights.

4.5.4.3 Bus Gates/Virtual Bus Priority

A Bus Gate is a sign posted short length of stand-alone bus lane. This short length of road is restricted exclusively to buses, taxis and cyclists plus emergency vehicles. It facilitates bus priority by removing general through traffic along the overall road where the bus gate is located. General traffic will be directed by signage to divert away to other roads before they arrive at the Bus Gate.

4.5.4.4 Bus Stop Locations

Existing bus stop locations have been rationalised to provide for improved efficiency of existing and any future bus services using the Cross- City Link.

This rationalisation exercise adds to the overall level of service provision for buses travelling along the route by reducing journey times (linked to bus stop dwell times), while also optimising the walking catchment of the bus stops, thereby attracting more passengers, and ensuring key trip attractors located along the route are sufficiently catered for.

4.5.4.5 Island Bus Stops

Where sufficient space is available, and both cycle tracks and bus stops are present, Island Bus Stops, as shown in both Diagram 4.2, have been proposed, which help to reduce the conflict between users departing the bus and cyclists.

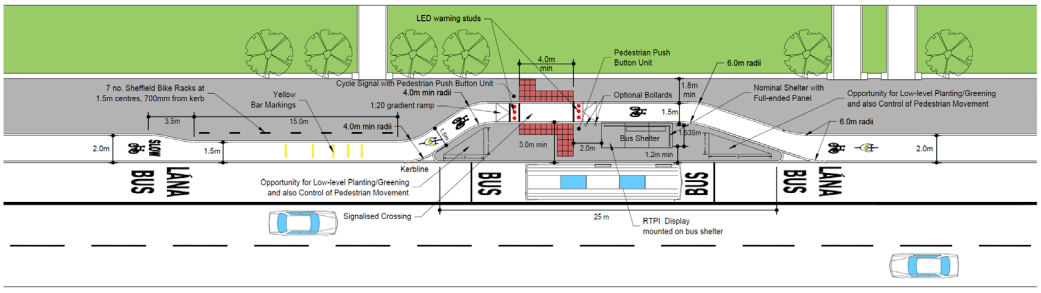


Diagram 4.2 : Island Bus-Stop Arrangement

4.5.4.6 Shared Landing Area Bus Stops

Shared landing areas, as shown in Diagram 4.3, are used where there is insufficient space to provide an island bus stop. The cycle lane width is reduced on the approach to slow cyclists, along with a 1m island being proved for users departing the bus. This is to prevent bus users stepping directly into the cycleway.

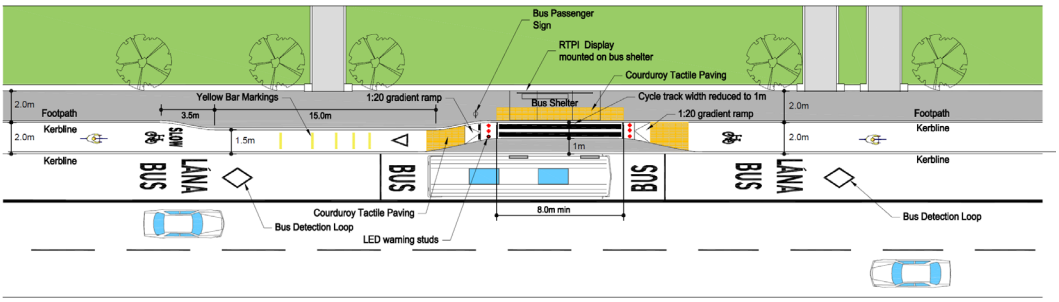


Diagram 4.3: Shared Landing Bus Stops

4.5.4.7 Inline Bus Stop

Where there are no cycle tracks provided, inline bus stops are used, where the users departing the bus exit straight on the footway.

4.5.4.8 Bus Stop Shelters

The Proposed Scheme supports the intent of providing significant improvement in the customer experience for bus service users in Galway under the BusConnects programme. The provision of high-quality bus shelters at bus stops forms part of this level of service improvement.

Bus shelters offer protection for people from poor weather, with lighting to help them feel more secure. Seating is provided to assist ambulant disabled and older passengers. Real Time Passenger Information (RTPI) signage is included at bus stops to provide information on the bus services which use the stop.

The optimum bus shelter configuration used on the Proposed Scheme to provide maximum comfort and protection from the elements to the travelling public is the 3-Bay Reliance ‘mark’ with full width roof.

This shelter is a relatively new arrangement which has been developed by JCDecaux in conjunction with the NTA. The shelter consists mainly of a stainless-steel structure with toughened safety glass and extruded aluminium roof beams.

Diagram 4.4 provides an example image of the preferred full end panel shelter arrangement.

Diagram 4.4: Example of a 3-Bay Reliance full end Panel Bus Shelter (Source: JCDecaux)

The desirable minimum footpath/island widths required to accommodate the full end panel shelter is 3.3m with an absolute minimum width of 3m to facilitate a minimum 1.2m clearance at the end panel for pedestrians.

Alternative arrangements for more constrained footpath widths are also required along sections of the route of the Proposed Scheme.

The cantilever shelter, using a full width roof and half end panel arrangement, provides a second alternative solution for bus shelters in constrained footpath locations.

Diagram 4.5 provides an example of this type of shelter.

Diagram 4.5: Example of a 3-Bay Reliance Cantilever Shelter with full width Roof and half end Panels (Source: JCDecaux)

Advertising panels in this arrangement are normally located on the back façade of the shelter compared to the full end panel arrangement. The desirable minimum footpath/island widths required to accommodate the full end panel shelter is 2.75m with an absolute minimum width of 2.4m to facilitate a minimum 1.2m clearance at the end panels for pedestrians.

Two alternative narrow roof shelter configurations, as illustrated by the images in Diagram 4.6, are also proposed which offer reduced protection against the elements compared to the full width roof arrangements but do provide an alternative solution for particularly constrained locations where widths cannot be achieved to facilitate the full width roof with half end panel shelter. The absolute minimum footpath widths for these shelters are 2.4m (with end panel) and 1.8m (no end panel) to allow for boarding and alighting passengers in consideration of wheelchair, pram, luggage and other such similar spatial requirements.

Diagram 4.6: Example of a 3-Bay Reliance Cantilever Shelter with narrow Roof Configuration with and without half end Panels (Source: JCDecaux)

4.5.5 General Traffic Provision

4.5.5.1 Traffic Lanes

For roads or streets with a design speed of 60 km/h or less, traffic lane widths follow the guidance outlined in DMURS, with the preferred minimum width of general traffic lanes on the Proposed Scheme being:

- 3.0m in areas with a posted speed limit ≤ 60 km/h; and
- Reduced traffic lane widths of 2.75m in limited locations (these are permissible in DMURS but are not desirable). Reduced lane widths have only been applied on short, constrained sections with very low heavy goods vehicle (HGV) traffic and where all desirable minimum widths for footpaths, cycle tracks, parking, bus lanes are not achievable without impact on third-party land.

4.5.6 Pavement

As part of the Proposed Scheme, varying pavement works will be undertaken. These works will comprise the following:

- Widening and narrowing of the existing carriageways;
- Carriageway realignment;
- Rehabilitation and strengthening of the existing carriageways;
- Other specific trafficked areas (e.g., bus lay-bys, off-line parking and loading bays);
- New pedestrianised areas including footways; and
- New cycle facilities.

New pavements are designed and constructed in accordance with TII's publications, international standards and relevant Local Authority standards.

4.5.7 Junctions

The design for each junction within the Proposed Scheme was developed to meet the objectives of the scheme and to align with the geometric parameters set out in conjunction with the junction operation principles described in the DMURS. Various traffic modelling tools were used to assess the impact of the proposals on a local, corridor and surrounding road network level which is further described in Appendix 6.1 (Traffic Modelling Report) in Volume 4 of this EIAR.

A traffic impact assessment has been undertaken for the Proposed Scheme in order to determine the predicted magnitude of impact Proposed Scheme measures may have against the likely receiving environment. The impact assessments have been carried out using the following scenarios:

- 'Do Minimum' – This scenario represents the likely conditions of the road and street network with all major committed transportation schemes in place that will impact on the use of public transport and general traffic, without the Proposed Scheme.
- 'Do Something' – This scenario represents the likely conditions of the road and street network with all major committed transportation schemes in place that will impact on the use of public transport and general traffic, with the Proposed Scheme (i.e. the 'Do Minimum' scenario with the addition of the Proposed Scheme) in place.

For the Proposed Scheme, a key policy is to ensure appropriate capacity and reliability for the bus services so as to maximise the overall throughput of people in an efficient manner. The design for each junction within the Proposed Scheme was an iterative process and was developed to meet the underlying objectives of the Proposed Scheme. The junctions shall provide safe and convenient crossing facilities for pedestrians with as little delay as possible.

The junction locations along the Proposed Scheme and the layouts that will be implemented at these locations are presented in Section 4.5.7.

4.5.8 Traffic Signage

Preliminary traffic sign design shall identify the requirements of the Proposed Scheme. A combination of Information, Regulatory and Warning signs shall be assessed taking consideration of key destinations/centres; intersections/decision points; built and natural environment.

In line with DMURS, signage proposals shall be kept to the minimum requirements of the Traffic Signs Manual (TSM) to avoid sign congestion within the Proposed Scheme streets.

The preliminary assessment shall consider the applicable requirements for all: information signs (TSM Chapter 2), regulatory signs (TSM Chapter 5), warning signs (TSM Chapter 6), and road markings (TSM Chapter 7).

4.5.9 Accessibility for Mobility Impaired Users

The aim of the Proposed Scheme is to provide enhanced walking, cycling and bus infrastructure. In achieving this aim, the Proposed Scheme has been developed in accordance with the principles of DMURS and Building for Everyone: A Universal Design Approach (NDA 2020) and the additional supporting guidance as listed in Section 4.4.

The following provides a description of the key accessibility features and potential barriers to mobility impaired people which have been incorporated into the Proposed Scheme:

- Accessible Parking - On-street Disabled Parking Spaces to the appropriate standard, with dropped kerb access between the parking space and footpath;
- Access Routes on Footpaths - Width of footpaths clear of clutter, such as street furniture, and allowing unimpeded access for the mobility impaired, and in doing so, meet the minimum standards for widths;
- Drainage - All footpaths having sufficient cross-fall for drainage purposes but without affecting the ability of mobility-impaired people to move safely along the corridor;
- Guardrails - Guardrails located only where needed for safety purposes –care taken not to create narrow spaces which create difficulties for movement;
- Pedestrian Crossing Points - Pedestrian crossing points laid out in accordance with standards and made convenient and safe for mobility impaired users to negotiate crossing of carriageways;
- Controlled and Uncontrolled Crossings – All controlled and uncontrolled crossings have tactile paving laid out correctly to provide tactile and visual assistance to mobility-impaired users approaching crossing points;
- Changes in Level - Any changes in level addressed to ensure that all changes in level, where practicable, comply with standards;
- Shared pedestrian/cyclist areas - Shared pedestrian/cyclist areas well laid out, with clear visual and tactile elements included, to ensure that these areas are safe for mobility-impaired users, pedestrians and cyclists;

- Surface Material - Footpath materials selected to ensure surfaces are free of undulations, with no trip hazards where there is a transition between surface materials – or where the Proposed Scheme ties into the existing infrastructure; and
- Street Furniture - All poles for signs and street lighting carefully located to minimise the effect on the safe and convenient passage of pedestrians and cyclists, with due cognisance to the safe movement of mobility impaired users

4.5.10 Integration

4.5.10.1 Interchange with Existing and Proposed Public Transport Network

One of the objectives of the Proposed Scheme is to enhance interchange between the various modes of public transport operating in the city. The Proposed Scheme facilitates improved existing and new interchange opportunities with other transport services including:

- Interchange with existing regional bus services at Ceannt Station at R336 Eyre Square;
- Interchange with existing rail services at Ceannt Station at R336 Eyre Square;
- Interchange with regional and inter-urban coach services at Fairgreen Coach Station;
- Potential interchange with coach services utilising new parking facilities at Galway Cathedral; and
- Interchange between proposed bus routes along the Cross-City Link through utilisation of the same bus stops for multiple bus services.

4.5.10.2 Integration with Other Road Users

Local access will be maintained along the Proposed Scheme corridor although there will be impacts on vehicle routing along the route due to the creation of bus priority and the removal of 'through traffic along the majority of the Cross-City Link. The provision of bus priority will result in more efficient movement of increased numbers of people along the route, without removing the option for general traffic to access locations along the route. It is recognised that some members of the public and local businesses will remain dependant on cars or other private vehicles.

4.5.10.3 Integration with Other Infrastructure Projects and Transport Management Schemes

Several infrastructure projects are planned within the vicinity of the Proposed Scheme which will interface with the proposals. These are outlined below:

4.5.10.4 Galway City 30 km/hr Special Speed Limit Zone

Galway City Council intend to introduce a special 30 km/hr speed limit zone within the city centre area. The boundary of this area is proposed to be defined by, but not including the City Centre Access Network. This special speed limit is intended to be proposed at the next Galway City Council speed limit review and a decision to adopt these will be made by the Elected Members of Galway City Council under the Road Traffic Act 2004. Should this special speed limit be adopted, the majority of the proposed scheme (with the exception of the Section of R339 College Road between Lough Atalia Road and Moneenageisha Junction and R338 Dublin Road) will be subject to a 30 km/hr speed limit. This will further improve the cycling environment along the Cross-City Link and provide additional traffic calming within the city centre, further improving the pedestrian environment.

4.5.10.5 Salmon Weir Pedestrian and Cycle Bridge

This project includes the construction of a new bridge over the river Corrib, connecting Gaol Road with Newtownsmith. The proposed scheme ties in with this bridge at either end and complements the proposals with regards to improved pedestrian and cycle movement.

4.5.10.6 Bonham Quay Development

The Bonham Quay development comprises of four buildings, containing new office space. The development is located at Queen Street and Dock Road and interfaces directly with the proposed scheme. The Proposed Scheme ties in with the proposed footpath works along Dock Road at this location.

4.5.10.7 Connacht Rugby Sportsground

This development proposes to upgrade the existing Connacht Rugby stadium on R339 College Road to a capacity for up to 12,000 spectators. The Proposed Scheme interfaces with this development and directly ties in with the development along the development boundary on R339 College Road. The Proposed Scheme will complement this proposed development in terms of improving pedestrian connections from the city centre to the Sportsground, including accessibility to public transport services within the city centre and along the Cross-City Link.

4.5.10.8 BusConnects Galway: R338 Dublin Road

Galway City Council propose a 4-kilometre multi-modal transport corridor along the entire length of R338 Dublin Road, for the end of the Proposed Scheme to the Martin Roundabout. This development is only at concept stage, however the Proposed Scheme has been developed so that it can operate in isolation while also facilitate tying into the future development of the R338 Dublin Road.

4.5.11 Landscape and Urban Realm

Urban Realm refers to the everyday streets and spaces that are used by people to shop, socialise, play, and use for activities such as walking, exercise or to commute to/from work. The Urban Realm encompasses all streets, public spaces, junctions and other rights-of-way, whether in residential, commercial or civic use. Well-designed urban realm contributes to the identity of localities and enhances the everyday lives of local communities and those passing through. It typically relates to the space between buildings to which the public has free access and may include seating, trees, planting and other features that enhance the experience for all.

Successful urban realms or public open spaces tend to have certain characteristics. These include:

- Having a distinct identity;
- Being safe and pleasant;
- Being easy to move through; and
- Welcoming in character.

4.5.11.1 Landscape and Character Analysis

The landscape and urban realm proposals included within the Proposed Scheme are derived from analysis of the existing urban realm, including existing street and public space character, heritage features, boundaries, tree planting and vegetation, and the range of contemporary and heritage materials in use that inform the quality and character of different parts of the overall route.

The analysis identified the range of character areas along different parts of the route informed by adjacent land uses fronting onto the route; the character and heritage of buildings including any protected structures and private gardens or grounds; the nature and presentation of any boundary walls, railings or hedgerows; existing street trees or vegetation and the nature and quality of streetscape materials.

This analysis provided an understanding of the existing character areas along the route and facilitated detailed and iterative consideration as to the integration of the Proposed Scheme. This analysis informed design changes to the initial proposals so as to avoid adverse impacts of existing streetscape character, and also identified opportunities for enhancement and creation of new spaces along the route. Character analysis also informed the development of mitigation proposals where public or private property would be directly impacted by the Proposed Scheme.

4.5.11.2 Hardscape

The Proposed Scheme has been developed in a manner which employs best practice in urban design and having regard to the Street Material typology described in Chapter 4 Streetscape Materials of Galway Public Realm Strategy (GPRS), Galway City Council (2019).

4.5.11.3 Material Typologies

The GPRS sets out the typical streetscape arrangements for the public realm typologies for Galway as illustrated in Diagram 4.7.

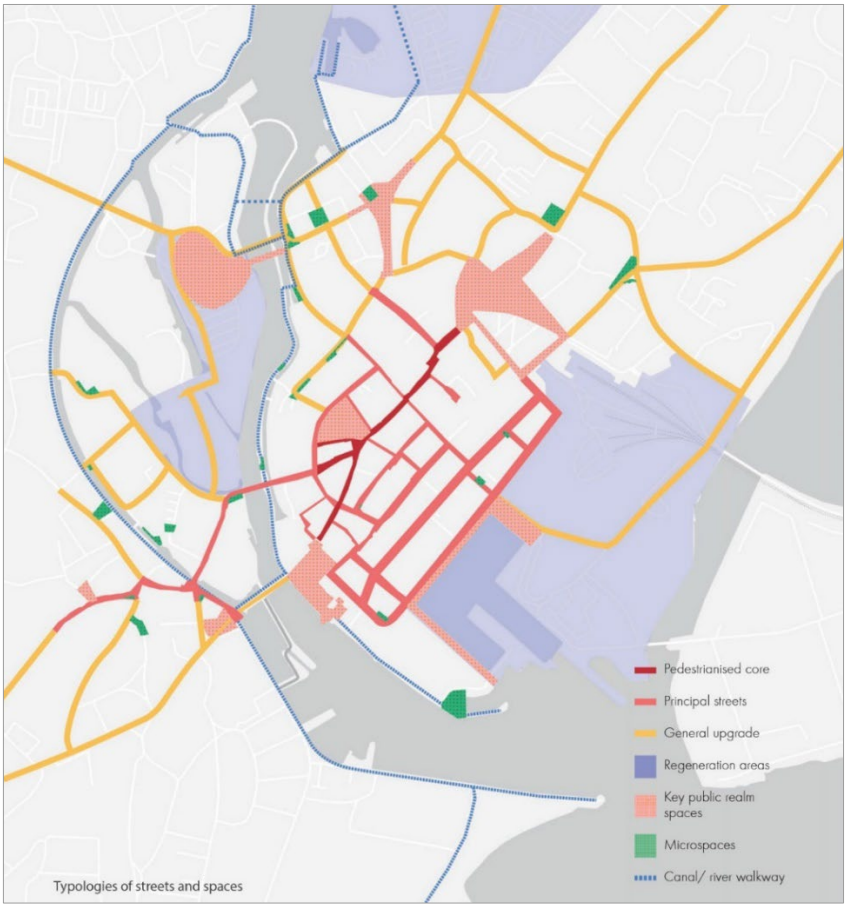


Diagram 4.7: Typologies of Streets and Spaces, extract from Galway Public Realm Strategy

It showcases how the design approach and application of the material palette and streetscape elements differ in each typology. The materials palette accounts for different typologies and different conditions within those typologies. A hierarchy of streets and spaces ensures that the proposals are cost-efficient while setting apart special places in the city. The proposed materials are based on the existing materials and treatments along various parts of the route to match existing material treatments, while also identifying areas of opportunity for enhancement through the use of higher quality materials.

The proposed material typologies employed in the preliminary design for the Proposed Scheme are characterised as:

- **Poured in situ concrete pavement -** Used generally on existing footpaths outside of the identified upgrade areas. Concrete pavements can be laid with or without a kerb, can have neatly trowelled edges and textured surface for a clean, durable, slip resistant surface.

- **Precast concrete unit paving -** Concrete paving slabs and bricks available in a wide variety of sizes, colours and finishes to provide an enhanced urban realm. Can be used with matching concrete kerbs or with salvaged natural stone kerbs as appropriate. This is used extensively along the scheme.
- **Natural stone paving** - Employed for high quality urban realm areas, mostly in city centre locations. This typology represents new or re-used natural stone paving and kerbs surface and is used to create enhanced public spaces for major urban realm interventions.
- **Stone or concrete setts -** Proposed for distinguishing features such as pedestrian crossing points, raised tables and parking/set-down areas.
- **Self-binding gravel -** Proposed for some pedestrian pathways that are off-road and leading through informal landscaped areas.
- **No change/existing surface retained -** At some locations, the proposed scheme does not necessitate any alteration to the alignment of the existing footpath or roadway. These include established and more recently constructed sections of streetscape.

4.5.11.4 Pedestrianised Core

These streets are Galway's traditional 'high streets', which are in an Architectural Conservation Area and an archaeological zone, and include a number of protected structure designations. Williamsgate Street is part of the Pedestrianised Core identified in the Galway Public Realm Strategy and is located on the Cross-City Link. The approach to the design for Galway's Pedestrianised Core is to resolve the underlying issues (substructure failures, drainage issues and heavy vehicular use), and to provide a robust surfacing of the highest quality, allowing the buildings and activity to be the focal point.

The proposed materials palette is described as 'Natural limestone paving' This typology represents new or re-used Irish limestone paviours, setts and kerb surfaces, as illustrated in Diagram 4.8.

Diagram 4.8: Pedestrianised Core Materials Palette (extract from GPRS)

4.5.11.5 Principal Streets

The principal streets are places which provide a city centre role and are visited by a huge number of people. In these streets, materials will remain high quality, though perhaps be slightly less formal in their application and expression. Eglinton Street, Victoria Place, Queen Street, Merchants Road and Forthill Street are all Principal Streets within the proposed scheme.

The proposed materials palette is described as 'Natural limestone slab paving and Irish granite setts paving with granite kerb. This typology represents new or re-used natural stone paviours, setts and kerb surfaces, as illustrated in Diagram 4.9.

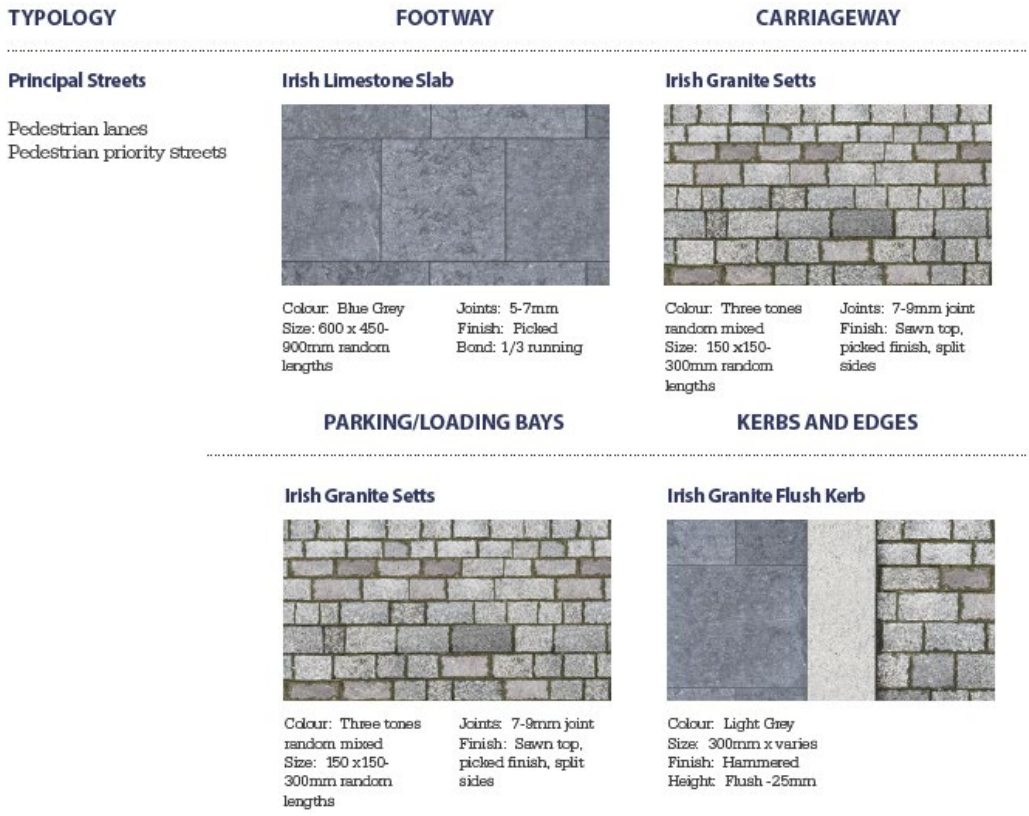


Diagram 4.9 : Principal Streets Materials Palette (extract from GPRS)

4.5.11.6 Public Realm Upgrades/General Upgrade

The strategy provides a palette for general upgrades across the city. Here the focus is on lifting the quality of streetscape and achieving a level of consistency in the design approach.

The proposed materials palette is described as concrete paving and concrete setts paving with granite kerb, as illustrated in Diagram 4.10.

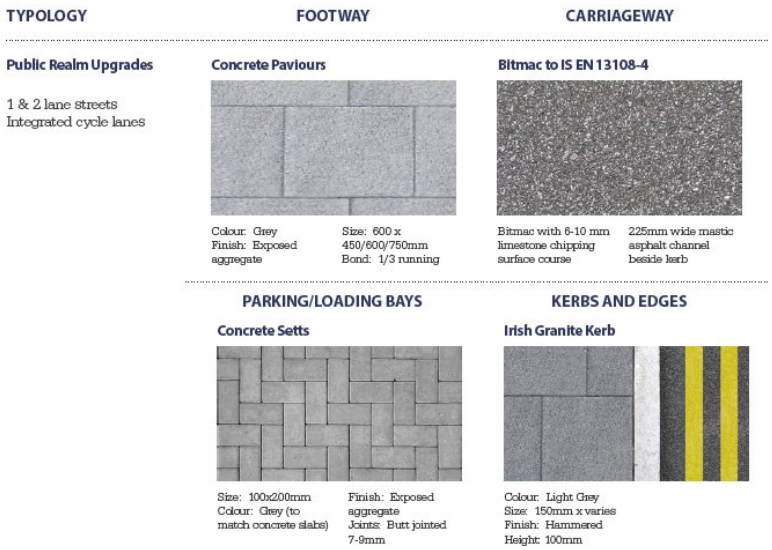


Diagram 4.10: Public Realm Upgrade Materials Palette (extract from GPRS)

4.5.11.7 Detailing

The Proposed Scheme design considered re-use of existing high-quality and natural stone kerbs so as to maintain streetscape character, reduce construction costs and maximise sustainability.

Pedestrian crossings at side streets will be raised where practicable and will be distinguished using stone or concrete setts as appropriate to the locality.

In some locations, existing street trees have disturbed or broken footpath surfaces. The footpath around such trees will be replaced where appropriate with self-binding gravel so as improve the vitality of the trees and ensure accessible pedestrian facilities.

Sustainable Drainage Systems (SuDS) will be incorporated within hardscape areas to locally manage surface water run-off and reduce demand for piped surface water drainage infrastructure.

Informal footpaths through landscaped areas that are set back from the main carriageway will be formed using self-binding gravel as an alternative to asphalt or concrete.

Where private or commercial property boundaries are realigned, boundary walls and railings will be reinstated to match the existing and may be extended to other properties along the same street to enhance streetscape character.

Existing street furniture such as seating will be relocated within the revised streetscape and new street furniture will be provided at locations where opportunity sites have been identified to establish or enhance public spaces.

Hardscape works will be complemented by soft landscaping including trees, hedgerows, native planting, ornamental planting, amenity grass areas and species rich grasslands as appropriate. Soft landscaping will enhance the amenity value and visual character of streets and spaces, mitigate the loss of existing trees, and enhance ecological value along the route.

4.5.11.8 Softscape

Softscape refers to existing trees including street trees and groups of trees, new tree planting, hedgerows, ornamental planting and amenity grasslands. Softscape plays an important role in ensuring that streets and public spaces are attractive and healthy spaces for the local community, but also in providing better air quality, managing surface water run-off and in maintaining and creating habitats.

Planting Strategy

The planting strategy has been developed in response to the objectives set out in both the Galway City Council Development Plan (GCDP) 2017-2023 and in response to landscape and urban realm opportunities arising from the proposed scheme to integrate new infrastructure within the existing local context and to enhance the visual and amenity value of streets and spaces.

The overarching planting strategy is to retain established trees and vegetation wherever possible for their arboricultural amenity and biodiversity value.

The planting strategy includes replacement of street trees and groups of trees that may be impacted by the proposed scheme, but also the introduction of new tree planting and street trees within other spaces and along streets. Reinforcement of green infrastructure along the route will improve the overall amenity, character and appeal of the route corridor and localities along it, as well as enhancing biodiversity.

In addition to trees and street trees, other vegetation is also proposed along the route including hedgerows, ornamental planting and amenity grassland, shrub and meadow grass areas. These will, in part, be utilised to reinstate property boundaries altered by the Proposed Scheme, but also to create new landscape spaces along the route where existing junctions are to be rationalised yield increases in pedestrian and amenity space.

Throughout the design process, collaboration between the Landscape and Urban Realm designers and the Drainage Engineers has sought to adopt Sustainable Drainage Solutions (SuDS) to manage storm water run-off. SuDS features have been considered along the route and incorporated within suitable landscape areas in the form of rain gardens, bioretention areas, filter drains, swales, tree pits and permeable paving.

Arboricultural Survey

An Arboricultural Impact Assessment (AIA) Report (Appendix 16.1 in Volume 4 of this EIAR) identifies the likely direct and indirect impacts to trees of the Proposed Scheme along with suitable mitigation measures, as appropriate to allow for the successful retention of significant trees, or to compensate for trees to be removed.

The Arboricultural Survey identified trees and groups of trees along the route of the Proposed Scheme and provided a detailed schedule of the characteristics, vitality and quality of trees. The AIA Report was prepared by overlaying the Proposed Scheme General Arrangement with the tree survey so as to identify trees or groups of trees that might be impacted by the scheme. The AIAR includes recommendations for the retention, removal or management of trees and identifies trees that will be impacted by virtue of the proposed scheme. It also sets out tree protection measures for trees adjacent to the proposed scheme that might otherwise risk damage during construction.

Typical Planting Typologies

A range of general planting typologies are incorporated into the Proposed Scheme as appropriate to localities and character areas along the route. In some instances, planting is focussed on reinstatement and repair of existing tree group areas that will be impacted to facilitate construction of new footpaths and road infrastructure. In other cases, planting is focussed on enhancing the amenity, green infrastructure, and biodiversity along the route and in providing distinctive and attractive places for people to gather and relax.

New Street Trees and Tree Groups

A range of urban street tree species have been incorporated into the overall Proposed Scheme planting design depending on location and whether trees are to be planted in grass verges or in tree pits within paved urban environments as appropriate, and also to ensure diversity of species and provide habitats for urban wildlife. Typically, proposed trees will be semi-mature, minimum 20/25cm girth standards with 2m clear stem height to facilitate visual permeability. The full range of proposed street trees are included in Table 4.4.

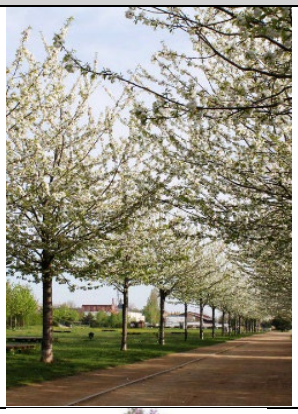
Elsewhere along the route of the Proposed Scheme there are a range of existing mature and immature street trees. While it is proposed to retain and protect existing trees wherever possible, some will be impacted. The Proposed Scheme includes replacement and additional planting of semi-mature street trees to mitigate the loss of existing trees and to maintain the long-term tree-lined character of streets.

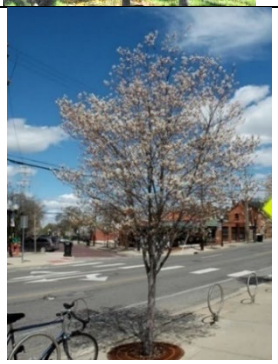
The Proposed Scheme incorporates additional landscaping arising from junction reconfiguration, reinforcement of existing vegetation areas, and the establishment of new urban realm and landscape opportunity areas. Tree species will be determined by location and will comprise either native trees species as set out above, or selected non-native street trees suitable for coastal areas, tolerant to salt-laden wind and tolerant to drought as set out in Table 4.4.

Table 4.4: Proposed Tree Planting Species

Scientific name Common name	Criteria for use	Proposed specification	Reference Image
Carpinus betulus 'Frans Fontaine' Hornbeam	Attractive, small, fastigiate and columnar tree. Tough, resilient and attractive tree with good autumn colour. Excellent for narrow spaces/streetscapes. Tolerant coastal areas.	25-30cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 80cm rootball.	
Pyrus calleryana 'Chanticleer' Ornamental pear	This tried and tested street tree, up to 8m tall, has a narrow, triangular habit, white flowers in spring and glossy green deciduous leaves that turn burgundy and claret late in autumn. It is a beautiful tree, suitable for most soils, very hardy and	25-30cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 80cm rootball.	

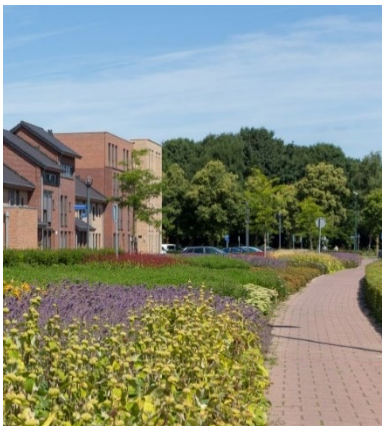
Scientific name Common name	Criteria for use	Proposed specification	Reference Image
	tolerant of drought conditions. Tolerant in sheltered, well drained coastal areas. Great for attracting native wildlife.		
Alnus glutinosa Alder	Irish native tree. Planter beds. Native, deciduous. Tolerant of exposed coastal areas.	25-30cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 80cm rootball.	
Arbutus unedo Strawberry Tree	Irish native tree. Specimen planter beds. Native, evergreen. Tolerant in sheltered, well drained coastal areas.	Multistem with raised stems, 3-3.5m, 130L CG.	
Betula pendula Silver Birch	Irish native tree. Planter beds. Good in groups. Tolerant of exposed coastal areas. An invaluable part of the native ecosystem, host to many insect species and birds.	25-30cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 80cm rootball.	

Scientific name Common name	Criteria for use	Proposed specification	Reference Image
Prunus avium 'Plena' Double flowering cherry	Irish native tree. Planter beds. Tolerant in sheltered coastal areas. Feature accent element on urban squares, parks and avenues.	30-35cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 100cm rootballs.	
Ilex aquifolium 'Nellie Stevens' Holly	Irish native tree. Evergreen. Tolerant of exposed coastal areas. Provides a habitat for native Irish fauna and fauna.	20-25cm girth, 4.0-4.5m tall, standard, 1.8-2.0m clearstem, 80cm rootball.	
Acer campestre 'Streetwise' 'Elsrijk' or 'Elegant' Field Maple	Good street tree. Tolerant of exposed coastal areas. Tolerates air pollution and resists drought. Low maintenance architectural tree. Attractive to pollinating insects.	25-30cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 80cm rootball.	
Quercus robur 'Fastigiata Koster' Common Oak	Irish native tree. Feature tree in planter beds. Tall narrow pyramidal version of the Common Oak 'Fastigiata Koster' is ideal for growing along an avenue or where space is at a premium. Great for attracting native wildlife.	25-30cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 80cm rootball.	

Scientific name Common name	Criteria for use	Proposed specification	Reference Image
Acer platanoides 'Columnare' Norway Maple	Good street tree. Tolerant of exposed coastal areas. Low maintenance architectural tree. Attractive to pollinating insects.	30-35cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 100cm rootball.	
Amelanchier x grandiflora 'Robin Hill' Snowy Mespilus or Shadbush	Specimen planter beds. Tolerant in sheltered coastal areas. Feature accent element on urban squares and parks. Available as a multi-stem and a standard tree. Attracts a wide assortment of birds and wildlife.	25-30cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 80cm rootball.	
Tilia cordata 'Greenspire' Small-leaved Lime	Street tree. Tolerant in sheltered coastal areas. Tolerates air pollution and resists heavy pruning. Wildlife friendly, attractive to pollinating insects.	30-35cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 100cm rootball.	
Ulmus 'Doedens', U. 'Lobel' Elm (DED resistant)	Good street tree. Tolerant of exposed coastal areas. Tolerant of urban conditions. High resistance to Dutch elm disease (DED).	30-35cm girth, 5.0-5.5m tall, standard, 1.8-2.0m clearstem, 100cm rootball.	

Landscaping proposals respond to the different localities and may include grass planting, hedgerows, trees, grasses, ornamental planting and swathes of spring bulbs. The full range of proposed ornamental planting, shrub and hedging species specified for the Proposed Scheme are included in Table 4.5.

Table 4.5: Proposed Ornamental Planting, Shrub and Hedging Species

Scientific name	Reference image
Blocks of mixed perennial planting including: *Achillea 'Moonshine'* *Agapanthus Headbourne hybrids* *Armeria maritima* *Artemesia ludoviciniana 'Silver Queen'* *Anenome 'Honorine Jobert'* *Aster x frikartii 'Monch'* *Ballotia pseudodictamnus* *Bupleurum fructicosum* *Centranthus ruber* *Convolvulus cneorum* *Crocosmia x crocosmiflora 'George Davison'* *Erigeron karvinskianus* *Erysimum 'Bowles's Mauve'* *Eryngium x zabelii 'Jos Eijking'* *Geranium 'Orion'* *Geranium 'Rozanne'* *Geranium sanguineum* *Geranium oxonianum 'Wargrave Pink'* *Helenium 'Rubinzwerg'* *Hemerocallus 'Burning Daylight' and ' Red Precious'* *Hydrangea macrophylla 'Zorro'* *Hydrangea macrophylla 'Ayesha'* *Iris sibirica 'Sparkling Rose'* *Kniphofia 'Alcazar'* *Libertia grandiflora* *Limonium platyhphyllum* *Nepeta 'Six Hills Giant'* *Origanum vulgare* *Perovskia 'Blue Spire'* *Persicaria amplexicaulis 'Blackfield'* *Phlomis fructiosa, P. lanata, P.russeliana* *Phygelius x rectus 'Wincester Fanfare'* *Phygelius x rectus 'Devils Tears'* *Rudbeckia fulgida var. sullivantii 'Goldsturm'* *Salvia nemorosa 'Ostfriesland'* *Salvia nemorosa 'Caradonna'* *Salvia officinalis* *Santolina chaemaecyparis* *Santolina rosmarinifolia subsp. rosmarinifolia* *Sedum spectible 'Brilliant'* *Stachys byzantium 'Silver Carpet'* *Verbena bonariensis* *Veronica spicata 'Ulster Blue Dwarf'* P11 plants planted at 8 plants/sq.m. ***Low maintenance low height evergreen edging/hedge*** *Euonymus japonicus 'Jean Hughes'* *Euonymus japonicus 'Microphyllus Aureovariegatus'* *Ilex crenata*	   

Taller hedge *Ilex aquifolium* *Viburnum opulus* **Low maintenance, low shrub planting** *Astelia chathamica 'Silver Spear'* *Convolvulus cneorum* *Genista Lydia* *Hedera helix 'Hibernica', H. 'Green Ripple'* *Hebe albicans* *Hebe pimeleoides* *Hebe rakiensis* *Hebe 'Frozen Flame'* *Hebe 'Blue Gem'* *Lonicera pileata 'Maigreen'* *Rosa rugosa 'Alba' and 'Rubra'* *Pittosporum tenuifolium 'Tom Thumb'* *Viburnum tinus 'Eve Prince'*	 

4.5.12 Lighting

4.5.12.1 New Lighting and Modifications to Existing Lighting

All new public lighting will be designed and installed in accordance with the specific lighting and electrical items set out the following National Standards and guides, including but not limited to:

- Galway City Council Guidance Specifications;
- EN 13201: 2014 Road Lighting (all sections);
- ET211:2003 'Code of Practice for Public Lighting Installations in Residential Areas';
- BS 5489-1 'Code of practice for the design of road lighting';
- Volume 1 - NRA Specification for Road Works, Series 1300 & 1400;
- Volume 4 - NRA Road Construction Details, Series 1300 & 1400;
- IS EN 40 – Lighting Columns;
- Institution of Lighting Professionals "GN01 Guidance Notes for Reduction of Obtrusive Light".

All new lighting on the Proposed Scheme will aim to minimise the effects of obtrusive light at night and reduce visual impact during daylight. Lighting schemes will comply with the 'Guidance notes for the Reduction of Light Pollution' issued by the Institution of Lighting Professionals (ILP).

Light Emitting Diode (LED) lanterns will be the light source for any new or relocated public lighting provided.

The lighting design involves works on functional, heritage and contemporary lighting installations, on a broad spectrum of lighting infrastructure along the Proposed Scheme.

This will include, but not exclusively, luminaires supplied by underground and overhead cable installations and those located on ESB Infrastructure.

In locations where road widening and/or additional space in the road margin is required, it is proposed that the public lighting columns be replaced and relocated to the rear of the footpath, where practicable, and the existing lighting columns removed once the new facility is operational.

Where significant alterations are proposed to the existing carriageways, the existing public lighting arrangement will be reviewed in association with the Public Lighting Departments of the relevant Local Authority, to ensure that the current standard of public lighting is maintained or improved.

To determine whether existing public lighting is to be improved / relocated or where new public lighting is required, an inspection will be carried out in association with the relevant Local Authority, to identify any new column locations required for particular sections of the Proposed Scheme.

For existing columns that have specific aesthetic requirements, the intent for the replacement of such columns will include:

- Replacing the existing heritage columns and brackets with identical replica columns and brackets;
- Replacing existing luminaires with approved LED heritage luminaires; and
- Ensuring that the electrical installation is compliant.

4.5.12.2 Lighting at Bus Stops

The Proposed Scheme will include for the provision of lighting in covered areas, open areas and passenger waiting areas.

The location of the lighting column will be dictated by light spread of fittings to give the necessary level of illumination (the columns at stations provide clearance for buses).

4.5.13 Utilities

There are several measures incorporated to protect existing utilities during the Construction Phase of the Proposed Scheme. These are specifically outlined in Chapter 5 (Construction) and Chapter 18 (Material Assets) of this EIAR. Where there are clashes between the existing utility infrastructure, measures are proposed to either protect the infrastructure in place or divert the utility infrastructure as required.

The utility design strategy included the analysis of records provided by all utility providers associated with the Proposed Scheme corridor. The analysis included desktop reviews including review of topographic surveys together with site reconnaissance. In locations where critical assets were identified and the risk of interference was considered high, Ground Penetrating Radar surveys were undertaken to inform the Proposed Scheme design.

4.5.13.1 Utility Diversions

The construction of the Proposed Scheme will result in conflicts with several existing utility assets. Identified service conflicts and proposed diversions are described and assessed in Chapter 18 (Material Assets) of this EIAR.

These conflicts have been identified, so that the conflict can be resolved by relocating or diverting the services, where necessary, and protecting in-situ where appropriate.

The principal statutory and other service providers affected are:

- ESB;
- Irish Water (Water & Public Sewer);
- GNI; and
- Telecommunication Services – Eir, Virgin Media, eNet, BT and GCC Fibre Optic Network.

In addition to the above, it will be necessary to relocate and upgrade some of the existing public lighting and traffic signalling network and equipment along the extents of the scheme.

4.5.14 Drainage

4.5.14.1 Relevant Standards and Approach

The drainage design for the Proposed Scheme was developed following consultation with Galway City Council. The design basis was developed taking account of the Planning requirements of Galway City Council, Transport Infrastructure Ireland (TII) requirements and international best practices such as CIRIA The SuDS Manual (C753).

The principal objectives of drainage design are as follows:

- To drain surface water from existing and proposed pavement areas throughout the Proposed Scheme and maintain the existing standard of service.
- To maintain existing run-off rates from existing and newly paved surfaces using Sustainable Urban Drainage Systems (SuDS).
- To minimise the impact of the runoff from the carriageway on the surrounding environment using SuDS and/or silt traps.

No drainage features like gullies or manholes will be located at, or any ponding will be allowed to occur at, pedestrian crossing locations or at bus-stop locations. Drainage of newly paved areas includes SuDS measures to treat and attenuate any additional run-off where possible. These measures ensure that there is:

- No increase in existing run-off rates from newly paved areas; and
- Appropriate treatment to ensure run-off quality.

A hierarchical approach to the selection of SuDS measures has been adopted with 'Source' type measures e.g. Tree pits implemented in preference to catchment type measures e.g. attenuation tanks.

The Drainage Preliminary Design Report and the Drainage Design Basis are contained in Appendix 4.1 and Sub Appendix 4.1A respectively.

4.5.15 Maintenance

All traffic signal, CCTV, and communications equipment will be located to allow access for maintenance. All equipment will be accessible without disrupting pedestrian, bicycle, or vehicle traffic and without the use of special equipment.

Apparatus will be designed and located to allow for easy access and the safe maintenance of the Proposed Scheme into the future. This will include:

- Use of retention sockets, where applicable, for the erection of Traffic Signals, CCTV, Above Ground Detection, and other equipment mounting poles to allow for the ease of installation, maintenance and replacement;
- The use of lightweight equipment poles, where appropriate, such as cantilever signal poles. Consideration will be given to the selection of products that allow for maintenance activities to be undertaken from ground level, such as tilt down poles or poles with wind-down mechanisms;
- Placement of poles and retention sockets within 7m of chambers to provide ease of installation and replacement of cables;
- Locating chambers away from pedestrian desire lines, and areas of tactile paving. This is to provide for a reduced impact of Traffic Management;
- On longitudinal duct runs, chambers to be placed at 180m centres to allow for the ease of installation and replacement of cables;
- Safe areas to be provided for the access and parking of maintenance vehicles; and
- Locating controller, and other, cabinets in positions that allow for safe access and clear visibility of the operation of the junction.

4.5.16 Safety and Security

The requirement for a pleasant, safe and secure environment for passengers waiting at Bus Stops and undertaking their journeys is a key component of the proposed public transport service. This is facilitated by the provision of:

- RTPI – Each stop will be provided with Real Time Passenger Information showing the estimated time of arrival of subsequent buses; and
- Public Lighting – each stop will have public lighting designed to ensure the safe operation of the stops in all lighting conditions and to enhance the sense of security at the stops.
- Increased frequency of services – Unreliable services can leave users waiting for extended periods sometimes in vulnerable situations. Increased frequency of services, especially after dark, will provide improved safety for bus passengers.

4.5.17 Land Use and Accommodation Works

The land use along the Proposed Scheme comprises a mix of residential, commercial properties, community, cultural and institutional and city centre uses. The extent of the impact due to the Proposed Scheme on a landowner's holding is shown on the Compulsory Purchase Order maps for the Proposed Scheme.

The nature and extent of accommodation works associated with any land acquisition varies and is described as appropriate for each sub-section of the Proposed Scheme Route in Section 4.6.

The proposed accommodation works typically consist of relocated boundary walls and gates, and the regrading of driveways and adjacent grass areas, where deemed necessary. Where driveways are proposed to be regraded a maximum gradient of 5% in accordance with Recommendations for Site Development Works for Housing Areas, Department of the Environment and Local Government, 1998 has been adopted, where practicable.

Where cellar and private landings are affected by the Proposed Scheme, pre-construction and post construction surveys will be performed by the appointed contractor. It will be determined during the detailed design stage if strengthening works are required to these existing structures.

To maintain the character and setting along the route of the Proposed Scheme, the approach to undertaking the new boundary treatment works is replacement on a 'like for like' basis in terms of material selection and general aesthetics, unless otherwise noted on the scheme drawings, as listed at the outset of this Chapter.

4.6 Description of the Proposed Scheme

This section details the proposed scheme. It should be read in conjunction with the scheme plans, which are contained in Chapter 3 (Consideration of Reasonable Alternatives) of the EIAR.

4.6.1 Route Sub-Sections

For the purposes of description, the Proposed Scheme is divided into the eleven route sub-sections as listed below, and as located in Diagram 4.11:

- Sub-Section 1 - R863 University Road to R866 St. Francis Street;
- Sub-Section 2 - R866 St. Francis Street and R866 Eglinton Street;
- Sub-Section 3 - R866/R336 Eyre Square to R339 Forster Street;
- Sub-Section 4 - R339 College Road (R339 Forster Street to Lough Atalia Road);
- Sub-Section 5 - R339 College Road (Lough Atalia Road to Moneenageisha Junction);
- Sub-Section 6 - R338 Dublin Road;

For the Inner-City Access Route:

- Sub-Section 7 - Fairgreen Road;

- Sub-Section 8 - Bóthar Uí hEithir and R336 Prospect Hill;
- Sub-Section 9 - Bóthar na mBan / St. Brendan's Avenue / R866 Headford Road / Dyke Road;
- Sub-Section 10 - Woodquay / Walsh's Terrace / Daly's Place / Mary Street; and
- Sub-Section 11 - Forthill Street / R336 Merchants Road / Queen Street.

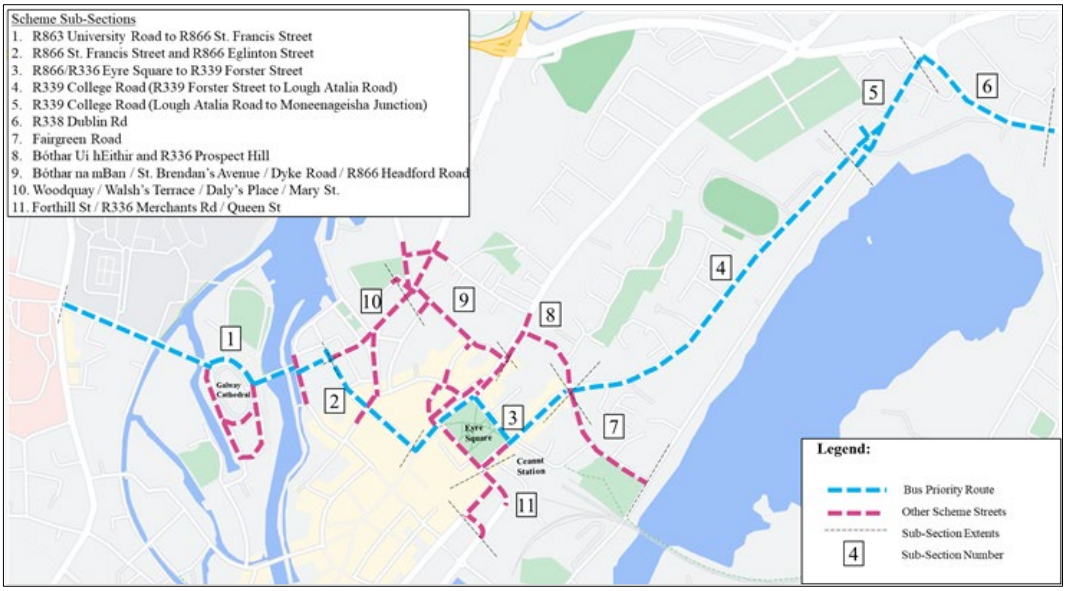


Diagram 4.11: Proposed Scheme Sub-Sections

4.6.2 Sub-Section 1 - R863 University Road to R866 St. Francis Street

4.6.2.1 Overview

The interventions proposed on this section of the Proposed Scheme are summarised as follows:

- Footpaths widened along R863 University Road;
- New drainage network along R863 University Road and outfall to canal;
- Salmon Weir Bridge to be restricted to a 'bus gate' during associated hours of operation (07:00 – 19:00);
- Public Realm Space to be created in front of Galway Cathedral, with Gaol Road to the back of the Cathedral to be made 2-way;
- Re-configured bus and car parking within existing Cathedral car park;
- Newtownsmith and Waterside to be closed off onto St. Vincent's Avenue;
- The provision of raised tables, entry treatments and signalised crossings;
- Reconfiguration of footpaths on Salmon Weir Bridge; and
- Temporary land acquisition necessary to construct the Proposed Scheme.

4.6.2.2 Bus Lane Provision and General Vehicular Impacts

The Proposed Scheme involves the creation of bus lanes over the existing Salmon Weir Bridge, effectively closing the Salmon Weir Bridge to general vehicular traffic during the hours of operation of the bus lane (07:00-19:00). Bus priority will be achieved along R863 University Road largely through the removal of through vehicular traffic along the route.

The inbound bus lane will begin to the immediate east of the existing vehicular access to Fisheries Field and will terminate immediately to the east of the Salmon Weir Bridge. This will permit vehicles exiting from Newtownsmith to travel along St. Vincent's Avenue, during times that vehicles are permitted to exit from Newtownsmith (06:00-10:00).

The outbound bus lane along this route begins at the junction of St. Vincent's Avenue with R866 St. Francis Street. The R866 St. Francis Street approach to this junction does not have a bus lane, meaning any vehicles travelling along R866 St. Francis Street which are not permitted to enter a bus lane must either turn right onto the R866 towards the Headford Road, or continue straight towards Waterside. On the R866 westbound approach to the R866 St. Francis Street / St. Vincent's Avenue junction, a westbound bus lane is proposed beginning at Woodquay, meaning only vehicles permitted to travel along a bus lane will arrive at this junction and can continue onto the bus lane along St. Vincent's Avenue towards the Salmon Weir Bridge. This section is bus lane will be time plated and operate between the hours of 07:00-10:00 and 13:00-19:00, thereby providing access to the Cross-City Link on R866 St. Francis Street and R866 Eglinton Street to R866/R336 Eyre Square, for the purposes and loading and deliveries between the house of 10:00-13:00, and between 19:00-07:00.

The Proposed Scheme includes for the conversion of Gaol Road (west) into a two-way street alongside the Cathedral to the west and south, with the Gaol Road (east) junction to R863 University Road being closed off to all public transport and vehicular traffic. This creates a natural 'gateway' whereby general traffic is diverted from R863 University Road in advance of Salmon Weir Bridge, and facilitates local access to Nun's Island and the environs of Galway Cathedral.

In tandem with these works, the existing car park to the south of Galway Cathedral is will be amended to provide additional coach parking facilities and to reduce the number of general parking spaces as a result. The existing vehicular egress arrangement from Galway Cathedral will also be amended, with the existing entrance on the southern side to be widened into an entrance and exit, with the existing exit on the eastern side to be closed to vehicular traffic.

Traffic calming features are proposed along the route entailing the provision of raised tables at the Canal Road Upper and Fisheries Field, and the provision of two new signalised pedestrian crossings on R863 University Road in combination with the narrowing of the road carriageway along R863 University Road. These will impact upon the existing on-street parking provision with a reduction in parking spaces along R863 University Road. This is considered in Section 4.6.2.7.

4.6.2.3 Bus Stops

Table 4.6 states the how existing bus stops will be affected by the Proposed Scheme.

Table 4.6: Proposed changes to Bus Stops

Inbound/ Outbound	Bus Stop Name/No.	Bus Stop Type	Location	Retained/ Relocated/ Removed / New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Eastbound	R863 University Road (NUIG Main Gate) No.522561	Inline	30m North-West of NUI Galway Main Gate	Retained	Bus Shelter No Seating Paper timetable	Bus Shelter with Seating	N/A
Westbound	NUIG Main Gate No. 523031	Inline	35m south-east of NUI Galway Main Gate	Retained	RTPI Bus Stop Pole Paper timetable	Bus Shelter with Seating	N/A
Eastbound	Galway Cathedral No. 523181	Inline	North East Galway Cathedral, 50m after crossing Salmon Weir Bridge	Relocated	Bus Stop Pole Paper timetable	Bus Shelter with Seating	Stop moved closer to pedestrian crossing
Westbound	Galway Cathedral No. 522571	Inline	North East Galway Cathedral, 50m after crossing Salmon Weir Bridge	New	Bus Stop Pole Paper timetable	Bus Shelter with Seating	New outbound stop to correspond with existing inbound stop

4.6.2.4 Cycling Provision

The removal of through traffic on R863 University Road between 07:00-19:00 in combination with traffic calming will enable safer and more efficient cycling in the inbound and outbound directions within a low speed, low traffic environment. No segregated cycle facilities are proposed along this section.

New bicycle parking is proposed along R863 University Road, Gaol Road, Newtownsmith and Waterside. Refer to General Arrangement drawings, as listed at the outset of this Chapter.

4.6.2.5 Pedestrian Provision

In conjunction with the closure of the Salmon Weir bridge to through traffic, the Proposed Scheme will also involve upgrading pedestrian footways and crossing points to improve pedestrian accessibility to and along R863 University Road itself. This will include widening footways along the route and the rationalisation of on-street parking.

On the Salmon Weir Bridge, the existing narrow footpath on the southern side of the bridge will be removed and replaced with a narrower 'rubbing strip' (still maintaining traffic safety and providing protection to the bridge parapet), thereby allowing the northern footpath to be widened to 1.8m wide. This maintains this pedestrian route and retaining the view of the weir for those walking across the bridge.

The diversion of general traffic onto Gaol Road (west of the Cathedral) affords an opportunity to considerably enhance the public realm in the Galway Cathedral area. To achieve this, it is proposed to close Gaol Road on the eastern side of Galway Cathedral and to re-purpose the space as a large public area with urban landscaping permeable to pedestrians and cyclists.

Footpaths along R863 University Road, Salmon Weir Bridge and St. Vincent's Avenue are to be replaced and widened. All footpath on these streets will be replaced with a concrete paving surface and granite kerbs. Existing natural stone kerbs at the junction of St. Vincent's Avenue and R866 St. Francis Street will be retained however, while the existing footpath on the northern side of St. Vincent's Avenue in the vicinity of Galway Courthouse and on the western side of Gaol Road will be retained. Footpaths and islands within the reconfigured Galway Cathedral carpark will be formed by in-situ concrete. Pedestrian routes through Newtownsmith and Waterside, which will be permeable to vehicles at specific times, will be finished with concrete setts.

4.6.2.6 Junctions

Table 4.7 (Signalised) and Table 4.8 (Non-Signalised) summarises the junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.7: Signalised Junctions

Name	Summary
St Vincent Avenue / R866 St. Francis Street / Court House Square	**Overview** An upgrading of the existing signal controlled cross intersection junction is proposed. The design rationale was to ensure buses will have more priority at the junction and to reduce potential impacts on local access to R866 St. Francis Street and surrounding areas. This is achieved using a mix of full and virtual bus priority.

	This junction is connected to Galway City Council's Urban Traffic Control System which has the capability to provide appropriate bus priority through signal operation. **Permitted Movements** R866 St. Francis Street outbound: This lane will remain open to general traffic, allowing to turn right onto St. Vincent Avenue or continue straight on to Court House Square. Court House Square inbound: Here, general traffic will only have the option turn left only onto St Vincent's Avenue. St. Vincent's Ave westbound: This will be converted to a bus lane, with the option to turn left or continue straight on to other bus lanes. On the St. Vincent's Ave eastbound direction, this will remain as a general traffic lane, with virtual bus priority, with the option to turn right or continue straight on to other bus lanes.

Table 4.8: Minor/Non-signalised Junctions

Name	Summary
R863 University Road / University Driveway	**Overview** The existing T-junction is to remain, with a raised table proposed at the side-road entrance to improve facilities for pedestrians crossing the junction.
R863 University Road / Canal Road Upper	**Overview** Existing 4-way junction is to remain, with raised table proposed across intersection to improve facilities for pedestrians crossing the junction.
R863 University Road / Gaol Road (west)	**Overview** Existing T-junction is to remain with reduced kerb radii proposed
R863 University Road / Fisheries Field Access	**Overview** Existing T-way junction is to remain, with raised table proposed across intersection to improve facilities for pedestrians crossing the junction.
R863 University Road / Gaol Road (east)	**Overview** Existing T-junction to be removed and replaced with pedestrian plaza
R863 University Road / Waterside	**Overview** Existing T-junction is to be replaced with pedestrian plaza and cycle permeability
R863 University Road / Newtownsmith	**Overview** Existing T-junction is to remain, though it is to become one-way (northbound) with controlled egress to facilitate deliveries.

4.6.2.7 Parking and Loading Bays

The Proposed Scheme will require the removal of some parking spaces and adjustments to loading facilities along this section of its route to deliver the required improvements to facilities for pedestrians, cyclists, and buses. The proposed changes in parking and loading provision along the Cross-City Link are summarised in Table 4.9 and Table 4.10.

Table 4.9: Summary of Parking Changes

Location	Baseline		Proposed		Change
	Corridor	Adjacent	Corridor	Adjacent	
R863 University Road (Newcastle Road to Salmon Weir Bridge)	17	211	13	211	-4
Galway Cathedral	175	175	49	175	-126

Table 4.10: Summary of Loading Changes

Location	Loading Bays		Change
	Baseline	Proposed	
R863 University Road (Newcastle Road to Salmon Weir Bridge)	3	3	0
Galway Cathedral	0	0	0

4.6.2.8 Landscape Design

R863 University Road

The Proposed Scheme will be modified to increase the quantum of public space and through the provision of hard and soft landscaping to create a more attractive and pedestrian friendly environment. Entry treatments will improve pedestrian facilities at junctions along the route, with raised pedestrian crossing facilities provided.

The landscape design intent is to also reenforce the low-speed street environment as set out in Section 4.5.2.1, thereby changing the character of the route for all those moving along or across it, particularly pedestrians and cyclists.

Full details of the landscape proposals are set out in Drawings BCG-LA-00-01/02, with extracts for illustration provided in Diagram 4.12 and Diagram 4.13 (photomontage) respectively.

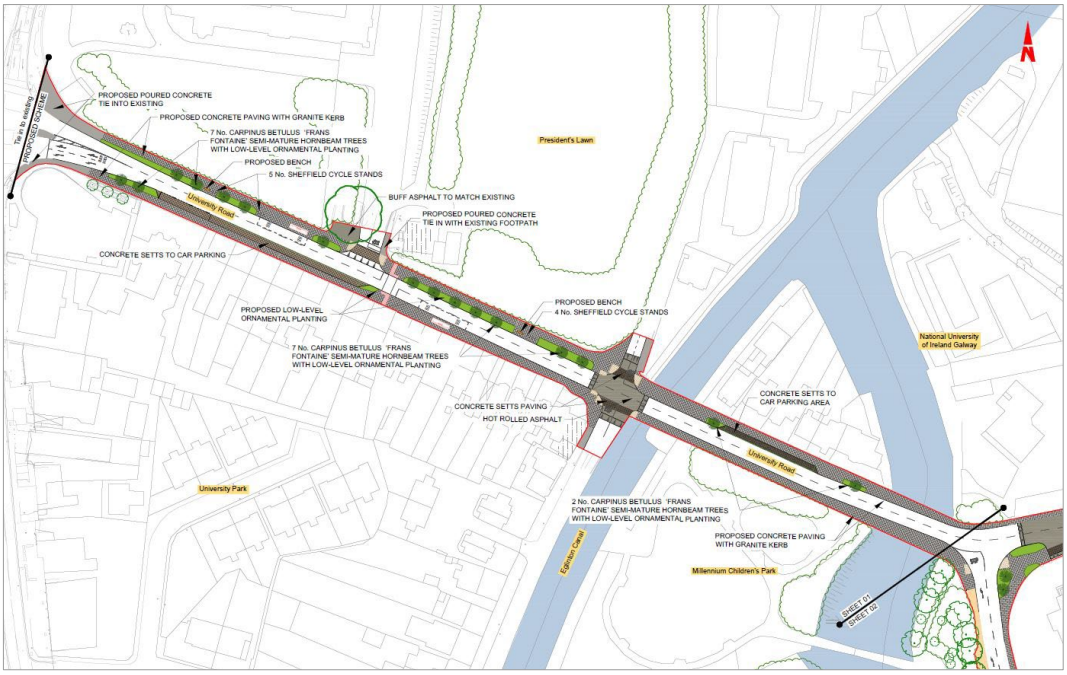


Diagram 4.12: Landscape Proposals along R863 University Road

Diagram 4.13: View of Proposed Scheme from R863 University Road

Galway City Cathedral

The closure of Gaol Road to the east of Galway Cathedral will allow for creation of a new Civic Plaza with high quality hard and soft landscaping, tree planting, bicycle cycling. The proposed public realm will extend and connect to the Salmon Weir pedestrian and cycle bridge currently under construction.

The new Civic Plaza and bridge will facilitate a seamless and natural flow for pedestrians and cyclists from either side of the river, while creating an iconic focal point for locals and tourists alike to take in the views of the River Corrib, the Salmon Weir, the Cathedral, natural and built heritage in the area, providing high quality public amenity space and transport infrastructure

The car park to the south of the Cathedral is retained and reconfigured and will accommodate bus and car parking. Refer to Diagram 4.14 and photomontage views Diagram 4.15 and Diagram 4.16.

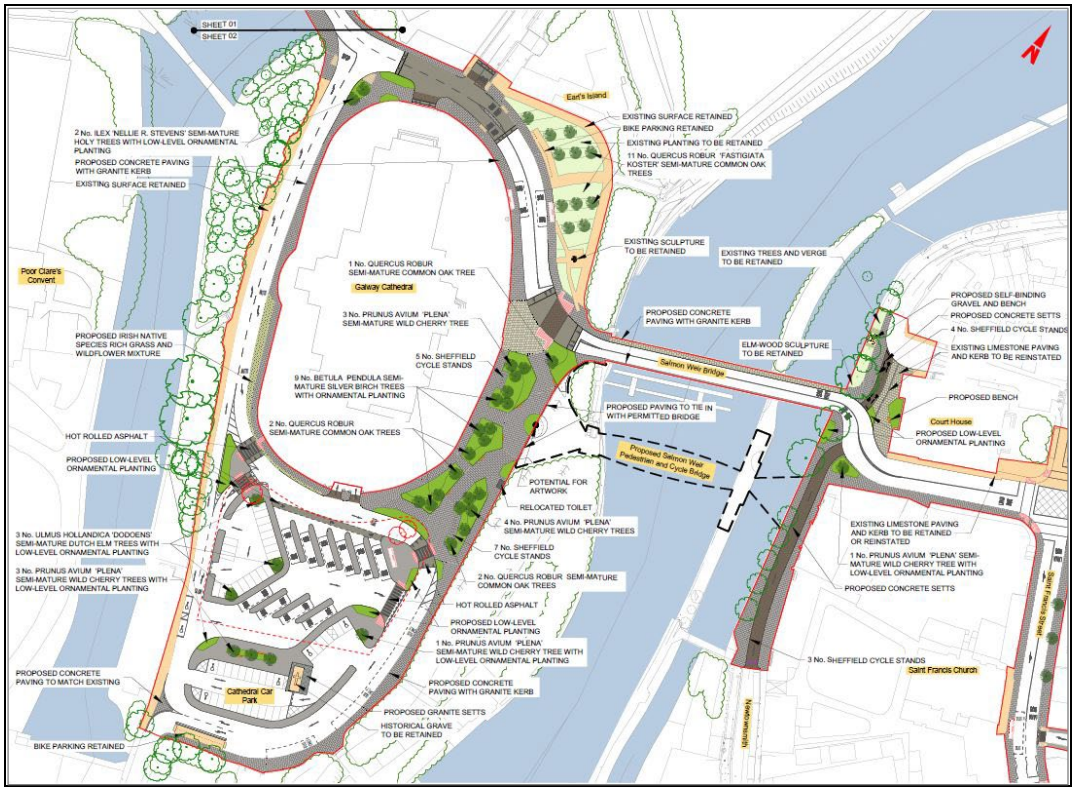


Diagram 4.14 : Landscape Proposals at Galway City Cathedral

Diagram 4.15 : View of Proposed Scheme from R863 University Road/Gaol Road

Diagram 4.16 : View of Proposed Scheme from Goal Road

4.6.2.9 Structures

There are no structures proposed along this sub-section of the Proposed Scheme route.

4.6.2.10 Land Acquisition and Accommodation Works

This section of the Proposed Scheme route traverses adjoining mixed land uses, comprising residential housing along R863 University Road, recreational and amenity lands at Millennium Children's Park and Playgrounds and Community, Cultural and institutional lands at NUIG, Galway Cathedral, Galway Court House and the Franciscan Abbey.

In order to construct the Proposed Scheme, permanent and temporary land take is required within this section at the following locations:

- Entrance to NUIG adjacent to the Quadrangle to facilitate the construction of a raised entry treatment
- Entrance to NUIG at Canal Road Upper to facilitate the construction of a raised table junction
- Entrance to NUIG at Earl's Island to facilitate the construction of a raised entry treatment

In addition to this land acquisition the Proposed Scheme will require the acquisition or restriction or otherwise interference, either temporary or permanent to private rights associated with the land acquisition at the following locations:

- Entrance to NUIG at Canal Road Upper affecting private rights to a residential property.
- Entrance to NUIG at Earl's Island affecting private rights.
- Vehicular exit to the Cathedral on the Eastern side near the Salmon Wier Bridge will be restricted due to the private realm and landscaping in front of the Cathedral which requires vehicular exit to be moved to another location. This affects the private rights of the Cathedral.

There are no additional accommodation works associated with land take requirements to facilitate the Proposed Scheme along this section of the route.

4.6.3 Sub-Section 2 - R866 St. Francis Street and R866 Eglinton Street

4.6.3.1 Overview

The interventions proposed are summarised as follows:

- R866 St. Francis Street to include a time-plated bus lane inbound;
- R866 Eglington Street to be a time plated bus lane inbound;
- Footpath widening on R866 Eglinton Street;
- Signal controlled pedestrian crossing on R866 St. Francis Street;
- Signalisation of the junction of R866 St. Francis Street / R866 Eglinton Street / Mary Street / Daly Place;
- New bicycle parking on R866 St. Francis Street and R866 Eglinton Street.

4.6.3.2 Bus Lane Provision and General Vehicular Impacts

The proposed scheme involves converting the inbound lane of both R866 St. Francis Street and R866 Eglinton Street into a time plated bus lane while maintaining the outbound lanes as all-traffic lanes. The scheme also proposes reversing the one-way direction of traffic on Daly's Place from Woodquay to R866 Eglinton Street.

All traffic from Mary Street, will be required to turn left onto R866 St. Francis Street unless permitted to enter into a bus lane, while all traffic from Daly's Place will be required to turn right unless permitted to enter into a bus lane. Local access to R866 Eglinton Street will remain possible via Eyre Street and R866/R336 Eyre Square, however R866 Eglinton Street outbound will effectively be removed as a through route, thereby providing bus priority over general traffic.

R866 St. Francis Street inbound and R866 Eglinton Street inbound will operate as bus lanes during the hours of operation of the bus lane which are proposed to be 07:00-10:00 and 13:00-19:00, while R866 St. Francis Street will be open to general traffic to permit local traffic from Woodquay to access R866 St. Francis Street and return to the Headford Road and traffic from Mary Street to access the Headford Road.

4.6.3.3 Bus Stops

The principles of bus route rationalisation, as stated in Section 4.5.4.4 were employed on this sub-section. Table 4.11 below states how existing bus stops shall be affected by the Proposed Scheme.

Table 4.11: Proposed Changes to Bus Stops

Inbound/ Outbound	Bus Stop Name/No.	Bus Stop Type	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Eastbound	Franciscan Friary No. 522591	Inline	Osteria Italia Restaurant R863 St. Francis Street	Retained	Bus Stop Pole Paper timetable	Bus Shelter with Seating	N/A
Westbound	Francis Street No. 523021	Inline	Franciscan Abbey R863 St. Francis Street	Retained	RTPI Bus Stop Pole	Bus Shelter with Seating	N/A

4.6.3.4 Cycling Provision

Virtual bus priority in the outbound direction, and full bus priority in the inbound direction, on R866 Eglinton Street and R866 St. Francis Street, will enable safer and more efficient cycling, due to traffic reduction effects. No segregated cycle lanes are proposed along this section.

4.6.3.5 Pedestrian Provision

Footpaths along R866 Eglinton Street and parts of R866 St. Francis Street in the vicinity of the new signalised junction will be replaced and widened. All footpaths will be replaced with new materials, with a natural stone surface proposed along R866 Eglinton Street and a concrete paving surface proposed along R866 St. Francis Street. A raised table will be installed at the junction of R866 Eglinton Street and Williamsgate Street to improve pedestrian movement between R866/R336 Eyre Square and Shop Street areas. A loading bay, semi-recessed into the footway along R866 Eglinton Street inbound is proposed, which will be utilised as a footway outside of designated loading times (i.e. during hours of operation of the bus lane).

4.6.3.6 Junctions

Table 4.12 (Signalised) and Table 4.13 (Non-Signalised) summarises the junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.12: Signalised Junctions

Name	Summary
R866 St. Francis Street / Mary's Street / R863 Eglinton Street / Daly's Place	**Overview** Proposed Signal Controlled Crossroads Junction. The design rationale was to ensure buses will have more priority at the junction and to reduce potential impacts arising from local access to Mary's Street and Daly's Place and surrounding areas. This is achieved using a mix of Full and Virtual Bus Priority. Inbound along R866 St. Francis and R866 Eglinton Street have full bus priority during the hours of operation of the bus lanes. Outbound along R866 St. Francis and R866 Eglinton Street have virtual bus priority through traffic reduction. Mary's Street will be turn left only while exiting Daly's Place will be turn right only. This junction will be connected to Galway City Council's Urban Traffic Control System which has the capability to provide appropriate bus priority through signal operation.

Table 4.13: Minor/Non-Signalised Junctions

Name	Summary
R866 St. Francis St / St. Anthony's Place	**Overview** Existing T-junction is to remain, though St Anthony's Place is to become one-way (westbound)
Court Lane / St. Anthony's Place	**Overview** Existing T-junction is to remain, however Court Lane to become exit only with a right turn onto St. Anthony's Place
R866 Eglinton Street / William St / Williamsgate Street	**Overview** Existing T-junction is to remain, with raised table across intersection

4.6.3.7 Parking and Loading Bays

With the proposed scheme in place, there is an associated need to remove some parking space to provide improved facilities for pedestrians, cyclists, and buses – which inevitably requires some reallocation of parking road space. The proposed changes in parking and loading provision along the Cross-City Link are summarised in Table 4.14 and Table 4.15.

Table 4.14: Summary of Parking Changes

Location	Baseline		Proposed		Change
	Corridor	Adjacent	Corridor	Adjacent	
Salmon Weir Bridge to R866/R336 Eyre Square	9	1,298	0	1,298	-9

Table 4.15: Summary of Loading Changes

Location	Loading Bays		Change
	Baseline	Proposed	
Salmon Weir Bridge to R866/R336 Eyre Square	6	4	-2

4.6.3.8 Landscape Design

Due to the constrained nature of this section of the proposed scheme, limited landscape design measures are proposed. Footpaths will be replaced with higher quality materials, with concrete paving slabs proposed along R866 St. Francis Street and natural stone paving proposed along R866 Eglinton Street.

Full details of the landscape proposals are set out in Drawings BCG-LA-00-02/04.

4.6.3.9 Structures

There are no structures proposed in this sub-section.

4.6.3.10 Land Use and Accommodation

This section of the scheme includes Community, Cultural and institutional lands at the Franciscan Abbey and the Mercy School. The remainder of this section of the route is zoned for city centre uses and this is reflected on the numerous retail units, hospitality offerings and offices located along this section.

No permanent or temporary land take is required through this section to facilitate the scheme, as all lands are in the ownership or control of Galway City Council.

4.6.4 Sub-Section 3 - R866/R336 Eyre Square to R339 Forster Street

4.6.4.1 Overview

The interventions proposed are summarised as follows:

- Williamsgate Street and R866 Eyre Square North to become a time-plated bus lane;
- R336 Eyre Square East to be two-way time-plated bus lane between St. Patricks Avenue and R866 Eyre Square North;
- R339 Forster Street to become two-way time-plated bus lanes;
- Junction of R336 Eyre Square East and R339 Forster Street to be signalised for all movements;
- Raised table on R866 Eyre Square North connecting Rosemary Avenue and Eyre Square West;
- R866 Eyre Square North to be upgraded to a landscaped pedestrianised plaza area;
- Vehicular access to Rosemary Avenue, and Eyre Street to be restricted to permitted hours only;
- R336 Prospect Hill between Bóthar na mBan and R866 Eyre Square North to be made a cul-de-sac with restricted access to R866 Eyre Square North to permitted hours only;
- New bicycle parking on R339 Forster Street.

4.6.4.2 Bus Lane Provision and General Vehicular Impacts

The proposed scheme involves converting R339 Forster Street and R336 Eyre Square East into two-way streets, operating as bus-lanes during peak hours, with R866 Eyre Square North (currently operating as two-way) and Williamsgate Street also becoming time-plated bus lanes (heading eastbound only). The westbound route along R866 Eyre Square North and Williamsgate Street will not be designated as bus lanes, in order to facilitate loading and delivery access to Shop Street via Williamsgate Street.

As part of this scheme, R336 Prospect Hill will also become a two-way route, to facilitate loading/delivery and taxi access from the north-east. However, there will be restricted connectivity through to R866 Eyre Square North from R336 Prospect

Hill (there will be a looped route which will allow vehicles to enter and exit from the north-eastern approach).

Access for vehicular traffic from R336 Prospect Hill to Eyre Square will be permitted during specific hours to allow for loading and access to the Shop Street area. Loading/delivery vehicles approaching from the south will use Eyre Square West (which is open for a portion of the morning) to access Williamsgate and Shop Street.

Access to R866 Eglinton Street and Eyre Square North Plaza and Rosemary Avenue can be achieved via Eyre Street onto R866 Eyre Square North. Rosemary Avenue access will also be restricted to specific permitted hours to coincide with delivery and casual trading times permitted at Eyre Square.

Between R336 Eyre Square South and St. Patrick's Avenue, no bus lanes are proposed, in order to maintain vehicular access to St. Patrick's Avenue which is the sole access to residential properties and parking. However, this is extremely limited and therefore no impact on bus operation is anticipated along this section.

R339 Forster Street is proposed to be converted into a two-way bus only street (07:00-10:00 and 13:00-19:00, with access permitted during the 10:00-13:00 period to facilitate deliveries/loading, etc.). Existing parking will be converted to loading bays and public realm improvement areas. The junction of R339 Forster Street / Bóthar Uí Eithir / Fairgreen Road / R339 College Road will be reconfigured to facilitate altered movements, including the removal of left slip lanes, shorter pedestrian crossings and crossings on all arms of the junction.

Due to the conversion of R336 Eyre Square East and R339 Forster Street to two-way movements and the restricted geometry at the corner, the junction of R336 Eyre Square / R339 Forster Street / Ceannt Station and Frenchville Lane will be signalised for all movements, this will include controlled pedestrian crossings on all arms of the junction.

Existing shared loading bays / taxi ranks will be retained along R336 Eyre Square East with the directions being reversed, however the taxi rank and disabled parking along R866 Eyre Square North will be removed with an alternative loading bay on Rosemary Avenue, shared taxi rank / loading bays on R336 Prospect Hill, disabled parking spaces on R336 Prospect Hill and Bóthar Irwin. The existing loading bay on Williamsgate Street will be retained. An eastbound loading bay is proposed at the eastern end of R339 Forster Street at Saint Patrick's Church. This will in turn lead to on-street parking being removed at this location. One existing bus bay and shelter along R866 Eyre Square North will be removed to facilitate access from Eyre Street.

4.6.4.3 Bus Stops

The principles of bus route rationalisation, as stated in Section 4.5.4.4 were employed on this sub-section. Table 4.16 below states how existing bus stops shall be affected by the Proposed Scheme.

Table 4.16: Proposed changes to Bus Stops

Inbound/ Outbound	Bus Stop Name/ No.	Bus Stop Type	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Eastbound	Eyre Square Stop 1	Lay-by	North of Eyre Square parallel to the plaza.	Removed	RTPI Bus Shelter with Seating	Bus Shelter with Seating	Removed due to amendments to road layout from Eyre Street
Eastbound	Eyre Square Stop 2	Lay-by	North of Eyre Square parallel to the plaza.	Retained	RTPI Bus Shelter with Seating	Bus Shelter with Seating	N/A
Eastbound	Eyre Square Stop 3	Lay-by	North of Eyre Square parallel to the plaza.	Retained	RTPI Bus Shelter with Seating	Bus Shelter with Seating	N/A
Eastbound	Eyre Square Stop 4	Lay-by	North of Eyre Square parallel to the plaza.	Retained	RTPI Bus Shelter with Seating	Bus Shelter with Seating	N/A
Westbound	Eyre Square Stop 5	Lay-by	East of Eyre Square Parallel to playground	Retained	RTPI Bus Shelter with Seating	Bus Shelter with Seating	N/A
Westbound	Eyre Square Stop 6	Lay-by	East of Eyre Square Parallel to playground	Retained	RTPI Bus Shelter with Seating	Bus Shelter with Seating	N/A
Westbound	Eyre Square Stop 7	Lay-by	East of Eyre Square	Retained	RTPI Bus Shelter	Bus Shelter with Seating	N/A

Inbound/ Outbound	Bus Stop Name/ No.	Bus Stop Type	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
			Parallel to playground		with Seating		
Westbound	Eyre Square Stop 8	Lay-by	East of Eyre Square Parallel to playground	Retained	RTPI Bus Shelter with Seating	Bus Shelter with Seating	N/A
Westbound	Eyre Square Stop 9	Lay-by	South of Eyre Square Beside AIB Building	Removed	RTPI Bus Shelter with Seating	N/A	Removed as bus stop is now obsolete
Westbound	Forster Street No. 524361	Inline	Outside Forster Court	Removed	Bus Stop Pole Paper Timetable	Bus Shelter with Seating	Removed due to Proximity to Eyre Square

4.6.4.4 Cycling Provision

Bus priority on R866/R336 Eyre Square and R339 Forster Street and the removal of through traffic will enable safer and more efficient cycling in the inbound and outbound directions, due to traffic calming effects. No segregated cycle lanes are proposed along this section.

4.6.4.5 Pedestrian Provision

Footpath widening and reconstruction is proposed along Williamsgate Street and R339 Forster Street and all surface materials on the reconstructed footpaths and plazas in this area will be natural stone. Surfaces which have a shared pedestrian and vehicle loading including Rosemary Avenue, Eyre Street, Loading and taxi bays on R336 Eyre Square East, and raised tables will have a stone paving sett surface. The northern section of the cul-de-sac of R336 Prospect Hill will also have a stone paving sett surface to provide continuity and connectivity for pedestrians from R866 Eyre Square North to Bóthar na mBan.

The existing streetscape to the north of the main carriageway at R866 Eyre Square North will be re-purposed to create a larger, open plaza area with urban landscaping features. The existing public bike share station will be relocated, and the Liam Mellows Statue will be retained in its current location with the plinth to be redesigned.

4.6.4.6 Junctions

Table 4.17 (Signalised) and Table 4.18 (Non-Signalised) summarises the junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.17: Signalised Junctions

Name	Summary
R336 Eyre Square East / R336 Eyre Square South / R339 Forster Street / Galway Bus Station / Frenchville Lane	**Overview** Proposed Signal Controlled 5-arm Junction. The design rationale was to ensure buses will have priority at the junction and to reduce potential impacts on local access to R336 Eyre Square and Frenchville Lane and surrounding areas. **Permitted Movements** Exiting R336 Eyre Square East, general traffic can turn right onto R336 Eyre Square South or continues straight on to Frenchville lane. Buses can turn left onto R339 Forster Steet which is full bus priority. Exiting R336 Eyre Square South, general traffic can turn left onto R336 Eyre Square East or turn right onto Frenchville lane. Buses can continue straight onto R339 Forster Street. Exiting R339 Forster Street, buses can turn right onto R336 Eyre Square East, or continue straight onto R336 Eyre Square South. Only buses or authorised vehicles can exit from R336 Forster Street. Exiting Frenchville lane, general traffic can continue straight on to R336 Eyre Square East or turn left onto R336 Eyre Square South. Exiting Galway Bus Station, buses can turn left onto Eyre Square south, continues straight on to R336 Eyre Square East, or turn right onto R339 Forster Street.

Table 4.18: Minor/Non-Signalised Junctions

Name	Summary
R866 Williamsgate Street / Rosemary Avenue	**Overview** Existing T-junction is to remain, with intersection on raised table. Rosemary Avenue is to become egress controlled
Bóthar Irwin / Rosemary Avenue	**Overview** Existing T-junction is to remain, with access control
R866 Eyre Square North / Eyre Street	**Overview** Existing T-junction is to remain and extend onto R866 Eyre Square North, with intersection on raised table. Eyre Street is to become access controlled and one-way (southbound)
Bóthar Irwin / Eyre Street	**Overview** Existing T-junction is to remain, with access control
R866 Eyre Square North / R336 Prospect Hill	**Overview** Existing T-junction is to remain, with access control
R336 Eyre Square East / St. Patrick's Avenue	**Overview** Existing T-junction is to remain
R336 Eyre Square South / Eyre Square West	**Overview** Existing T-junction is to remain

4.6.4.7 Parking and Loading Bays

With the proposed scheme in place, there is an associated need to remove some parking space to provide improved facilities for pedestrians, cyclists, and buses – which inevitably requires some reallocation of parking road space. The proposed changes in parking and loading provision along the Cross-City Link are summarised in Table 4.19 and Table 4.20.

Table 4.19: Summary of Parking Changes

Location	Baseline		Proposed		Change
	Corridor	Adjacent	Corridor	Adjacent	
Eyre Square and R336 Prospect Hill	17	606	7	606	-10

Table 4.20: Summary of Loading Changes

Location	Loading Bays		Change
	Baseline	Proposed	
Eyre Square and R336 Prospect Hill	21	25	+4

4.6.4.8 Landscape Design

The proposed R866 Eyre Square North redesign will involve reallocating street space, creating a new public space and redesign of the public transport space in that area.

The proposed alterations will include closure of the north-eastern corner of R866/R336 Eyre Square (the connection to R336 Prospect Hill) returning this space to the people of Galway and extending the natural heart of the city from Eyre Square. Eyre Street and Rosemary Ave will be transformed into shared space environments.

Full details of the landscape proposals are set out in Drawings BCG-LA-00-04/06/07, with extracts for illustration provided in Diagram 4.17 and photomontage views in Diagram 4.18 and Diagram 4.19.

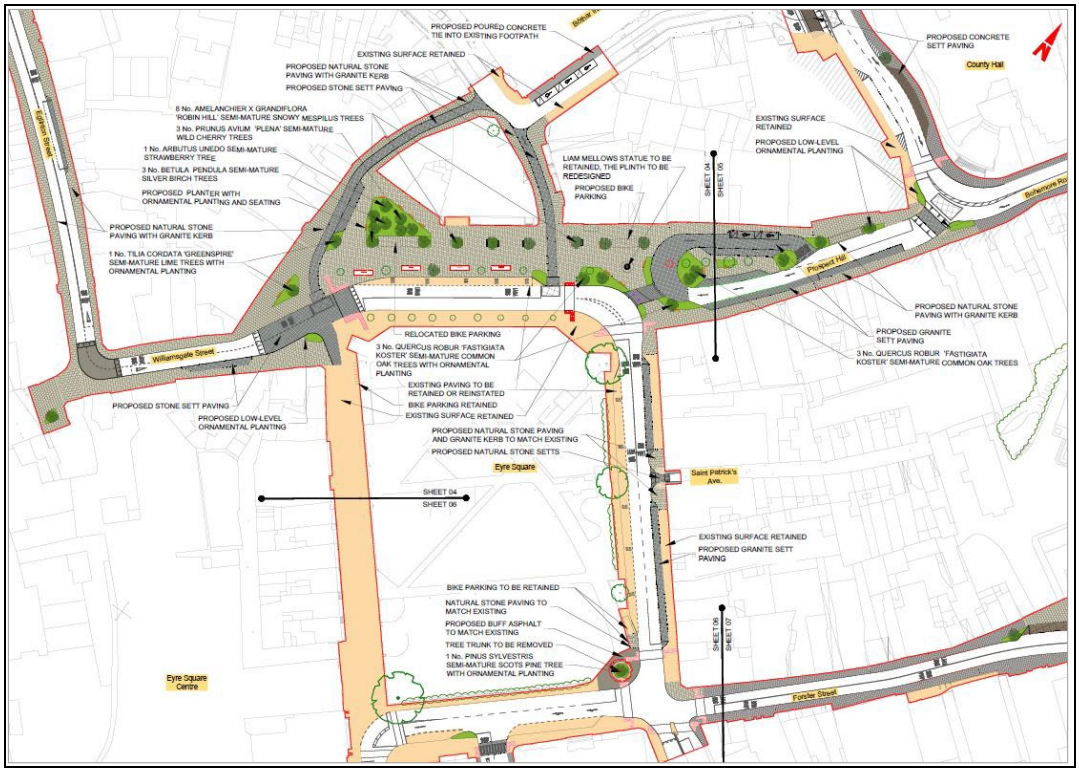


Diagram 4.17: Eyre Square

Diagram 4.18: Proposed view from Eyre Square

Diagram 4.19: Proposed view from R336 Prospect Hill

4.6.4.9 Structures

There are no structures proposed in this sub-section.

4.6.4.10 Land Use and Accommodation

This section includes Williamsgate Street, R866 Eyre Square North, R336 Eyre Square East and R339 Forster Street and it also incorporates sections of R336 Eyre Square South, R336 Prospect Hill, Rosemary Avenue, Eyre Street and Bothar Irwin.

This section of the scheme is zoned for city centre uses and this is reflected on the numerous retail units, hospitality offerings and offices located along this section. The only exceptions to this zoning are in the middle of Eyre Square (Kennedy Park) which is zoned as recreational and amenity and at the gateway to St. Patricks Church on R339 Forster Street, which is zoned as Community, Cultural and Institutional lands.

Permanent land takeis required through this section to facilitate the scheme, as not all lands are in the ownership or control of Galway City Council.

Permanent land take is required within this section to facilitate:

- Construction of a traffic signal-controlled junction at the exit from Ceannt Station.

4.6.5 Sub-Section 4 - R339 College Road (R339 Forster Street to Lough Atalia Road)

4.6.5.1 Overview

The interventions proposed are summarised as follows:

- Bus Gate to be provided on R339 College Road (between City Hall and R339 Forster Street);
- Footpaths to be widened;
- On-Street Parking to be rationalised;
- Entry Treatment at junctions;
- New Pedestrian crossings;
- New storm drainage network;
- Temporary land acquisition necessary to construct the Proposed Scheme.

4.6.5.2 Bus Lane Provision and General Vehicular Impacts

The proposed scheme will provide a bus gate on R339 College Road in order to restrict through-movement for vehicular traffic, whilst facilitating the movement of public transport vehicles directly to and from R339 Forster Street. This gate will permit local access to and from R339 College Road to be maintained for all vehicles, albeit only from one side or the other depending on the location along R339 College Road. For example, vehicular access to City Hall will be possible for all vehicles, but only from the Lough Atalia / Moneenageisha end of R339 College Road, while vehicle access to The Elms will be possible for all vehicles, but only from the Fairgreen Road / Bóthar Uí Eithir end of R339 College Road.

This proposal will ensure that the only vehicles on R339 College Road will be those with an origin or destination on R339 College Road and will remove this as a through route for general traffic, thereby removing the extensive queuing and delay experienced frequently on this route. Cyclist and bus priority will be achieved through the removal of general traffic.

The proposed bus gate will be a short section of bus lanes and controlled by traffic signals operating on a one-way shuttle system.

4.6.5.3 Bus Stops

The principles of bus route rationalisation, as stated in Section 4.5.4.4 were employed on this sub-section. Table 4.21 below states how existing bus stops shall be affected by the Proposed Scheme.

Table 4.21: Proposed changes to Bus Stops

Inbound/ Outbound	Bus Stop Name/No.	Bus Stop Type	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Westbound	College Road Galway (Opp City Hall) No. 523691	Inline	Opposite Galway City Council Entrance	Relocated	Bus Stop Pole Paper Timetable	Bus Shelter with Seating	Relocated due to installing of new pedestrian crossing
Westbound	College Road Stop ID 523231	Inline	Yeats College Gate	Retained	Bus Stop Pole Paper Timetable	Bus Shelter with Seating	N/A
Westbound	Connacht Rugby No. 523681	Inline	Opposite Connacht Rugby Main Entrance	Relocated	Bus Stop Pole Paper Timetable	Bus Shelter with Seating	Relocated due to reconfiguration of loading bay
Eastbound	Connacht Rugby No. 523241	Lay-by	Connacht Rugby 50m North East of Main Entrance	Retained	Bus Stop Pole Paper Timetable	Bus Shelter with Seating	N/A
Westbound	Loyola Park No. 523671	Inline	40m South West from Lough Atalia Road Junction	Removed	Bus Shelter Paper Timetable	N/A	Removed due to proximity to Connaught Rugby Stop
Eastbound	Loyola Park No. 523251	Inline	60m South West from Lough Atalia Road Junction	Removed	Bus Stop Pole Paper Timetable	N/A	Removed due to proximity to Connaught Rugby Stop

4.6.5.4 Cycling Provision

Virtual bus priority on R339 College Road will allow for safer and more efficient cycling in the inbound and outbound travel lanes, due to reduced traffic volumes. No segregated cycle tracks are proposed along this section of the scheme.

4.6.5.5 Pedestrian Provision

In conjunction with the provision of the bus gate, the scheme will also involve upgrading pedestrian footways and crossing points to improve the pedestrian accessibility to and along the route. This will include widening footways generally to at least 2.0m where possible, while ensuring the occurrence of narrower 'pinch-points' be kept to an absolute minimum. Pedestrian crossings will be installed in the vicinity of the Connacht Rugby sportsgrounds and in the vicinity of Yeats College (close to Galway City Hall). All footpaths on R339 College Road will be replaced with a concrete paving surface and granite kerbs.

4.6.5.6 Junctions

Table 4.22 (Signalised) and Table 4.23 (Non-Signalised) summarises the junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.22: Signalised Junctions

Name	Summary
R339 Forster Street/ Bóthar Uí Eithir / R339 College Road/Fairgreen Road	**Overview** Proposed Signal Controlled Crossroad Junction. The design rationale was to ensure buses will have priority at the junction and to reduce potential impacts on local access to Bóthar Uí Eithir, R339 College Road, Fairgreen Road, and surrounding areas. This is achieved using a mix of Full and Virtual Bus Priority. **Permitted Movements** Exiting R339 Forster Street, only buses can exit R339 Forster Street, the options are to turn left onto Bóthar Uí Eithir, right onto Fairgreen Road, or continue straight onto R339 College Road. Exiting Bóthar Uí Eithir, General traffic can go left onto R339 College Road, or continue straight onto Fairgreen road. Only Buses can turn right onto R339 Forster Street. Exiting R339 College Road, general traffic can go left onto Fairgreen Road or right onto Bóthar Uí Eithir. Only buses can continue straight onto R339 Forster Street. Exiting Fairgreen Road, general traffic can only go straight onto to Bóthar Uí Eithir, or turn right onto R339 College Road.
Bus Gate on R339 College Road	**Overview** Proposed Signal Controlled bus gate between Galway City Council Building and Snoozles Tourist Hostel. The design rationale was to ensure buses will have virtual priority on the road, and to reduce potential impacts on local access on R339 College Road and surrounding areas.

Table 4.23: Minor/Non-Signalised Junctions

Name	Summary
R339 Forster Street / The Elms	**Overview** Existing T-junction is to remain, with proposed raised table across access
R339 College Road / GCC Access	**Overview** Existing T-junction is to remain with proposed raised table across access
R339 College Road / Glenmore	**Overview** Existing T-junction is to remain with proposed raised table across access
R339 College Road / The Green	**Overview** Existing T-junction is to remain with proposed raised table across access
R339 College Road / Greyhound Stadium Access	**Overview** Existing T-junction is to remain with proposed raised table across access

4.6.5.7 Parking and Loading Bays

With the proposed scheme in place, there is an associated need to remove some parking space to provide improved facilities for pedestrians, cyclists, and buses – which inevitably requires some reallocation of parking road space. The proposed changes in parking and loading provision along the Cross-City Link are summarised in Table 4.24 and Table 4.25.

Table 4.24: Summary of Parking Changes

Location	Baseline		Proposed		Change
	Corridor	Adjacent	Corridor	Adjacent	
R339 College Road (R339 Forster Street to Lough Atalia Road)	64	90	46	90	-18

Table 4.25: Summary of Loading Changes

Location	Loading Bays		Change
	Baseline	Proposed	
R339 College Road (R339 Forster Street to Lough Atalia Road)	4	2	-2

4.6.5.8 Landscape Design

Landscape designs along this section primarily comprise of footpath replacement and the provision of street trees. Footpaths will be replaced with higher quality materials, with concrete paving slabs proposed along R339 College Road.

Full details of the landscape proposals are set out in Drawings BCG-LA-00-07/08/09.

4.6.5.9 Structures

There are no structures proposed in this sub-section.

4.6.5.10 Land Use and Accommodation

This section includes R339 College Road, from R339 Forster Street to its junction with Lough Atalia Road. This section of the scheme includes residential lands along R339 College Road, recreational and amenity lands at the Sportsground and Community, Cultural and institutional lands at the Magdalen Convent.

Permanent and temporary land take is required through this section to facilitate the scheme, as not all lands are in the ownership or control of Galway City Council.

In order to construct the Proposed Scheme, permanent and temporary land take is required within this section at the following locations:

- Footpath reconfiguration at raised table entry treatment at Galway Coach Station;
- Raised table entry treatment at the entrance to Glenmore

In addition to this land acquisition the Proposed Scheme will require the acquisition or restriction or otherwise interference, either temporary or permanent to private rights associated with the land acquisition at the following locations:

- Entrance to Glenmore

4.6.6 Sub-Section 5 - R339 College Road (Lough Atalia Road to Moneenageisha Junction)

4.6.6.1 Overview

The interventions proposed are summarised as follows:

- Realignment of the R339 College Road / Lough Atalia Road junction;
- R339 College Road, between Lough Atalia Road and Moneenageisha Road to be widened to provide an additional inbound segregated cycle track and an outbound bus lane;
- Major amendments to Moneenageisha and Lough Atalia junctions;
- Landscaping design at new green space at R339 College Road / Lough Atalia Road junction;
- Removal of underground fuel tanks;
- Construction of a retaining wall;
- Tree removal;
- New drainage network;

- Permanent and temporary land and acquisition necessary to construct the Proposed Scheme.

4.6.6.2 Bus Lane Provision and General Vehicular Impacts

The scheme proposes the provision of an outbound bus lane on R339 College Road between Lough Atalia Road and Moneenageisha junction, and an inbound segregated cycle track between Moneenageisha junction and the Lough Atalia Road junction. This will be facilitated through road widening and land acquisition on the western side of the road.

Inbound, a single traffic lane is proposed which will then flare locally to provide right-turning facilities to Loyola Park and R339 College Road. The scheme also includes the provision of an inbound, raised adjacent cycle track from Moneenageisha junction to R339 College Road/Lough Atalia Road junction.

4.6.6.3 Bus Stops

There are no existing or proposed bus stops in this sub-section.

4.6.6.4 Cycling Provision

An inbound, raised adjacent cycle lane is proposed on the southern side of R339 College Road between the junction at Moneenageisha and the junction at Lough Atalia Road.

In the outbound direction, cyclist can use the proposed bus lane, which will enable safer and more efficient cycling in the inbound and outbound directions.

4.6.6.5 Junction Information

Modifications to R339 College Road/Lough Atalia Road Junction

Due to the proposed restriction on R339 College Road to through-traffic, at the junction with Lough Atalia Road it is therefore necessary to permit a right-turn manoeuvre from R339 College Road to Lough Atalia to allow traffic exiting R339 College Road at the eastern end to subsequently route back towards the city centre via Lough Atalia Road. It is proposed to realign the junction of R339 College Road and Lough Atalia Road, to a formal T-junction (with R339 College Road forming the minor arm and Lough Atalia Road forming the major arm).

The junction will be signalised, with pedestrian crossings across the R339 College Road arm of the junction and a toucan crossing across Lough Atalia Road on the southern side of the junction. The currently signalised Loyola Park leg of the existing junction will be converted into a priority-controlled junction with a raised table, located apart from the signalised junction.

The realignment of the junction will primarily be through the existing green space located between Lough Atalia Road and R339 College Road, and two new replacement green spaces will be formed and landscaped.

Modifications to Moneenageisha Junction

A new toucan crossing on the R339 College Road arm is proposed, which will complement the proposed cycle track along R338 Dublin Road. At the location of the proposed toucan crossing, a new bus priority signal is proposed, to allow outbound buses to turn right on to the R338 Dublin Road bus lane or to continue straight to Wellpark Road.

On the Wellpark Road approach to the junction, the left slip lane and island is also proposed to be removed, and the exit from the junction widened to facilitate the outbound bus lane on R338 Dublin Road.

On the Moneenageisha Road approach to the junction, the right turn movement from Moneenageisha Road to R339 College Road is proposed to be reinstated to facilitate movement on the City Centre Access Network.

The scheme will require the removal of existing mature trees within Moneenageisha Court, Gleann Noinin, and in the existing green area between R339 College Road and Lough Atalia Road.

4.6.6.6 Junctions

Table 4.26 (Signalised) and Table 4.27 (Non-Signalised) summarises the junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.26: Signalised Junctions

Name	Summary
Lough Atalia Road / R339 College Road	**Overview** Proposed Signal Controlled Cross Intersection Junction. The design rationale was to ensure buses will have more priority at the junction and to reduce potential impacts on local access to R339 College Road, Lough Atalia Road, and surrounding areas. **Permitted Movements** Exiting R339 College Road, general traffic can turn either left or right onto Lough Atalia Road. Buses have the option of turning left onto a bus lane on R339 College Road (outbound direction). Exiting Lough Atalia Road, cars can continue straight on to R339 College Road (towards Moneenageisha) or turn left onto R339 College Road towards the City Centre for local access. R339 College Road inbound, cars can continue straight on to Lough Atalia Road, or turn right onto R339 College Road for local access.
Moneenageisha Road / R338 Dublin Road / Wellpark Road / Lough Atalia Road	**Overview** Proposed Signal Controlled Crossroad Junction. The design rationale was to ensure buses will have more priority at the junction., cyclists and pedestrians will have safer facilities and reinstate movement along the City Centre Access Network. **Permitted Movements** Exiting Moneenageisha Road, general traffic can continue straight on to R338 Dublin Road, turn left onto Wellpark Road, or turn

	right onto R339 College Road. The right turn movement is a new addition to this junction. Exiting R338 Dublin Road, general traffic can continue straight onto Moneenageisha Road, or turn left on to Lough Atalia Road. This exit contains full bus priority with a bus priority signal. Exiting Wellpark Road, general traffic can turn left onto R338 Dublin Road, turn right onto Moneenageisha Road, or continue straight onto R339 College Road. Exiting R339 College Road, general traffic can turn left onto Moneenageisha Road, turn right onto R338 Dublin Road, or continues straight onto Wellpark Road. This exit contains full bus priority with a bus priority signal.

Table 4.27: Minor/Non-Signalised Junctions

Name	Summary
R339 College Road / Loyola Park	**Overview** Existing T-junction is to become non-signalised, with proposed raised table across access
R339 College Road / Gleann Nóinín	**Overview** Existing T-junction is to remain with proposed raised table across access

4.6.6.7 Parking and Loading Bays

No on-street parking or loading bays are present in this sub-section of the proposed scheme.

Works required within the Moneenageisha Court residential development, due to the widening of College Road, will result in the relocation of 7 no. existing parking spaces to an alternative location within the development, located in the north western corner. No nett change in the number of parking spaces is proposed in Moneenageisha Court. The proposed widening of College Road will result in the removal of 6 no. existing parking spaces within the Gleann Noinin residential development, the removal of 4 no. existing parking spaces within the Circle K petrol station and the removal of 5 no. existing parking spaces within the Bayview B&B along College Road.

4.6.6.8 Landscape Design

R339 College Road and Lough Atalia Road Junction

The R339 College Road and Lough Atalia Road junction rationalisation presents a public realm improvement opportunity that will enhance pedestrian amenity and public realm.

The redesigning of the junction will require localised boundary realignments including the removal of some boundaries and street trees however, the proposals include for provision of additional landscaping and tree planting.

New hard and soft landscaping with outdoor seating will be introduced to enhance the presentation, amenity and biodiversity value of the junction and to create a more pedestrian friendly and distinctive character.

Full details of the landscape proposals are set out in Drawings BCG-LA-00-09/10, with extracts for illustration provided in Diagram 4.20 and Diagram 4.23 and photomontage views in Diagram 4.21 and Diagram 4.22.

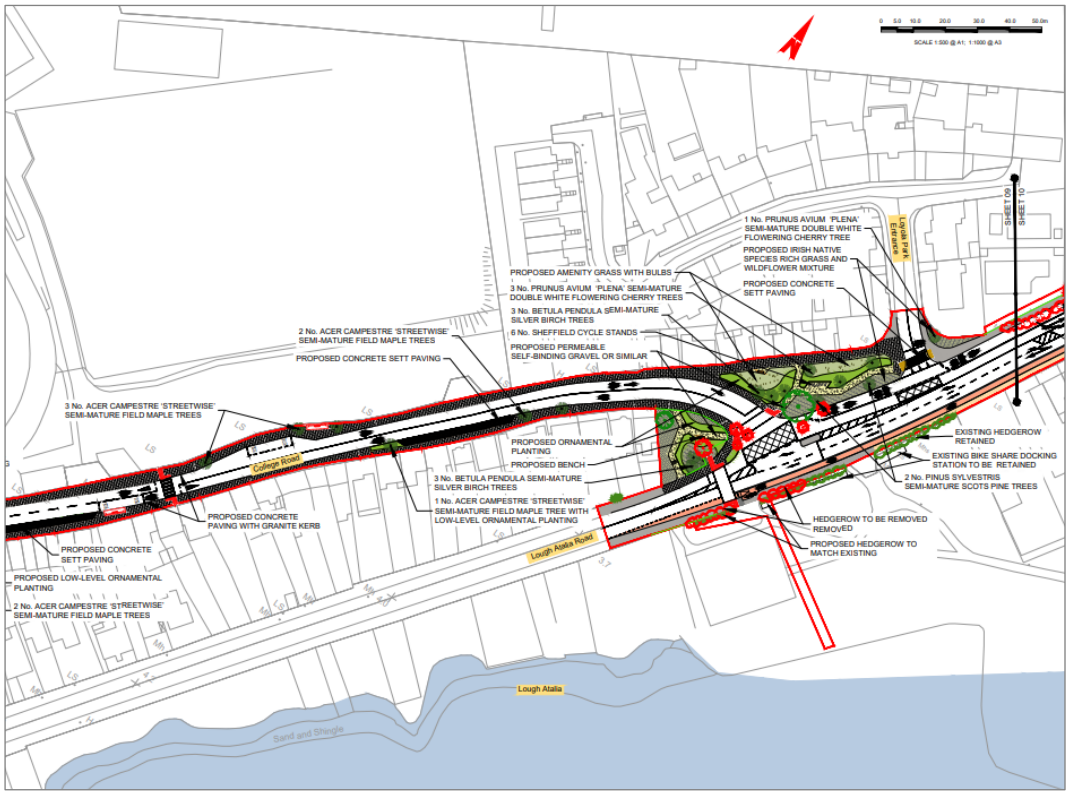


Diagram 4.20: R339 College Road and Lough Atalia Road Junction

Diagram 4.21: Proposed view from R339 College Road/Lough Atalia Road

R339 College Road

The proposal requires felling of the existing trees in front of Moneenageisha Court on R339 College Road. Existing boundary wall and trees will be removed in this location and new boundary wall to match existing will be constructed along proposed road widening with climbing vegetation planted on Moneenageisha Court side of wall.

Diagram 4.22 : Proposed view from R339 College Road

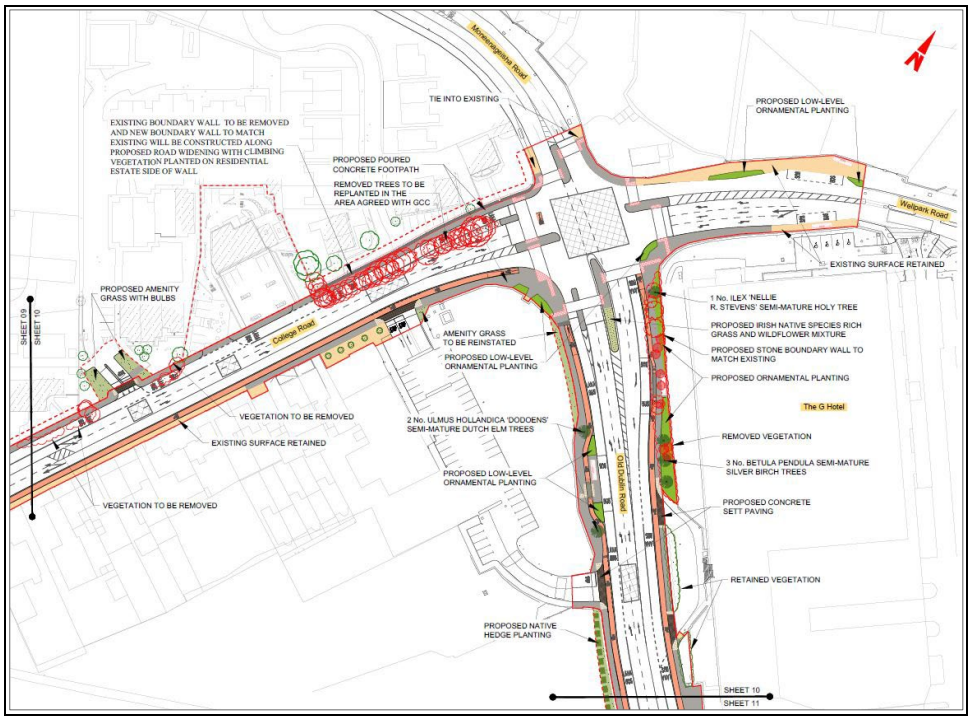


Diagram 4.23 : R339 College Road and R338 Dublin Road Junction

4.6.6.9 Structures

One retaining wall (RW01) is proposed in this sub-section.

A cantilever, reinforced concrete wall of length 78.1m, and of approximate maximum height 2.3m, is proposed at the frontage of 21-25 Moneenageisha Court and the Bayview House B&B, up to the Moneenageisha Junction. The wall is required to overcome site grading challenges and minimize land acquisition needs.

4.6.6.10 Land Use and Accommodation

This section of the proposed scheme includes R339 College Road, from its junction with Lough Atalia Road to its junction with R338 Dublin Road at Moneenageisha. This section of the scheme includes residential lands along R339 College Road, Enterprise, Light Industry and Commercial Lands at Circle K and the Huntsman Inn and recreational and amenity lands at the green area to the front of the Huntsman Inn.

In order to construct the Proposed Scheme, permanent and temporary land take is required within this section at the following locations:

- College Road/ Lough Atalia Road junction to facilitate realignment of junction;
- Green space at Lough Atalia Road to facilitate the installation of a replacement drainage pipe to Lough Atalia;
- 139 College Road to facilitate the widening of R339 College Road;
- Gleann Noinin to facilitate the widening of R339 College Road and raised entry treatment;

- Circle K to facilitate the widening of R339 College Road;
- Moneenageisha Court to facilitate the widening of R339 College Road;
- Bay View B&B to facilitate the widening of R339 College Road;
- The Huntsman Inn to facilitate the raised table entry treatment at the entrance.

In addition to this land acquisition the Proposed Scheme will require the acquisition or restriction or otherwise interference, either temporary or permanent to private rights associated with the land acquisition at the following location:

- Entrance to The Huntsman Inn.

4.6.7 Sub-Section 6 - R338 Dublin Road

4.6.7.1 Overview

The interventions proposed are summarised as follows:

- R338 Dublin Road, to be widened between Brothers of Charity and The Huntsman Inn entrance;
- A bus lane to be provided in both directions;
- A segregated cycle track to be provided in both directions;
- New footpaths to be provided on both sides of the road;
- 1 no. outbound general traffic lane to be provided. 1 no. inbound traffic lane, widening to two lanes on approach to the Moneenageisa Junction to be provided;
- New pedestrian crossing at Wellpark Retail Park;
- Widening of existing pedestrian and cycle track adjacent to Lough Atalia;
- Removal of half of an existing advertising billboard.

4.6.7.2 Bus Lane Provision and General Vehicular Impacts

R338 Dublin Road, between the Moneenageisha junction and the end of the proposed scheme at the entrance to the Brothers of Charity, is to be realigned and widened in order to provide a continuous bus lane in both directions, a segregated cycle track in both directions, a reconstructed footway in both directions and a general traffic lane in both directions.

The inbound general traffic lane flares to two lanes to the immediate west of the Wellpark Retail Park entrance. One of these lanes is proposed as a straight-ahead lane to Moneenageisha Road while the other is proposed as a left turn lane to R339 College Road. The existing right turn lanes on the R338 Dublin Road into the Wellpark Retail Park and to Wellpark Road at the Moneenageisha junction are to be removed. At the Moneenageisha Junction a bus priority signal is proposed on the inbound bus lane to provide priority for buses entering the junction.

The outbound bus lane will begin at the Moneenageisha junction, fully separate from the general traffic lanes. To provide adequate access and interchange opportunity, 3 no. new bus stops, 2 outbound and 1 inbound are proposed, with associated bus shelters.

4.6.7.3 Bus Stops

The principles of bus route rationalisation, as stated in Section 4.5.4.4 were employed on this sub-section. Table 4.28 below states how existing bus stops shall be affected by the Proposed Scheme.

Table 4.28: Proposed changes to Bus Stops

Inbound/ Outbound	Bus Stop Name/No.	Bus Stop Type	Location	Retained/ Relocated / Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Westbound	Dublin Road (Opp G Hotel) No. 522971	Island	30m North West of Huntsman Inn Entrance	Retained	Bus Shelter Paper Timetable	Bus Shelter with Seating	N/A
Eastbound	Dublin Road (G Hotel) No. 522691	Shared Landing	60m North West of G Hotel Entrance	Relocated	Bus Shelter Paper Timetable	Bus Shelter with Seating	Relocated to improve interchange opportunity
Eastbound	Dublin Road (Eye Cinema)	Island	80m West of Wellpark Shopping Centre Entrance on Dublin Road	New	N/A	Bus Shelter with Seating	Access to Wellpark Grove and Brothers of Charity
Westbound	Wellpark Retail No. 523661	Inline	Opposite Galway Community College Main Gate	Relocated	Bus Shelter with Seating Paper Timetable	Bus Shelter with Seating	Relocated to improve interchange opportunity
Eastbound	Galway Community College No. 533261	Lay-by	Outside Galway Community College Main Gate	Retained	Bus Shelter with Seating Paper Timetable	Bus Shelter with Seating	N/A

4.6.7.4 Cycling Provision

Inbound and outbound raised adjacent segregated cycle tracks are proposed alongside the proposed bus lanes. Cycle facilities will require localised treatments at accesses to the Huntsman and to the G Hotel. The proposed bus lanes and cycle lanes will tie back into the existing R338 Dublin Road alignment approximately 320m east of the junction at Moneenageisha.

4.6.7.5 Pedestrian Provision

A new toucan crossing, to the west of the entrance to the Wellpark Retail Park is proposed, connecting the Lough Atalia Pathway and the Retail Centre.

4.6.7.6 Junctions

No signalised junctions are proposed or modified as part of the Proposed Scheme in this sub-section with the exception of the Moneenageisha Junction described in Section 4.6.6.6.

Table 4.29 summarises the non-signalised junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.29: Minor/Non-Signalised Junctions

Name	Summary
R338 Dublin Road / Sáilín (Wellpark Retail)	**Overview** Existing T-junction is to remain with proposed raised table across access

4.6.7.7 Parking and Loading Bays

No parking or loading bays are present or proposed in this scheme sub-section.

4.6.7.8 Landscape Design

The proposed road widening shall also impact on existing landscaping and stone boundary wall to front of the G Hotel on R338 Dublin Road. The existing stone boundary wall to be reinstated on the new setback boundary wall and landscaping reinstated wherever possible.

Full details of the landscape proposals are set out in Drawings BCG-LA-00-10/11, with photomontage illustration provided in Diagram 4.24.

Diagram 4.24: Proposed view from R338 Dublin Road

4.6.7.9 Structures

One minor retaining wall (RW02) is proposed in this sub-section.

A cantilever, reinforced concrete wall of length 38.6m, and of approximate maximum height 2.1m, is proposed on the south side of R338 Dublin Road, where the proposed toucan crossing to Wellpark Retail Park is situated. The wall is required to overcome site grading challenges and minimize land acquisition needs.

Along the Lough Atalia pathway widening, to avoid encroachment into the SPA boundary, it is proposed to retain the existing stone wall/embankment by constructing a mass concrete gravity wall in behind it.

4.6.7.10 Land Use and Accommodation

The Proposed Scheme in this section includes the R338 Dublin Road from Moneenaeisha junction to the end of the proposed corridor at the entrance to the Brothers of Charity. This section of the scheme includes Enterprise, Light Industry and Commercial Lands at the Huntsman Inn the G Hotel / Wellpark Retail Park, residential zoned lands at Sáilín, Community, Cultural and institutional lands at the Brothers of Charity and recreational and amenity lands at the green areas along the remainder of the R338 Dublin Road.

In order to construct the Proposed Scheme, permanent and temporary land take is required within this section at the following locations:

- Huntsman Inn to facilitate the widening of R338 Dublin Road and raised table entry treatment at entrance;

- Green area along R338 Dublin Road to facilitate the widening of R338 Dublin Road including the area containing an existing billboard, including removal of 6m of existing billboard;
- Brothers of Charity to facilitate the widening of R338 Dublin Road;
- Wellpark Retail Park to facilitate the raised table entry treatment at the entrance.

In addition to this land acquisition the Proposed Scheme will require the acquisition or restriction or otherwise interference, either temporary or permanent to private rights associated with the land acquisition at the following location:

- Entrance to The Huntsman Inn

4.6.8 Sub-Section 7 - Fairgreen Road

4.6.8.1 Overview

The interventions proposed are summarised as follows:

- Footpath replacement;
- New controlled pedestrian crossing;
- Entry Treatments at entrances.

4.6.8.2 Bus Lane Provision and General Vehicular Impacts

The exiting two-way vehicle operation of Fairgreen Road is proposed to be retained. As Fairgreen Road intersects with the Cross-City Link at R339 Forster Street and R339 College Road, access onto the Cross-City Link will not be required for most traffic. The length of the right turn lane from Fairgreen Road to R339 College Road is proposed to be reduced and the left slip lane from Fairgreen Road onto R339 Forster Street will be removed.

Existing set-down areas in front of Galway Coach Station are proposed to be realigned and retained. The existing taxi rank is also proposed to be retained together with the loading bay on Fairgreen Road.

4.6.8.3 Bus Stops

There are no existing or proposed bus stops in this sub-section.

4.6.8.4 Cycling Provision

Amendments to cycle infrastructure are not proposed along this sub-section.

4.6.8.5 Pedestrian Provision

Entrances to the Galmont Hotel, Ceannt Station and Fairgreen House car park are proposed to be realigned with tighter radii and raised entry treatment provided. Concrete sett paving is proposed across the exit from Galway Coach Station.

All footpaths on Fairgreen Road will be replaced with a concrete paving surface and granite kerbs. A new controlled pedestrian crossing is proposed in front of Fairgreen House, connecting Ceannt Station and Galway Coach Station.

4.6.8.6 Junctions

No signalised junctions are proposed or modified as part of the Proposed Scheme in this sub-section.

Table 4.30 summarises the non-signalised junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.30: Minor/Non-Signalised Junctions

Name	Summary
Fairgreen Road / Station Road	**Overview** Existing T-junction is to remain with a proposed raised table across the access.

4.6.8.7 Parking and Loading Bays

The proposed changes in parking and loading provision along the Inner-City Access Network on Fairgreen Road are summarised in Table 4.31 and Table 4.32.

Table 4.31: Summary of Parking Changes

Location	Baseline		Proposed		Change
	Corridor	Adjacent	Corridor	Adjacent	
Fairgreen Road	7	858	0	858	-7

Table 4.32: Summary of Loading Changes

Location	Loading Bays		Change
	Baseline	Proposed	
Fairgreen Road	5	5	0

4.6.8.8 Landscape Design

The Fairgreen Road and R339 Forster Street junction will be rationalised, and this provides an opportunity to improve the public realm and urban space for pedestrians. Some of the existing slip lanes will be removed and the existing car parking layout reorganized to provide opportunities to further develop the public realm and to substantially improve pedestrian and cycle facility throughout the junction. The enlarged civic plaza to the north of the junction will incorporate high quality hard and soft landscaping which will establish a distinctive landscape character at the junction that will become a new gateway landmark.

Low level shrub planting will provide a buffer between pedestrians and the junction and new trees, ornamental planting and high-quality paving will provide an attractive public space. Refer to Diagram 4.25 and photomontage view Diagram 4.26.

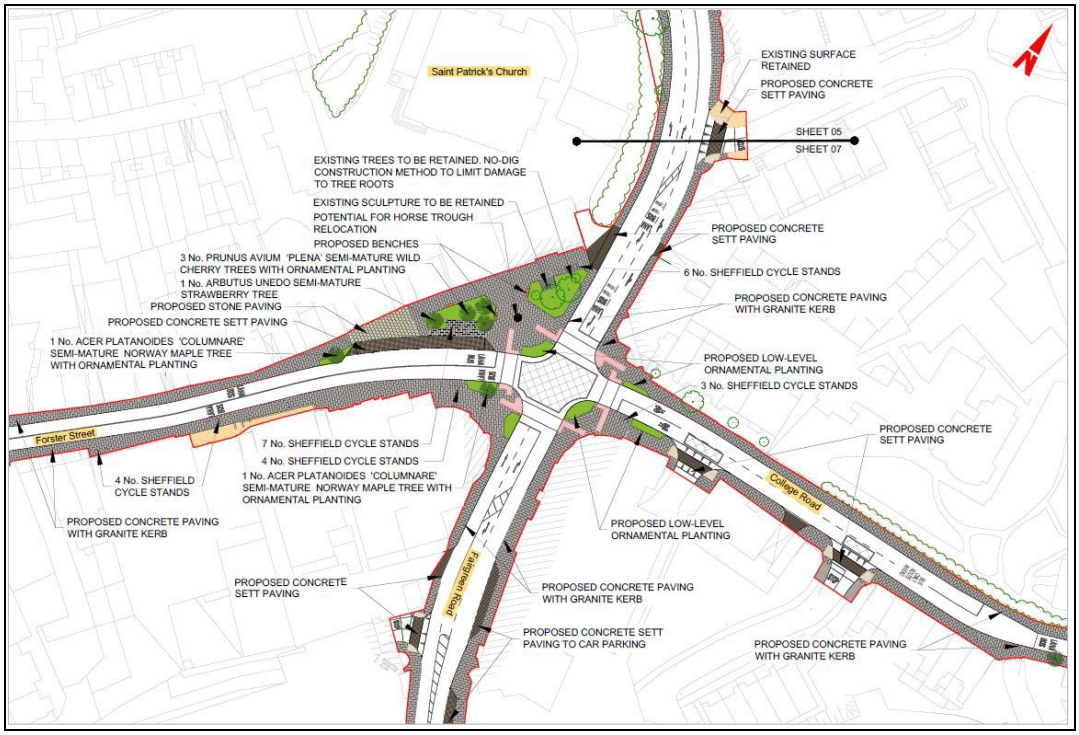


Diagram 4.25 : Fairgreen Road and R339 Forster Street Junction

Diagram 4.26: Proposed view from Foster Street

4.6.8.9 Structures

There are no structures proposed in this sub-section.

4.6.8.10 Land Use and Accommodation

The Inner-City Access Route section of the Proposed Scheme includes this section of Fairgreen Road between its junction with Lough Atalia Road and its junction with R339 Forster Street. This street is entirely zoned for City Centre uses and currently has development including a coach station, car-parks, hotel and office development.

Permanent and temporary take is required through this section to facilitate the scheme, as not all lands are in the ownership or control of Galway City Council.

In order to construct the Proposed Scheme, permanent and temporary land take is required within this section at the following locations:

- The entrance to the Galmont Hotel to facilitate the construction of a raised table entry treatment;
- The front of the Galmont Hotel to facilitate the reconstruction of the public road and footpaths;
- The entrance to Fairgreen House to facilitate a raised table entry treatment
- Galway Coach Station to facilitate alterations and reconstruction of footpaths;
- Along Fairgreen Road to facilitate the alterations and reconstruction of road, footpaths, raised table entry treatment and pedestrian crossings;
- At the entrance to the Galmont Hotel, adjacent to Geata Na Cathrach to facilitate the footpath works to tie in with raised table entry treatment.

In addition to this land acquisition the Proposed Scheme will require the acquisition or restriction or otherwise interference, either temporary or permanent to private rights associated with the land acquisition at the following:

- Fairgreen Road at entrance to Galmont Hotel;
- At the entrance to Fairgreen House;
- Fairgreen Road, between Lough Atalia Road and entrance to Galmont Hotel.

4.6.9 Sub-Section 8 - Bóthar Uí hEithir and R336 Prospect Hill

4.6.9.1 Overview

The interventions proposed are summarised as follows:

- Bóthar Uí Eithir and R336 Prospect Hill to be converted to two-way streets;
- Junction of Bóthar Uí Eithir and R336 Prospect Hill to be signalised;
- Footpath to be widened.

4.6.9.2 Bus Lane Provision and General Vehicular Impacts

Due to the creating of a two-way route along the Cross-City Link on R336 Eyre Square East and R339 Forster Street, the current one-way circulatory system around Bóthar Uí Eithir, R339 Forster Street, R336 Eyre Square East and R336 Prospect Hill will no longer be operational. In order to main access along the Inner-City Access Route, Bóthar Uí Eithir and R336 Prospect Hill (between Bothar na mBan and Bohermore) will both become two-way streets for all traffic. On Bóthar Uí Eithir, the existing 3 lanes width will be maintained. From the entrance to the Forster Court residential development to the junction with R336 Prospect Hill, there will be two traffic lanes travelling towards R336 Prospect Hill and one traffic lane travelling towards Fairgreen Road. From the entrance to Forster Court residential development to the junction with Fairgreen Road, there will be one traffic lane travelling towards R336 Prospect Hill, one traffic lane travelling towards Fairgreen Road and one bus lane travelling towards Fairgreen Road. This bus lane will be a right turn lane towards R339 Forster Street, as this facilitates permitted vehicles to enter onto the Cross-City Link.

The junction of Bóthar Uí Eithir, R336 Prospect Hill and Bohermore will be signalised with controlled pedestrian crossings on all arms of the junction. A left turn and right turn lane are proposed on the Bóthar Uí Eithir approach to the junction while a single lane approach is proposed from both Bohermore and R336 Prospect Hill.

4.6.9.3 Bus Stops

The principles of bus route rationalisation, as stated in Section 4.5.4.4 were employed on this sub-section. Table 4.33 below states the how existing bus stops shall be affected by the Proposed Scheme.

Table 4.33: Proposed changes to Bus Stops

Inbound/ Outbound	Bus Stop Name/No.	Bus Stop Type	Location	Retained/ Relocated / Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Westbound	Bóthar Uí Eithir	Inline	Outside Salon de Beauté	Removed	Bus stop pole paper timetable	Bus shelter with seating	Removed as bus stop is now obsolete

4.6.9.4 Cycling Provision

It is proposed to relocate the existing Bike Share station from its current location on R336 Prospect Hill to a location within the central island of this area. No segregated cycle lanes are to be provided.

Cyclists turning right onto R339 Forster Street from Bothár Uí Eithir can use the bus lane, to access R339 Forster Street. No segregated cycle lanes are to proposed along this section of the scheme.

4.6.9.5 Pedestrian Provision

The existing footpath on the western side of Bóthar Uí Eithir will be widened between the Forster Court entrance and R336 Prospect Hill. An entry treatment is proposed across the entrance to the Forster Court residential development and new concrete sett paving proposed across the existing entrance to St. Patrick's Church.

A proposed controlled pedestrian crossing is situated at the R336 Prospect Hill end of Bóthar Uí Eithir, in front of County Hall.

4.6.9.6 Junctions

Table 4.34 (Signalised) and Table 4.35 (Non-Signalised) summarises the junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.34: Signalised Junctions

Name	Summary
Bohermore Road, Bóthar Uí Eithir	**Overview** Proposed Signal Controlled 3-arm Junction. **Permitted Movements** Exiting R336 Prospect Hill, general traffic can continue straight on to Bohermore Road on or turn right onto Bóthar Uí Eithir. Exiting Bohermore Road, general traffic can continue straight on to R336 Prospect Hill or turn left onto Bóthar Uí Eithir. Exiting Bóthar Uí Eithir, general traffic can turn either left or right onto R336 Prospect Hill or Bohermore Road.

Table 4.35: Minor/Non-Signalised Junctions

Name	Summary
Bóthar Uí Eithir / Forster Court	**Overview** Existing T-junction is to remain with proposed raised table across access.

4.6.9.7 Parking and Loading Bays

There are no existing or proposed parking and loading bays along this sub-section of the proposed scheme.

4.6.9.8 Landscape Design

Landscape designs along this section primarily comprise of footpath replacement and the provision of street trees. Footpaths will be replaced with higher quality materials, with concrete paving slabs and granite kerbs proposed along Bóthar Uí hEithir and R336 Prospect Hill.

Full details of the landscape proposals are set out in Drawings BCG-LA-00-04/05/07.

4.6.9.9 Structures

There are no structures proposed in this sub-section.

4.6.9.10 Land Use and Accommodation

This section of the Inner-City Access Route includes R336 Prospect Hill and Bóthar Uí hEithir. The R336 Prospect Hill section and a partial section of Bóthar Uí hEithir are zoned for City Centre uses. St. Patrick's Church, which fronts onto Bóthar Uí hEithir is zoned for Community, Cultural and institutional lands. The corner of Bóthar Uí hEithir with Bohermore is zoned for Enterprise, Light Industry and Commercial use while the corner of Bóthar Uí hEithir and R339 College Road has a residential use designation.

No land take is required through this section to facilitate the scheme, as all lands are in the ownership or control of Galway City Council.

4.6.10 Sub-Section 9 - Bóthar na mBan / St. Brendan's Avenue / R866 Headford Road / Dyke Road

4.6.10.1 Overview

The interventions proposed are summarised as follows:

- Installation of a new footpath;
- Widening of an existing footpath;
- Acquisition and demolition of 2 no. residential properties and the adjoining laneway;
- New controlled pedestrian crossing;
- Entry treatments;
- Creation of a one-way circulatory around Dyke Road and Headford Road;
- Installation of a new two-way cycle track along Dyke Road.

4.6.10.2 Bus Lane Provision and General Vehicular Impacts

Bóthar na mBan, which forms part of the Inner-City Access Route, is proposed to be retained as a two-way street for all vehicles. At its junction with R336 Prospect Hill, the road will be realigned in order to make the Inner-City Access Route as the priority route.

As Bóthar na mBan approaches the Headford Road, the street becomes St. Brendan's Avenue. At its junction with Headford Road, all traffic will be required to continue straight ahead onto Dyke Road or turn left towards Woodquay.

The existing alignment of Bóthar na mBan / St. Brendan's Avenue as it approaches Headford Road, has a 'swan-neck' arrangement as is travels past St. Brendan's Avenue junction, with a sharp right turn followed by a sharp left turn alignment. Between St. Brendan's Avenue and Headford there is a narrow footpath on the eastern side of 1.2m width, which is further restricted due to the presence of utility poles, leaving a passable width of 600m along the footpath. On the western side of the road, there is also an existing 1.2m wide footpath, however, this path is discontinuous, whereby over a distance of approximately 23m, there is no footpath present.

This section of Bóthar na mBan / St. Brendan's Avenue has residential properties directly fronting both sides of the road, with 2 no. residential properties on the western side and 5 no. residential properties on the eastern side. The overall cross-section of this portion of Bóthar na mBan / St. Brendan's Avenue is approximately 8.1m.

4.6.10.3 Bus Stops

There are no existing or proposed bus stops in this sub-section.

4.6.10.4 Cycling Provision

Full bus priority on the section of Headford Road will enable safer and more efficient cycling in the inbound and outbound, due to traffic calming effects.

Dyke Road (northbound section) contains a segregated two-way cycle track, catering for both inbound and outbound routes.

4.6.10.5 Pedestrian Provision

The scheme proposes to provide a continuous footpath of minimum 2.0m width on both sides of the road.

Raised entry treatments are proposed across the junctions with Bothar Irwin and St. Brendan's Avenue and stone sett paving is proposed across the entrance to the Corrib Shopping Centre car park.

4.6.10.6 Junctions

Table 4.36 (Signalised) and Table 4.37 (Non-Signalised) summarises the junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.36: Signalised Junctions

Name	Summary
St. Brendans Avenue / Headford Road / Dyke Road	**Overview** Existing Signal Controlled Crossroad Junction. The design rationale was to ensure buses on the Headford Road will have more priority at the junction while improving pedestrian safety and vehicle movement along the ICAN. **Permitted Movements** Exiting St. Brendan's Avenue traffic must continue straight on to Dyke Road or turn left towards Woodquay. Existing Woodquay, traffic must turn left onto Dyke Road, except buses which can continue straight onto Headford Road. Exiting Headford Road, traffic can turn left onto St. Brendan's Avenue, continue straight towards Woodquay or turn right onto Dyke Road.
Dyke Road / Dyke Road	**Overview** Proposed Signal Controlled T Intersection Junction. **Permitted Movements** Exiting Dyke Road (northbound), cyclists have priority as their lane allows them pass traffic and have priority when the lights change. General traffic has the option to continue straight on or turn right onto Dyke Road (Eastbound). Exiting Dyke Road (southbound), cyclists have the option to turn left onto Dyke Road (Eastbound) or continue straight onto a contraflow cycle lane on Dyke Road (southbound). General traffic must turn left onto Dyke Road (Eastbound).
Dyke Road / Headford Road / St. Bridget's Place	**Overview** Proposed Signal Controlled Crossroad Junction. The design rationale was to ensure buses will have more priority at the junction and to reduce potential impacts on local access to Dyke Road and St. Bridgets Place and surrounding areas. **Permitted Movements** Exiting Dyke Road general traffic and turn either left or right onto Headford Road. Exiting Headford Road general traffic can continue straight on, or turn left onto St. Bridgets Place. Buses can avail of bus lane on Headford Road. Exiting St. Bridget's Place, general traffic must turn left only.

Table 4.37: Minor/Non-Signalised Junctions

Name	Summary
Bóthar na mBan / Bóthar Irwin	**Overview** Existing T-junction is to remain with proposed road table across the minor arm
Bóthar na mBan / St. Brendans Avenue	**Overview** Existing T-junction is to remain with proposed road table across the minor arm
Dyke Road / The Plots	**Overview** Existing T-junction is to remain proposed road table across the access

4.6.10.7 Parking and Loading Bays

The proposed changes in parking and loading provision along this section of the Inner-City Access Route are summarised in Table 4.38 and Table 4.39 below:

Table 4.38: Summary of Parking Changes

Location	Baseline		Proposed		Change
	Corridor	Adjacent	Corridor	Adjacent	
Headford Road (St. Bridget's Place to St. Brendan's Avenue)	2	106	0	106	-2
Dyke Road Car-Park	510	0	500	0	-10
St. Brendan's Avenue	48	106	46	106	-2

Table 4.39: Summary of Loading Changes

Location	Loading Bays		Change
	Baseline	Proposed	
Bothar na mBan	3	3	0

4.6.10.8 Landscape Design

Landscape designs along this section primarily comprise of footpath replacement and the provision of street trees. Footpaths will be replaced with higher quality materials, with concrete paving slabs and granite kerbs proposed along Bothar na mBan, St. Brendan's Avenue and Headford Road. At the junction of St. Brendan's Avenue and Headford Road a planted area with trees, ornamental planting and a bench is proposed utilising residual land from property demolition.

Full details of the landscape proposals are set out in Drawings BCG-LA-00-03/05.

4.6.10.9 Structures

There are no structures proposed in this sub-section. Two residential properties are proposed to be acquired and demolished to facilitate improvements to the Inner-City Access Route.

4.6.10.10 Land Use and Accommodation

The Inner-City Access Route section of the Proposed Scheme proposes alterations to the existing street network on Bothar na mBan and St. Brendan's Avenue. St. Brendan's Avenue and a small section of Bothar na mBan are residential development. The remainder of Bothar na mBan is zoned for city centre uses and is currently developed with County Hall and the Corrib Shopping Centre and car-park and a retail development.

In order to construct the Proposed Scheme, permanent and temporary land take is required within this section at the following locations:

- Acquisition of 20 St. Brendan's Avenue to facilitate the widening of St. Brendan's Avenue;
- Acquisition of 5/6 Headford Road to facilitate the widening of St. Brendan's Avenue;
- Partial acquisition of the existing laneway between 5/6 Headford Road and 20 St. Brendan's Avenue to facilitate the widening of St. Brendan's Avenue;
- County Hall to facilitate the realignment of Bothar na mBan onto R336 Prospect Hill;
- At County Hall, to facilitate amendments to the car-park access junction.
- Dyke Road car park to facilitate the widening of Dyke Road;
- Dyke Road adjacent to The Plots to facilitate a two-way cycle track and access junction realignment.

In addition to this land acquisition the Proposed Scheme will require the acquisition or restriction or otherwise interference, either temporary or permanent to private rights associated with the land acquisition at the following locations:

Laneway to the rear of 5/6 Headford Road.

4.6.11 Sub-Section 10 - Woodquay / Walsh's Terrace / Daly's Place / Mary Street

4.6.11.1 Overview

The interventions proposed are summarised as follows:

- Woodquay to become one-way only southbound;
- Daly's Place to become one-way only westbound;
- St. Anthony's Place to become one-way only westbound;
- No entry from St. Anthony's Place to Court Lane;

- Removal of on-street parking and creation of public space;
- Relocated bus stops and shelters;
- Raised tables and entry treatment;
- Contra-flow cycle track along Woodquay northbound;
- Toucan crossing on R866;
- New drainage network.

4.6.11.2 Bus Lane Provision and General Vehicle Provision

Due to the Cross-City Link on R866 St. Francis Street, St. Vincent's Avenue and over the Salmon Weir bridge, amendments to the adjoining streets are necessary to maintain access and remove through routes. Two-way traffic will be permitted along the R866 (Headford Road / Walsh's Terrace) between the St. Brendan's Avenue / Dyke Road junction and the Corrib Terrace junction. At this location a bus lane will be installed on St. Vincent's Avenue from Corrib Terrace to the R866 St. Francis Street junction to join the Cross-City Link. Inbound traffic on the R866 Headford Road can access Corrib Terrace, Waterside and Woodquay. Woodquay will be altered to a one-way traffic route southbound, with an adjoining northbound contra-flow cycle track. At the Daly's Place junction, vehicles can turn left onto Eyre Street and onto Bóthar Irwin or turn right onto Daly's Place and onto R863 St. Francis Street, maintaining access but removing through routes.

44 no. existing parking spaces at Woodquay are proposed to be removed and replaced with a public plaza incorporating urban landscaping. 22 no. on street parking spaces are proposed to be retained to facilitate local requirements.

4.6.11.3 Bus Stops

The principles of bus route rationalisation, as stated in Section 4.5.4.4 were employed on this sub-section. Table 4.40 below states how existing bus stops shall be affected by the Proposed Scheme.

Table 4.40: Proposed changes to Bus Stops

Inbound/ Outbound	Bus Stop Name/No.	Bus Stop Type	Location	Retained/ Relocated / Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Westbound	Woodquay Court No. 525411	Inline	Opposite AXA Insurance parallel to Walsh's Terrace	Relocated	Bus Shelter Paper timetable	Bus Shelter with Seating	Relocated due to road realignment
Eastbound	Headford Road No. 523711	Inline	Fronting Walsh's Terrace	Retained	Bus Shelter Paper timetable	Bus Shelter with Seating	N/A

4.6.11.4 Cycling Provision

A segregated cycle lane is proposed to be provided in the northbound direction along Woodquay adjacent to the one-way traffic route. The removal of through traffic in this area will also provide a safer and more efficient cycling environment.

4.6.11.5 Pedestrian Provision

A raised table is proposed on the R866, extending onto Woodquay, incorporating the junctions with Walsh's Terrace, Corrib Terrace and St. Brendan's Avenue. A raised entry treatment is also proposed at Woodquay junction with Eyre Street.

A new toucan crossing is proposed on the R866, connecting Woodquay with Corrib Terrace.

The footpaths and paved areas along the Headford Road, St. Vincent's Terrace, Woodquay, Daly's Place and Mary Street will be replaced with a concrete paving surface and granite kerbs.

4.6.11.6 Junctions

No signalised junctions are proposed or modified as part of the Proposed Scheme in this sub-section.

Table 4.41 summarises the non-signalised junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.41: Minor/Non-Signalised Junctions

Name	Summary
Woodquay / St. Brendan's Avenue	**Overview** Existing T-junction is to remain with proposed raised table across the junction.
Woodquay / Walsh's Terrace / Riverside / St. Vincent's Avenue	**Overview** New 4-way junction is proposed with the elimination of car park island and one-way modification to Woodquay with proposed raised table across the junction.
Corrib Terrace / St. Vincent's Avenue	**Overview** Revise existing 4-way junction, with removal of Woodquay leg due to one-way modification to Woodquay with proposed raised table across the junction.
Woodquay / Daly's Place / Eyre Street	**Overview** Revise existing junction to eliminate northbound entry to Woodquay due to one-way modification

4.6.11.7 Parking and Loading Bays

With the proposed scheme in place, there is an associated need to remove some parking space to provide improved facilities for pedestrians, cyclists, and buses – which inevitably requires some reallocation of parking road space. The proposed changes in parking and loading provision along the Cross-City Link are summarised in Table 4.42 and Table 4.43.

Table 4.42: Summary of Parking Changes

Location	Baseline		Proposed		Change
	Corridor	Adjacent	Corridor	Adjacent	
Woodquay and Newtownsmith	83	120	38	120	-43

Table 4.43: Summary of Loading Changes

Location	Loading Bays		Change
	Baseline	Proposed	
Woodquay and Newtownsmith	5	8	+3

4.6.11.8 Landscape Design

The Proposed Scheme will introduce traffic management measures that will substantially reduce through traffic at Woodquay and provide opportunities to develop the public realm to create a stronger pedestrian priority and urban neighbourhood character. It is planned to create new pedestrian and cyclist friendly public space at this location by aligning the carriageway to one side of Woodquay, providing pedestrian priority raised crossings, removing the majority of car parking spaces and freeing up space for new public realm for markets or events and allowing opportunities for local businesses to create outdoor seating.

The proposed high-quality public square will incorporate high quality hard and soft landscaping, street furniture, bicycle parking and tree planting and will promote a positive image of the city centre and contribute to safety, quality of life and wellbeing.

Full details of the landscape proposals are set out in Drawings BCG-LA-00-03, with extracts for illustration provided in
Diagram 4.27 and Diagram 4.28 (photomontage) respectively.

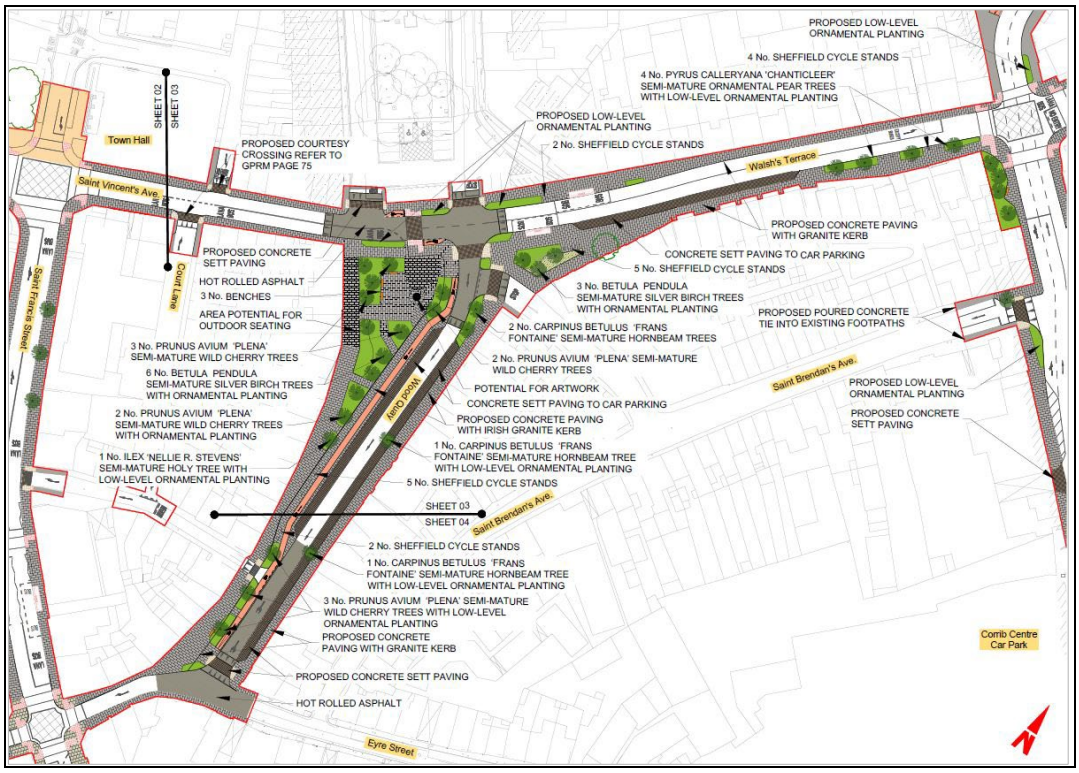


Diagram 4.27: Woodquay Square

Diagram 4.28: Proposed view from Woodquay

4.6.11.9 Structures

There are no structures proposed in this sub-section.

4.6.11.10 Land Use and Accommodation

The Proposed Scheme proposes alterations to the existing street network from the Dyke Road to Mary Street via Woodquay. This section of the scheme includes residential development along Walsh's Terrace and parts of Woodquay. The remainder of Woodquay, Daly's Place and Mary Street are zoned for city centre uses. There is one section of the scheme zoned for Enterprise, Light Industry and Commercial Lands at the corner of Woodquay and the Headford Road.

No permanent or temporary land take is required through this section to facilitate the scheme, as all lands are in the ownership or control of Galway City Council.

4.6.12 Sub-Section 11 - Forthill Street / R336 Merchants Road / Queen Street

4.6.12.1 Overview

The interventions proposed are summarised as follows:

- Realignment of road priority from R336 Merchants Road onto Forthill Street;
- Realignment of road priority from Forthill Street onto Dock Road;
- Footpath widening;
- Controlled pedestrian crossings;
- Entry Treatment;
- Car parking amendments.

4.6.12.2 Bus Lane Provision and General Vehicular Impacts

R336 Merchants Road, Forthill Street and Dock Road form part of the City Centre Access Network. With the creation of the Cross-City Link, through traffic will no longer be permitted via Eyre Square from R336 Merchants Road. Local access will remain for vehicles to access St. Patrick's Avenue, Frenchville Lane, Ceannt Station, Queen Street etc. All non-local access traffic will be required to utilise the City Centre access Network. There are currently two-lanes on R336 Merchants Road. It is proposed that both of these lanes continue onto Forthill Street and onto Dock Road as part of the CCAN. At the junction of R336 Merchants Road with Forthill Street, the primary route for vehicles will be amended so that both lanes continue onto Forthill Street, with R336 Merchants Road towards Eyre Square becoming the minor arm of the junction. Similarly, at the Junction of Forthill Street with Dock Road, both vehicle lanes from Forthill Street will continue onto Dock Road, with Queen Street being the minor arm of this junction. These will tie-into the recently constructed footpaths and road fronting the Bonham Quay development.

Existing on-street parking along Forthill Street is proposed to be converted from perpendicular parking to parallel parking. A retained bus stop and associated shelter is proposed on R336 Merchants Road, between Forthill Street and Victoria Place, with loading and taxi ranks retained.

4.6.12.3 Bus Stops

The principles of bus route rationalisation, as stated in Section 4.5.4.4 were employed on this sub-section. Table 4.44 below states how existing bus stops shall be affected by the Proposed Scheme.

Table 4.44: Proposed changes to Bus Stops

Inbound/ Outbound	Bus Stop Name/No.	Bus Stop Type	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Eastbound	Merchants Road No. 524501	Inline	Opposite Ross House	Retained	Bus Stop Pole Paper Timetable	Bus Shelter with Seating	N/A

4.6.12.4 Cycling Provision

No segregated cycle lanes or cycle priority are proposed on this section of the scheme.

4.6.12.5 Pedestrian Provision

Raised entry treatments are proposed at the junctions of R336 Merchants Road and Forthill Street, R336 Merchants Road and Victoria Place and Queen Street and Forthill Street. Controlled signalised crossings are proposed on Forthill Street at both the R336 Merchants Road end and at the Dock Road end. Footpath widening is proposed on Forthill Street and on R336 Merchants Road between Forthill Street and Victoria Place.
All footpaths on R336 Merchants Road (between Forthill Street and Victoria Place), on Forthill Street and on Victoria Place (between R336 Merchants Road and Queen Street) will be replaced with a stone paving surface.

4.6.12.6 Junctions

No signalised junctions are proposed or modified as part of the Proposed Scheme in this sub-section.
Table 4.45 summarises the non-signalised junction upgrade works to be provided along this section of the Proposed Scheme route.

Table 4.45: Minor/Non-signalised

Name	Summary
Victoria Place / R336 Merchants Road	**Overview** Existing T-junction is to remain with proposed raised table across the minor arm.
Forthill Street / R336 Merchants Road	**Overview** Existing T-junction is to remain with proposed raised table across the minor arm.
Forthill Street / Queen Street	**Overview** Existing T-junction is to remain with proposed raised table across the minor arm.

4.6.12.7 Parking and Loading Bays

With the proposed scheme in place, there is an associated need to remove some parking space to provide improved facilities for pedestrians, cyclists, and buses – which inevitably requires some reallocation of parking road space. The proposed changes in parking and loading provision along the Cross-City Link are summarised in Table 4.46 and Table 4.47.

Table 4.46: Summary of Parking Changes

Location	Baseline		Proposed		Change
	Corridor	Adjacent	Corridor	Adjacent	
R336 Merchants Road / Dock Road	27	986	13	986	-14

Table 4.47: Summary of Loading Changes

Location	Loading Bays		Change
	Baseline	Proposed	
R336 Merchants Road / Dock Road	0	0	0

4.6.12.8 Landscape Design

As the Proposed Scheme will substantially reorganise through traffic, it will provide opportunities to further develop the public realm to create an even stronger pedestrian priority urban neighbourhood character. The carriageway width will be reduced in many locations and the footpaths widened to match the existing urban realm works, the revised layout will facilitate planting of additional new trees and other landscaping.

Full details of the landscape proposals are set out in Drawing BCG-LA-00-06, with extracts for illustration provided in Diagram 4.29 and Diagram 4.30 (photomontage) respectively.

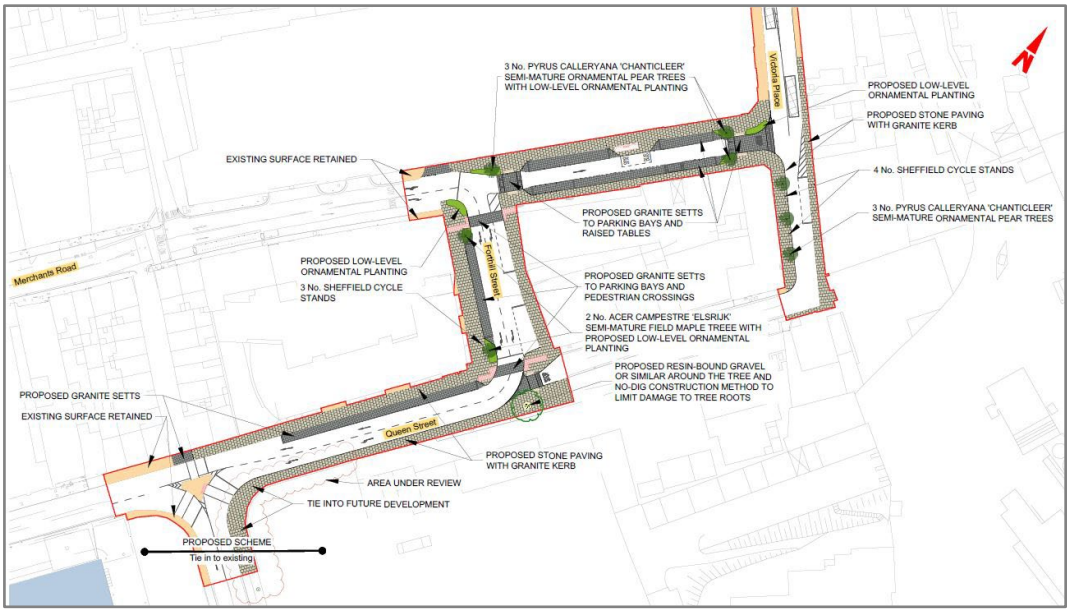


Diagram 4.29: Victoria Place, R336 Merchants Road, Forthill Street and Queens Street

Diagram 4.30: Proposed view from Victoria Place

4.6.12.9 Structures

There are no structures proposed in this sub-section.

4.6.12.10 Land Use and Accommodation

The proposed scheme includes the connection between the Cross-City Link at Eyre Square and the City Centre Access Network at R336 Merchants Road / Forthill Street. All of this section is zoned for City Centre uses, with the exception of the United Methodist Presbyterian Church, which is zoned as Community, Cultural and Institutional.

No permanent or temporary land take is required through this section to facilitate the scheme, as all lands are in the ownership or control of Galway City Council.

4.7 References

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The Irish Wheelchair Association [IWA] (2020) 'Best Practice Guidelines, Designing Accessible Environments'

TII (2011) Specification for Road Works Series 1300 - Road Lighting Columns and Brackets

TII (2017) Standard Construction Details - Series 1300

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Chapter 05
Construction

Contents

5 Construction

5.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) describes the construction activities associated with the BusConnects Galway: Cross-City Link (University Road to Dublin Road) Scheme hereafter referred to as the Proposed Scheme.

The design of the Proposed Scheme has been developed to a stage where potential environmental impacts can be identified, and a fully informed environmental impact assessment can be carried out.

Galway City Council (GCC) (the Employer for the construction works) shall set out the Employer's Requirements in the Construction Contract including all applicable mitigation measures identified in this EIAR, as well as additional measures required pursuant to conditions attached to any decision to grant approval. Procurement of the contractor will involve the determination that the appointed contractor is competent to carry out the works, including the effective implementation of the mitigation measures. The appointed contractor will be required to plan and construct the Proposed Scheme construction works in accordance with the Employer's Requirements, and GCC will employ an Employer's Representative team with appropriate competence to administer and monitor the Construction Contract for compliance with the Employer's Requirements.

In order to allow an assessment of the construction stage impacts associated with the Proposed Scheme, this Chapter describes the construction phasing and programme as well as the construction activities necessary to undertake the works, including information on the construction compounds, construction plant and equipment. This Chapter includes the following information:

- An overview of how the Proposed Scheme has been divided into sections is presented in Section 5.2;
- A programme for the Proposed Scheme (i.e., when the sections will be constructed) is presented in Section 5.3;
- A general overview description of the construction methodology for each section (i.e., how the Proposed Scheme will be built) is presented in Section 5.4;
- Construction methodology is presented in Section 5.5; and
- Details on Construction Environmental Management aspects are presented in Section 5.6.

Details of mitigation measures proposed to address potential impacts arising from construction activities are described in Chapter 6 (Traffic & Transport) to Chapter 20 (Cumulative Impact & Environmental Interactions) as appropriate and are summarised in Chapter 21 (Summary of Mitigation & Monitoring Measures) of this EIAR.

A Construction Environmental Management Plan (CEMP) has also been prepared and is included as Appendix 5.1 in Volume 4 of this EIAR. The CEMP will be updated by GCC prior to the commencement of the Construction Phase, so as to include any additional measures required pursuant to conditions attached to any decision to grant approval. The CEMP has regard to the guidance contained in the TII Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan, and the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015). All of the measures set out in the CEMP will be implemented in full.

5.2 Construction Phasing

Due to the dispersed nature of the scheme, it is anticipated that the construction works will be carried out at a minimum of three locations simultaneously at any given time. The scheme has therefore been split into three sections as detailed below and shown on Diagram 5.1. These sections have been further subdivided into 21 sub-sections. The sections / sub-sections are:

- Section A – University Road to Eyre Square, Woodquay and Headford Road;
  - Section A1 - University Road
  - Section A2 - Gaol Road and Galway Cathedral
  - Section A3 - Salmon Weir Bridge
  - Section A4 - Newtownsmith/Waterside
  - Section A5 - St. Vincent's Avenue/Walsh's Terrace
  - Section A6 - Dyke Road/Headford Road
  - Section A7 - St. Francis Street/Eglinton Street/Williamsgate Street
  - Section A8 - Woodquay/Daly's Place/Mary Street
- Section B – Eyre Square, Forster Street, Dock Road, Bóthar na mBan, Bóthar Ui Eithir and Fairgreen Road:
  - Section B1 - Bóthar na mBan/St. Brendan's Avenue
  - Section B2 - Prospect Hill
  - Section B3 - Eyre Square North/Eyre Square East/Eyre Square South
  - Section B4 - Victoria Place/ Merchant's Road/ Queen Street
  - Section B5 - Forster Street
  - Section B6 - College Road/Forster Street/Fairgreen Road/Bóthar Uí Eithir junction
  - Section B7 - Bóthar Uí Éithir
  - Section B8 - Fairgreen Road
- Section C – College Road to Dublin Road:
  - Section C1 – College Road (to junction with Lough Atalia Road)
  - Section C2 - College Road/Lough Atalia Road junction
  - Section C3 - College Road (to junction at Moneenageisha)
  - Section C4 - Moneenageisha junction
  - Section C5 - R338 Dublin Road

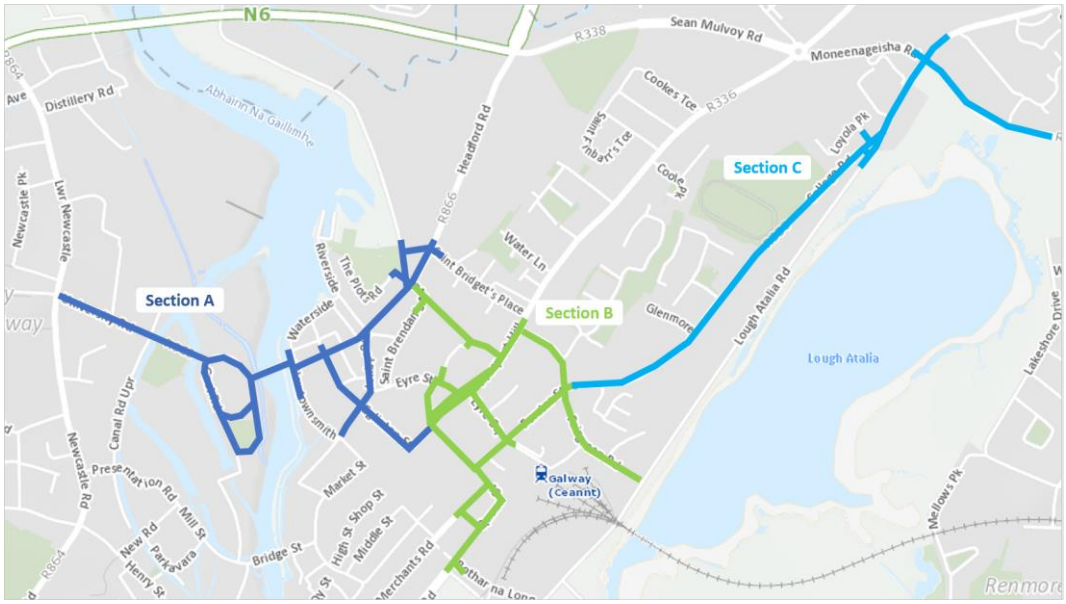

Diagram 5.1: Bus Connects Galway Cross-City Link

Diagrams showing these sections of the scheme are presented in the following sections of this Chapter. An overview of the construction activities to be carried out at each section / sub-section is provided in Section 5.4

5.3 Construction Programme

It is expected that construction will commence in 2023, subject to approval.

The construction works are anticipated to take 75 working weeks (approximately 18-20 months including holidays). It is anticipated that the Cross-City link section will be constructed and operational after 10 months. For the purposes of assessment, it is assumed that the opening of the scheme aligns with the implementation of the Cross-City Link, which is anticipated to occur at the end of 2023.

This construction duration is based on the assumption that a minimum of three works areas will be under construction at any given time, with one of these sections being from Section A, one from Section B and one from Section C as described in this report. With additional resources applied to the scheme, this construction duration could potentially be reduced.

Table 5.1: Construction Programme

Section	Duration in weeks	Month																																							
		1			2			3			4			5			6			7			8			9			10*			11			12			13			14			15			16			17			18		
Section A1	8																																																					
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Section A3	4																																																			
Section A4	8																																																			
Section A5	6																																																			
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Section B7	4																																																			
Section B8	3																																																			
Section C1	6																																																			
Section C2	12																																																			
Section C3	20																																																			
Section C4	10																																																			
Section C5	16																																																			

* Introduction of new bus routes and CCL restrictions

In order to achieve the overall programme duration, it will for the most part, be necessary to work on more than one section / sub-section at any one time. The programme shown in Table 5.1 has been prepared with a view to providing as much separation as practicable between sections under construction at any given time. This has been done in order to minimise traffic disruption and facilitate the ease of movement of sustainable modes, bus services and goods along the Proposed Scheme.

5.4 Overview of Construction Works

An overview of the likely scheme construction phasing and the necessary construction works associated with each phase is outlined in the following sections below.

For the majority of the works associated with the scheme, it is envisaged that normal working hours will be followed. In specific circumstances, such as road crossings or road resurfacing, the works will be carried out at night.

Existing signage will be retained or relocated within widened footpaths. Additional new signage will also be required at locations throughout the scheme. Typical excavation depths for installation of new signage will be approximately 1m.

Existing road markings will be retained where still valid within the carriageway. New road markings will be applied at locations throughout the scheme either via removal and replacement of existing markings or application of new road markings following resurfacing works.

Utility covers will be raised to match new ground heights where applicable.

This section should be read in conjunction with the drawings listed in Table 5.2. These drawings are contained in Volume 3 of this EIAR.

Table 5.2: List of Relevant Drawings

Drawing Series Number	Description
BCG-SP-00-9001	Site Map and Site Location Plan
BCG-GA-00-9001	General Arrangement
BCG-ML-00-9001	Mainline Plan and Profile
BCG-CS-00-9001	Typical Cross Sections
BCG-LA-00-9001	Landscaping General Arrangement
BCG-BW-00-9001	Fencing and Boundary Treatment
BCG-TS-00-9001	Traffic Signs and Road Markings
BCG-DN-00-9001	Proposed Surface Water Drainage Works
BCG-UT-01-9001	Combined Existing Utilities Records
BCG-UT-02-9001	IW Foul Sewer Asset Alterations
BCG-UT-03-9001	IW Water Asset Alterations
BCG-UT-04-9001	ESB Asset Alterations
BCG-UT-05-9001	GNI Asset Alterations
BCG-UT-06-9001	Telecommunications Asset Alterations
BCG-RW-00-9001	Retaining Structures

Further details on the design specifications, with regards to matters such as parking and loading bay widths, signalised junctions, priority junctions, bus stops, accessibility, traffic signals, lighting, utilities, drainage, pavement, and landscape design, can be found in Chapter 4 (Proposed Scheme Description) of this EIAR.

5.4.1 Section A – University Road to Eyre Square, Woodquay and Headford Road

Section A of the proposed works has been split into 8 sub-sections as detailed in Diagram 5.2 and Table 5.3.

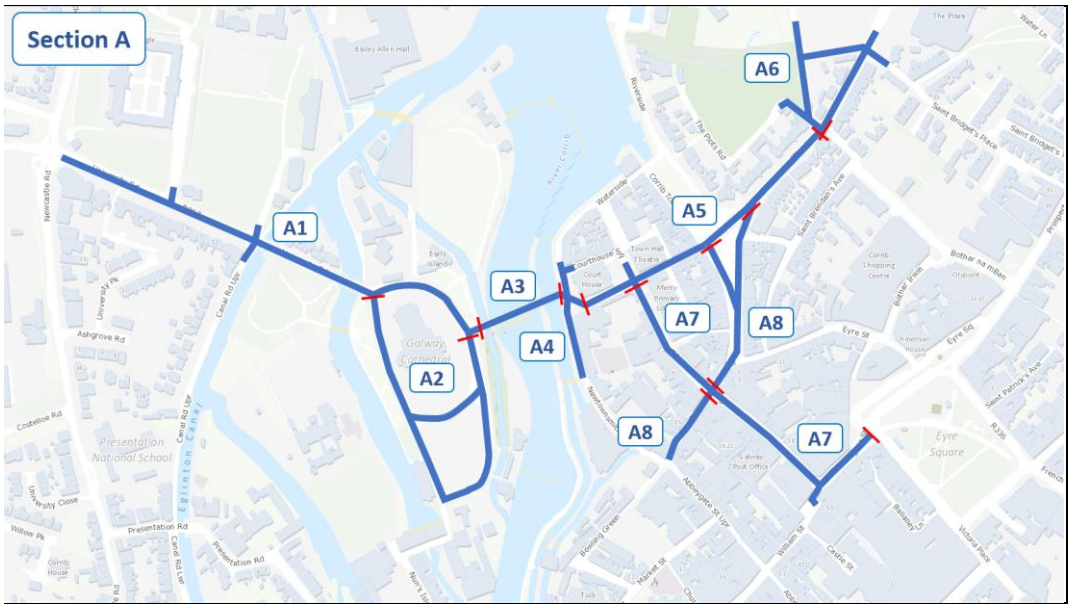

Diagram 5.2: Section A Sub-Sections

Table 5.3: Section A Sub-Sections

Section	Length (m)	Road Name	Drawing Number
A1	500	University Road	BCG-0100-00-01 & 02
A2	N/A	Gaol Road and Cathedral	BCG-0100-00-02
A3	85	Salmon Weir Bridge	BCG-0100-00-02
A4	130	Newtownsmith/Waterside	BCG-0100-00-02
A5	310	St. Vincent's Avenue / Walshs Terrace	BCG-0100-00-02 & 03
A6	420	Dyke Road / Headford Road	BCG-0100-00-03
A7	390	St. Francis Street / Eglinton Street / Williamsgate Street	BCG-0100-00-02 & 04
A8	260	Woodquay / Daly's Place / Mary Street	BCG-0100-00-03 & 04

5.4.1.1 Section A1 - University Road

Along University Road (from the junction with Newcastle Road to the Salmon Weir Bridge), the proposed scheme works will involve footpath widening, provision of an entry treatment at the entrance to NUIG, provision of two raised tables along the route at Canal Road Upper and Fisheries Field and the provision of two new signalised pedestrian crossings. Between the entrance to Fisheries Field and the Salmon Weir Bridge, it is proposed to install a bus gate and to designate the carriageway as a time-regulated bus lane in both directions.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect to a new drainage network proposed to be installed along University Road. The maximum depth of trench excavation required to install the new drainage, gully pots and new connection pipes is 1.7m – 1.8m. This new drainage network will outfall to the canal in the vicinity of Canal Road Upper. It will outfall via a proposed new petrol interceptor in Canal Road, which will require excavation of approximately 3.0m -3.5m for installation. Works will involve the diversion of Irish Water network within the new footpath. Additionally, a telecom chamber and a drainage manhole will likely require relocation to avoid proposed kerbs. Other utilities, where present will be either retained, protected or diverted as required.

Ducting for the proposed signalised pedestrian crossings will be trenched across the road and into the footpath with a maximum excavation depth of 1.2m.

For the provision of entry treatments (at the entrance to NUIG) and the raised tables (at the junction with Canal Road Upper and the entrance to Fisheries Field), the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials. The proposed bus gate adjacent to the Fisheries Field entrance will be installed within the raised table.

Temporary traffic management will be required to accommodate these works, including narrowing the road to a one-way shuttle system to facilitate road crossing trenches, works through narrow pinch points at certain times and for the surfacing of the road. The duration is estimated to be approximately eight weeks. In addition, the closure of Canal Road Upper to all vehicles for a duration of three days is expected for the installation of the petrol interceptor.

5.4.1.2 Section A2 - Gaol Road and Galway Cathedral

To the west of Galway Cathedral, on Gaol Road the works involve footpath widening at the junction with University Road and to the south on Gaol Road the works involve re-development of the car and coach parking area to the south of Galway Cathedral. To the east of Galway Cathedral the works involve the closure of the existing carriageway and creation of a pedestrianised and landscaped public space.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully pots and new connection pipes is 1.2m. Works will involve the relocation of an existing manhole.

Existing public toilets foul water connections will also need to be decommissioned and new public toilets connected to the foul drainage network. Other utilities, where present will be either retained, protected or diverted as required.

The car parking area south of Galway Cathedral will require the existing car parking area to be removed (including removal of existing kerbing and milling of the top layer of surface course). New carriageway surfacing, concrete islands and footpaths are to be provided within the revised car park area. The maximum depth of excavation within the existing car park is 300mm with trenches for new drainage connection pipes to be excavated to a maximum depth of 1.2m.

The area to the east of Galway Cathedral is to be closed to vehicular traffic and designated as a public pedestrian and landscaped space. The carriageway and footpaths that will ultimately become part of the public space will be removed and/or regraded, with a new paved and landscaped area installed to connect with the existing walls to the east (adjacent to the Canal). These will tie into the proposed landing area of the proposed Salmon Weir Pedestrian and Cycle Bridge which is due to complete construction by Q1 of 2023. This will require the removal of the existing bituminous layers on the road and replacement with new materials.

It is proposed that the existing surface carpark will be utilised as a construction compound for the contractor during the works, with this area being completed as per the scheme design at the end of the scheme. This will include connections to existing power, water and drainage services for the duration of the construction works.

Temporary traffic management will be required to accommodate these works, and the duration is estimated to be approximately 16 weeks (initial 12 weeks at the beginning of the programme and a further four weeks at the end of the programme upon removal of the proposed contractor’s compound).

The proposed works will be undertaken in in a single main phase of traffic management:

Gaol Road (west of the cathedral) will be converted into a two-way traffic route and Gaol Road (east of the cathedral) will be closed to traffic to form part of the works area. The carpark will form part of the works area for the duration of the scheme. Access to Nuns Island to be maintained for the duration.

5.4.1.3 Section A3 – Salmon Weir Bridge

On the Salmon Weir Bridge, the works include widening the existing footpath on the northern side of the bridge and the removal of the footpath on the southern side of the bridge and replacing it with a rubbing strip.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Other utilities, where present will be either retained, protected or diverted as required.

Temporary traffic management will be required to accommodate these works, and the duration is estimated to be approximately four weeks.

5.4.1.4 Section A4 - Newtownsmith/Waterside

The works at this location will involve the permanent closure of Waterside as it approaches St. Vincent's Avenue from the north (with the resultant space used to create a public space with permeability for cyclists), and the pedestrianisation of Newtownsmith as it approaches St. Vincent's Avenue from the south (from the location of the Corrib walkway access point northwards). Retractable bollards are to be installed at the beginning of the pedestrianised area to permit goods vehicles to exit from Newtownsmith at designated times. Cyclists are to be permitted to enter and utilise the pedestrianised area.

The pedestrianised area of Newtownsmith will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new surface to be raised and constructed at the level of the existing footway. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. The maximum depth of excavation pit of the installation of bollards is 1.6m. Other utilities, where present will be either retained, protected or diverted as required.

The carriageway and footpaths on Waterside that will ultimately become part of the public space will be removed and/or regraded, with a new paved area installed to connect with the existing footpaths (either kerbside where connecting to an existing footpath, or at the back of a fully-replaced footpath) either side. This will require the removal of the existing bituminous layers on the road and replacement with new materials.

Temporary traffic management will be required to accommodate these works, and the duration is estimated to be approximately eight weeks.

5.4.1.5 Section A5 - St. Vincent's Avenue/Walsh's Terrace

Localised works along St. Vincent's Avenue and Walsh's Terrace (between the Salmon Weir Bridge and Dyke Road) involve footpath widening and the upgrade of the junction at Woodquay (which is to be tightened up and replaced with a single, in-only road from St. Vincent's Avenue). A large, raised table, incorporating a toucan crossing is to be installed between and including the Corrib Terrace and Riverside junctions.

An entry treatment is proposed at the junction with Court Lane, and a small improvement to the junction with Court Avenue to provide a sufficient footpath on the eastern side of the junction.

Footpath widening and landscaping works are proposed along the R866 Headford Road (Walsh's Terrace) between Woodquay and Bothar na mBan.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The existing drainage pipe on Headford Road (Walsh's Terrace) to be moved onto northern side of the road. The maximum depth of trench excavation required to install the new drainage, gully pots and new connection pipes is 1.5m – 2.3m.

Works will involve the diversion of a section of Virgin Media network in the new footpath. ESB box and pole will need to be moved to avoid conflict with the new kerb. Similarly, a manhole will require relocation. A small section of existing watermain will also need to be diverted on Walsh's Terrace in the proposed footpath. Other utilities, where present will be either retained, protected or diverted as required.

For the provision of the entry treatment at Court Lane, the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials.

Temporary traffic management will be required to accommodate these works, including the likely requirement for lane closures and a shuttle traffic system, and the duration is estimated to be approximately six weeks.

5.4.1.6 Section A6 - Dyke Road/Headford Road

Works on Dyke Road and the Headford Road include footpath widening on Dyke Road, installation of a contra-flow cycle track along Dyke Road, the signalisation of the junction of Dyke Road (heading north) and Dyke Road (heading east) and the signalisation of the junction of Dyke Road/Headford Road/St. Bridget's Place.

A short section of Dyke Road is also to have its carriageway widened (approaching the signalised junction of Dyke Road northbound/Dyke Road eastbound) and also realigned into a portion of the Dyke Road car-park. Junctions to be signalised will have pedestrian crossings incorporated.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install the new drainage, gully pots and new connection pipes is 1.45m.

Works on Dyke Road will involve the decommissioning and diversion of a section of the existing ESB MV UG line. Similarly, a section of existing Eir duct and IW watermain will need to be decommissioned and diverted. An unidentified manhole will also require relocation to avoid the proposed kerb. Other utilities, where present will be either retained, protected or diverted as required.

Carriageway widening works will require the existing footpath to be broken out, full road build-up to be constructed and jointed to the existing adjacent carriageway, and replacement footpath constructed. Existing drainage, present kerbside, and other utilities present within the section of footpath to be removed will be relocated to the new kerb edge or the new footpath.

Ducting for the proposed signalisation works will be trenched across the road and into the footpath with a maximum excavation depth of 1.2m.

Temporary traffic management will be required to accommodate these works, including a one-way system and lane closures and a shuttle traffic system. The duration is estimated to be approximately 10 weeks.

5.4.1.7 Section A7 - St. Francis Street/Eglinton Street/Williamsgate Street

The works on St. Francis Street/Eglinton Street involve localised footpath widening along Eglinton Street and in the vicinity of the junction with Mary Street/Daly's Place, the provision of a new signalised crossing on St. Francis Street and the signalisation of the junction with Mary Street/Daly's Place.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. An ESB pole will need to be relocated on St. Francis Street to avoid conflict with the proposed Bus Shelter. A telecom chamber and a Manhole will be relocated into the proposed footpath on Eglinton Street. Other utilities, where present will be either retained, protected or diverted as required.

Ducting for the proposed signalised pedestrian crossing will be trenched across the road and into the footpath with a maximum excavation depth of 1.2m.

Temporary traffic management will be required to accommodate these works, including lane/road closures and a resultant shuttle traffic system, and the duration is estimated to be approximately eight weeks.

5.4.1.8 Section A8 - Wood Quay/Daly's Place/Mary Street

The works within Woodquay involve the removal of a substantial portion of the carriageway space and conversion of same to a pedestrian and landscaped public space through extensive footpath widening and landscaping and the provision of a southbound traffic lane linking Woodquay to Daly's Place/Eyre Street. Entry treatments are also proposed at the junction with St. Brendan's Avenue and the junction with St. Anthony's Place. A contra-flow cycle track from Daly's Place to St. Vincent's Avenue is also proposed.

On Mary Street, the works involve localised footpath widening approaching the junction with Eglinton Street, which is to be signalised.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully pots and new connection pipes is 1.2m.

Several manholes will need to be relocated to avoid conflict with proposed kerbs. Other utilities, where present will be either retained, protected or diverted as required.

At the proposed traffic signal junction, new ducting, crossing the road on all arms of the junction will require trenches to be excavated up to a maximum depth of 1.2m

For the provision of the entry treatments, the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials.

Temporary traffic management will be required to accommodate these works, including lane/road closures and a resultant shuttle traffic system, and the duration is estimated to be approximately 12 weeks.

5.4.2 Section B – Eyre Square, Forster St, Dock Road, Bothar na Mban, Bothar Ui hEithir and Fairgreen Road

Section B of the proposed works has been split into eight sub-sections as detailed in Diagram 5.3 and Table 5.4.

Diagram 5.3: Section B Sub-Sections

Table 5.4: Section B Sub-Sections

Section	Length (m)	Road Name	Drawing Number
B1	250	Bóthar na mBan/St. Brendan's Avenue	BCG-0100-00-03 & 04 & 05
B2	220	Prospect Hill	BCG-0100-00-04 & 05
B3	N/A	Eyre Square North/Eyre Square East/Eyre Square South	BCG-0100-00-04 & 06
B4	405	Victoria Place/ Merchant's Road/ Queen Street	BCG-0100-00-06
B5	155	Forster Street	BCG-0100-00-07
B6	N/A	College Road/Forster Street/Fairgreen Road/Bóthar Uí Eithir junction	BCG-0100-00-07
B7	175	Bóthar Uí Éithir	BCG-0100-00-05 & 07
B8	275	Fairgreen Road	BCG-0100-00-07

5.4.2.1 Section B1 - Bóthar na mBan/St. Brendan's Avenue / Headford Road

The proposed scheme works will involve road realignment, entry treatment installation, footpath widening, new footpath and also the demolition of two residential properties.

The two residential properties to be demolished are No. 20 St. Brendan's Avenue and No. 5/6 Headford Road. These properties are two-storey end of terrace houses, with a shared party wall with the adjoining property. A detailed methodology will be developed by the contractor for the demolition to ensure that the works are undertaken safely and with appropriate works to support the adjoining property. The proposed demolition will include the decommissioning and removal of all domestic utilities and heating systems, including water, electricity, gas and telecoms along with the removal of all above ground structures and their associated foundations. The shared party, which is assumed to be of stone or blockwork construction, will be maintained with associated structural interventions as may be required to ensure structural integrity of the remaining properties. The works will include the installation of appropriate insulation and weathering to the party wall. Reconstruction of the roof tie-in to seal the building will also be required. All demolition waste will be categorised and disposed of to appropriately licenced facilities.

Road widening and realignment is necessary at both ends of Bothar na mBan, in the location of the two residential properties to be demolished and also realignment of the road onto lands at Galway County Council's County Hall. New carriageway will require the existing footpath to be broken out, full road build-up to be constructed and jointed to the existing adjacent carriageway, and replacement footpath constructed.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. Works will involve the decommissioning and diversion of a section of the existing ESB LV UG line. Additionally, a section of the ESB LV OH Cable will be undergrounded in the new footpath. Similarly, a section of existing Eir duct and chambers will need to be decommissioned and diverted. Several manholes will need to be relocated to avoid conflict with proposed kerbs. Other utilities, where present will be either retained, protected or diverted as required.

For the provision of entry treatments (at the entrance to Eyre Square North, Bothar Irwin and St. Brendan's Avenue), the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials and natural stone.

Ducting for the proposed signalised pedestrian crossing will be trenched across the road and into the footpath with a maximum excavation depth of 1.2m.

Temporary traffic management will be required to accommodate these works, including lane closures and a resultant shuttle traffic system, and the duration is estimated to be approximately 20 weeks.

5.4.2.2 Section B2 - Prospect Hill

The works on Prospect Hill comprise the signalisation of the junction with Bohermore/Bóthar Uí hÉithir and the realignment of the junction with Bóthar na mBan (to re-designate Prospect Hill to the south-west as the minor arm of a T-junction with a proposed entry treatment). A portion of the existing footpath and stone wall outside the entrance to Galway County Hall will be removed to facilitate the junction realignment, with the boundary wall and existing footpath both set back.

The works will also involve the conversion of Prospect Hill (between Bóthar na mBan and Eyre Square) into a two-way traffic route which then becomes a looped, one-way circular carriageway route that approaches Eyre Square before looping around and returning out via the two-way portion of Prospect Hill (this is to facilitate a taxi rank, drop-off and loading and to allow onward loading access to Eyre Square North at specific times via a new access-controlled link (as outlined in Section 4.5.1.12)).

Footpath widening will also be carried out (as a number of existing traffic lanes are to be removed). Carriageway widening and new carriageway construction will be required as part of the realignment of the junction with Bóthar na mBan and the new one-way looped route.

A signalised pedestrian crossing is also proposed on Bóthar na mBan adjacent to the new T-junction with Prospect Hill.

Significant public realm and landscaping works are proposed between Eyre Square and Bother na mBan requiring replacement of the entire surface.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. A section of a watermain at the Prospect Hill /Bóthar na mBan junction will require protection. An Eir Chamber will need to be relocated to avoid conflict with the new kerb at the Prospect Hill/Bóthar Uí Éithir junction. Other utilities, where present will be either retained, protected or diverted as required.

5.4.2.3 Section B3 - Eyre Square North/Eyre Square East/Eyre Square South

The works on Eyre Square North involve the removal of the carriageway space running parallel to Eyre Square North (to the north of the Liam Mellows Statue) and conversion of this area to a pedestrianised and landscaped public space.

The vehicular linkage between Eyre Square North and Prospect Hill is also to be closed and replaced with a time-dependent controlled access link (controlled through retractable bollards) to facilitate access for loading and local access to Shop Street at specific times. A new raised table and relocated pedestrian crossing on Eyre Square north, connecting Eyre Square west with Rosemary Avenue is proposed. New surfacing, to be raised to existing footway level is proposed across the entire width of Rosemary Avenue and Eyre Street (Between Bothar Irwin and Eyre Square).

On Eyre Square East, the works involve localised footpath widening at the north-eastern corner (between Eyre Square East and Eyre Square North) and upgrade of the existing pedestrian crossing at the same location, the provision of an entry treatment at St. Patrick's Avenue and localised carriageway widening at the south-eastern corner.

The junction of Eyre Square East, Eyre Square South and Forster Street is to be fully signalised. On Eyre Square South minimal works are proposed.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. Enet chambers and several other manholes to be relocated to avoid conflict with the proposed kerb. Other utilities, where present will be either retained, protected or diverted as required.

Carriageway widening works will require the existing footpath to be broken out, full road build-up to be constructed and jointed to the existing adjacent carriageway, and replacement footpath constructed. Existing drainage present kerbside, and other utilities present within the section of footpath to be removed will be relocated to the new kerb edge or the new footpath.

For the provision of the entry treatment, the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials and natural stone.

Ducting for the proposed signalisation works will be trenched across the road and into the footpath with a maximum excavation depth of 1.2m. The maximum depth of excavation pit of the installation of bollards is 1.5m.

Temporary traffic management will be required to accommodate these works, including lane/road closures and a resultant shuttle traffic system, and the duration is estimated to be approximately 20 weeks.

5.4.2.4 Section B4 - Victoria Place/ Merchant's Road/ Queen Street

Localised works on Victoria Place, Merchant's Road and Queen Street primarily involve footpath widening, provision of new raised uncontrolled pedestrian crossings and two new signalised pedestrian crossings on Forthill Road. An entry treatment is proposed at the junction of Forthill Road and Queen Street.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. A new drainage pipe will be laid on Merchants Road and Forthill Street, with an outlet to tie into existing network on Queen Street. The depth of trench excavation required to install the new drainage, gully post and new connection pipes is 1.55m. Works will also involve the diversion of a watermain on Merchants Road. Several manholes will be relocated to avoid conflict with proposed kerbs. Other utilities, where present will be either retained, protected or diverted as required.

For the provision of the entry treatments/raised uncontrolled crossings, the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials and natural stone.

Ducting for the proposed signalisation works will be trenched across the road and into the footpath with a maximum excavation depth of 1.2m.

Temporary traffic management will be required to accommodate these works, including lane/road closures and a resultant shuttle traffic system, and the duration is estimated to be approximately six weeks.

5.4.2.5 Section B5 - Forster Street

The works on Forster Street involve the replacement of existing footpaths and widening of footpaths to the eastern end of the street, in the vicinity of the junction with Bóthar Uí Eithir/College Road/Fairgreen Road. The works at that junction are detailed in Section 5.4.2.6.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. Other utilities, where present will be either retained, protected or diverted as required.

Temporary traffic management will be required to accommodate these works, including lane closures and a resultant shuttle traffic system, and the duration is estimated to be approximately four weeks.

5.4.2.6 Section B6 - College Road/Forster Street/Fairgreen Road/Bóthar Uí Eithir junction

The works at this junction comprise the upgrade of the junction to reduce the overall size and provide wider footpaths and shorter crossing distances. Therefore, the works primarily comprise footpath widening and the removal of islands within the main carriageway and the installation of replacement traffic signals.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. Other utilities, where present will be either retained, protected or diverted as required.

Islands within the main carriageway will be broken out and the carriageway within the junction resurfaced. This will require the removal of the existing bituminous layers on the road and replacement with new materials.

Temporary traffic management will be required to accommodate these works, including lane closures and a resultant shuttle traffic system, and the duration is estimated to be approximately 10 weeks.

5.4.2.7 Section B7 - Bóthar Uí Éithir

Works on Bóthar Uí Eithir are localised in nature and primarily comprise localised footpath widening at the junction to the south (with Forster Street/College Road) and the junction to the north (with Prospect Hill/Bohermore).

An entry treatment is also proposed at the entrance to Forster Court, and the existing entrance into the grounds of St. Patrick's Church (towards the southern end of Bóthar Uí Éithir) is to be amended.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. Other utilities, where present will be either retained, protected or diverted as required.

For the provision of the entry treatment the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials and natural stone.

Temporary traffic management will be required to accommodate these works, including lane closures, and the duration is estimated to be approximately four weeks.

5.4.2.8 Section B8 - Fairgreen Road

The works at Fairgreen Road primarily comprise the upgrade at the signalised junction with College Road/Forster Street (as outlined above in Section 5.4.2.6), the provision of new entry treatments and some localised footpath widening in the vicinity of the entrance to the Radisson Blu Hotel, footpath replacement and the installation of a new controlled pedestrian crossing between Fairgreen House and the coach station.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network.

The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. Several manholes will need to be relocated to avoid conflict with proposed kerbs. Other utilities, where present will be either retained, protected or diverted as required.

For the provision of entry treatments, the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials.

Temporary traffic management will be required to accommodate these works, including lane closures, and the duration is estimated to be approximately three weeks.

5.4.3 Section C – College Road to Dublin Road

Section C of the proposed works has been split into five sub-sections as detailed in Diagram 5.4 and Table 5. 5.

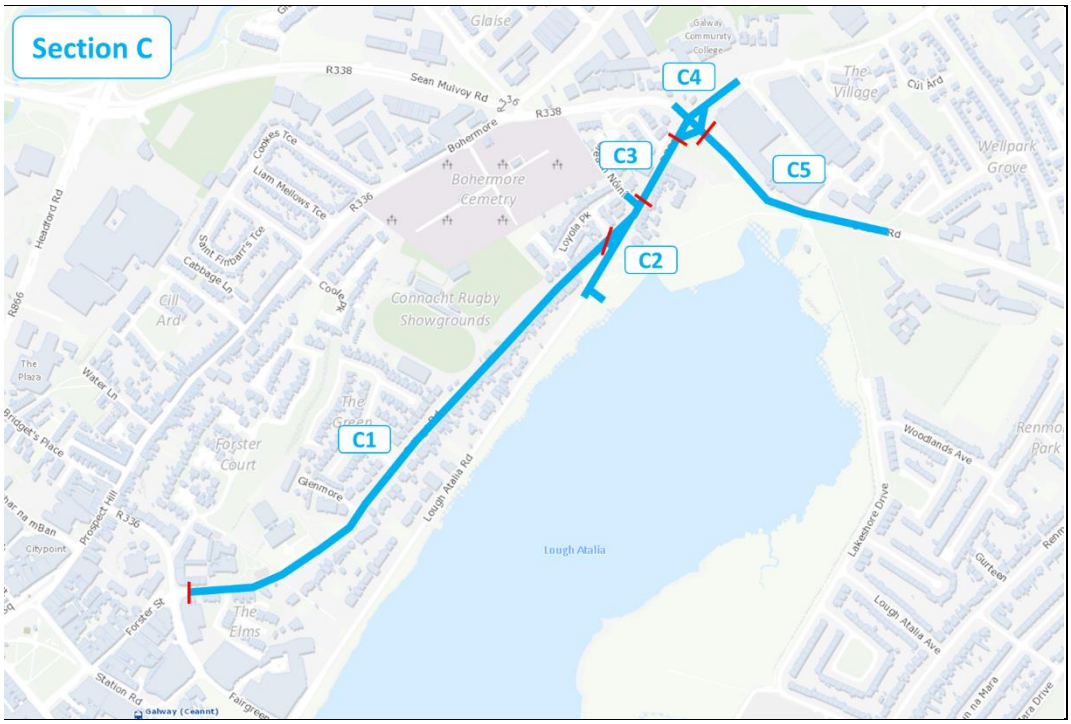

Diagram 5.4: Section C Sub-Sections

Table 5. 5: Section C Sub-Sections

Section	Length (m)	Road Name	Drawing Number
C1	885	College Road (to junction with Lough Atalia Road)	BCG-0100-00-07 & 08 & 09
C2	120	College Road/Lough Atalia Road junction	BCG-0100-00-09
C3	195	College Road (to junction at Moneenageisha)	BCG-0100-00-10
C4	N/A	Moneenageisha junction	BCG-0100-00-10
C5	370	R338 Dublin Road	BCG-0100-00-10 & 11

5.4.3.1 Section C1 – College Road (to junction with Lough Atalia Road)

The works along College Road between the junction with Forster Street and the junction with Lough Atalia Road primarily comprise localised footpath widening works, the provision of entry treatments at a number of junctions, new priority pedestrian crossings and the installation of a bus gate on College Road, west of the entrance to Galway City Hall.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect to a new drainage network. A new drainage pipe is to be laid along a section of the College Road from Yeats College to Lough Atalia. The maximum depth of trench excavation required to install the new drainage pipe, gully post and new connection pipes is 1.75m.

Works will involve the relocation of Eir chambers and duct that conflict with the kerb adjacent the College Road/Glenmore Junction. Two additional Telecom chambers and several manholes will be relocated along the College Road. Other utilities, where present will be either retained, protected or diverted as required.

For the provision of the entry treatments the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials.

Carriageway widening works (at the localised realignment point) will require the existing footpath to be broken out, full road build-up to be constructed and jointed to the existing adjacent carriageway, and replacement footpath constructed. Existing drainage present kerbside, and other utilities present within the section of footpath to be removed will be relocated to the new kerb edge or the new footpath.

Ducting for the proposed signalised pedestrian crossing and the proposed zebra crossing will be trenched across the road and into the footpath with a maximum excavation depth of 1.2m.

For the proposed bus gate, the works primarily involve footpath widening, the installation of traffic signals and the application of a coloured red resin surface to the carriageway on either side of the bus gate to delineate the proposed vehicle restrictions.

Temporary traffic management will be required to accommodate these works, including lane closures, and the duration is estimated to be approximately six weeks.

5.4.3.2 Section C2 - College Road/Lough Atalia Road junction

The junction of College Road/Lough Atalia Road is to be realigned into a standard, signal controlled, T-junction arrangement, with a reduced junction footprint. The College Road (from City Hall) arm of the junction will be the minor arm of the ‘T’ arrangement. Existing traffic islands within the existing junction are to be removed, and the College Road approach to the junction realigned to route through the existing grassed area between College Road and Lough Atalia Road. The new T-junction will be signalised. The existing junction area that becomes redundant will be used to provide new or widened footpaths and provision of new landscaped areas. The existing entrance to Loyola Park will be retained in its current location but altered to a priority controlled access with a new entry treatment and kerb lines.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the new drainage network. A new drainage pipe and non-return valve to be installed at discharge point into Lough Atalia. The maximum depth of trench excavation required to install the new pipe, gully post and new connection pipes is 2.2m. Additionally, a new attenuation tank and petrol interceptor will be installed, which will require excavation of approximately 3.5m -3.75m for installation. The outfall for the new pipe will be located in the existing rock armour along the shore of Lough Atalia, adjacent to the existing playground. All works will be carried out from the land side.

Works will involve the decommissioning and diversion of existing Eir and Virgin Media ducts. Additionally, an ESB LV OH line will need to be diverted and an electrical pole will need to be relocated. A manhole will need to be relocated to avoid the proposed kerb. Other utilities, where present will be either retained, protected or diverted as required.

For the provision of the entry treatments the works will involve the milling of the top layer of surface course, application of bond coat and the construction of the entry treatment/raised table utilising bituminous materials.

The construction of new carriageway in existing hard-standing areas will require the existing footpath to be broken out, full road build-up to be constructed and jointed to the existing adjacent carriageway, and replacement footpath constructed. Existing drainage present kerbside, and other utilities present within the section of footpath to be removed will be relocated to the new kerb edge or the new footpath. Where the carriageway is to be constructed in grassed areas, excavation and full road build-up will be required. Where islands are to be removed, the carriageway surface beneath will be resurfaced and jointed to the adjacent carriageway surface.

Ducting for the proposed signalisation works will be trenched across the road and into the footpath with a maximum excavation depth of 1.2m.

Temporary traffic management will be required to accommodate these works, including lane closures, and the duration is estimated to be approximately 12 weeks.

5.4.3.3 Section C3 - College Road (to junction at Moneenageisha)

The works proposed on College Road (between Lough Atalia Road and Moneenageisha) comprise significant carriageway widening on the western side of College Road to facilitate the construction of an additional outbound bus lane and inbound cycle track. Entry treatments are proposed at the entrances to Loyola Park, Gleann Nóinín and the Huntsman Inn.

Boundary walls along the section to be widened will be removed and set back at five properties (139 College Road, Gleann Noinin, Circle K, Moneenageisha Court and Bay View House). At 139 College Road and Gleann Noinin the existing lands within property boundaries will be broken out/excavated as necessary.

At Circle K, the existing boundary wall is proposed to be set back as part of the road widening along this section. This will require the temporary acquisition of the entire Circle K property in order to complete the works. The works will include the decommissioning of all fuel tanks and systems in accordance with design standards identified in the "Design, construction, modification, maintenance and decommissioning of filling stations" publication (APEA, 2011), for the duration of the works. The works will include the complete removal of two of the six underground fuel storage tanks located on the site. It will also include the removal of two of the existing pumping stations located in the forecourt of the site. The existing canopy over the forecourt will require removal and replacement with a smaller canopy which will not overhang the relocated boundary wall and the existing display signage will be required to be set back. The removal of the two underground tanks and the removal of the two pumping stations will also require the removal and relocation of a number of underground fuel pipes within the site.

At Moneenageisha Court, the existing boundary wall will be set back. This boundary wall is a retaining wall. A proposed new retaining wall (which retains a level difference of approximately 1.2m) will be constructed along the proposed new boundary. This wall will have an exposed face of approximately 2.4m on the College Road side. The wall will be a reinforced concrete wall and will require excavations of approximately 2.0m below existing ground level across the frontage of Moneenageisha Court with the temporary removal of the existing road parallel to College Road. Replacement car-parking is provided at the north western corner of the development. Existing landscaped sections will the excavated and replaced with car-park surfacing. This will require excavations of approximately 300mm of the existing grass and landscaped areas.

At Bay View House, the existing boundary wall will be set back. This boundary wall will be a retaining wall.

A proposed new retaining wall (which retains a level difference of approximately 0.9m) will be constructed along the proposed new boundary. The existing access gates and steps will be reconstructed along the new boundary. Internal car parking will be re-configured.

New carriageway will require the existing footpath to be broken out, full road build-up to be constructed and jointed to the existing adjacent carriageway, and replacement footpath and cycle-track constructed.

Drainage gullies will be relocated to the new kerb edge and will connect back to the new drainage network. Two runs of new drainage pipes are to be laid in the roadway, carrying the water in opposite directions. They will outfall via proposed petrol interceptors, which will require excavation of approximately 3.2m -3.4m for installation. The maximum depth of trench excavation required to install the new pipes, gully post and new connection pipes is 2.0m.

Works will involve the decommissioning and diversion of existing ESB LV UG Line, MV UG Line and LV OH cable, along with a pole, into the new footpath. Additionally, runs of Eir, Virgin Media and BT ducts will be diverted. Several manholes will need to be relocated to avoid conflict with proposed kerbs. Other utilities, where present will be either retained, protected or diverted as required.

Temporary traffic management will be required to accommodate these works, including lane closures, and the duration is estimated to be approximately 20 weeks.

5.4.3.4 Section C4 - Moneenageisha junction

The works at the junction at Moneenageisha involve the upgrade of the junction to provide two bus priority gates on approach to and through the junction from the College Road approach and also from the Dublin Road approach.

Removal and amendments to existing splitter islands are also proposed on order to facilitate the new cycle tracks, toucan crossing and proposed widened footpaths in some locations. The works predominantly relate to island removal, footpath widening and replacement of traffic signals.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. Works will include diversion of an ESB MV UG line, a section of which is within the junction. Other utilities, where present will be either retained, protected or diverted as required.

Islands within the main carriageway will require the existing islands to be broken out, full road build-up to be constructed and jointed to the existing adjacent carriageway. This will require the removal of the existing bituminous layers on the road and replacement with new materials.

New/relocated splitter islands will require the carriageway surface course to be milled out and new islands constructed.

Where existing ducting cannot be re-used, ducting for the relocated signals will be trenched across the road and into the footpath with a maximum excavation depth of 1.2m.

Temporary traffic management will be required to accommodate these works, including lane/road closures, and the duration is estimated to be approximately 10 weeks.

5.4.3.5 Section C5 - R338 Dublin Road

The works on the R338 Dublin Road comprise the installation of inbound and outbound bus lanes, raised adjacent cycle tracks and footpaths on both sides of the road. This is to be achieved via a combination of carriageway widening, re-purposing of existing traffic lanes and setting back the existing footpath. An entry treatment is proposed at the entrance to the Huntsman Inn and Wellpark Retail Park.

Approaching the junction at Moneenageisha, footpath widening is proposed as part of the tightening of the entrance to the junction (removal of the left-slip to College Road, etc.).

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to a new drainage network. Three runs of drainage pipes will be laid within the roadway with outlets to tie into the existing network. The maximum depth of trench excavation required to install the drainage pipes, gully post and new connection pipes is 1.8m – 2.3m. Additionally two new petrol interceptor will require excavation of approximately 3.0m -3.5m for installation.

Works will involve the diversion of two runs of ESB MV UG Line along the Dublin Road, along with diversions of a watermain and an Eir Duct. Other utilities, where present will be either retained, protected or diverted as required.

Carriageway widening works will require the existing footpath to be broken out, full road build-up to be constructed and jointed to the existing adjacent carriageway, and replacement footpath/raised adjacent cycle lane to be constructed. Existing drainage present kerbside, and other utilities present within the section of footpath to be removed will be relocated to the new kerb edge or the new footpath.

Carriageway widening works on the Lough Atalia side of Dublin Road, between Brothers of Charity and the existing billboard adjacent to the Huntsman Inn will require the construction of a retaining wall. The retaining wall is required between the proposed Dublin Road widening and the footpath / greenway area to the south.

Work to re-grade the existing ground profile is required between the realigned footpath / greenway and the bank of Lough Atalia, which slopes to the water. Part of the widening works is located within the Galway Bay Complex SAC and adjacent to the Inner Galway Bay SPA at this section at Lough Atalia. A new kerbline and drainage run is required to prevent run-off directly into Lough Atalia.

The SPA, in the vicinity of the widening, is a dry bay, with a grassed surface and is bounded by a cut stone dock wall which runs perpendicular to the Dublin Road, which degrades to a loose stone embankment as it wraps around the bay, running parallel to the Dublin Road. The section parallel to the proposed works is heavily vegetated. It is assumed that the section through this area comprises of a degraded loose stone wall beneath the vegetation.

The proposed works comprises a new 4.0 m wide footway/cycleway offset approximately 0.9m from the SPA boundary. Due to the uncertainty of the existing wall, it is proposed to install a new retaining wall through here to support the footway/cycleway, which is approximately 1.3m above the depressed bay level. To avoid encroachment into the SPA boundary, it is proposed to retain the existing stone wall/embankment by constructing a mass concrete gravity wall in behind it. This requires the material in behind the wall to be excavated out and then backfilled with mass concrete. Due to the potential instability of the stone wall, care is required during construction to protect the existing stone wall/embankment. While the wall itself has not been identified as being of heritage importance, the area behind it is designated as an SPA. In order to avoid the collapse of the existing wall/slope, the installation of a temporary/sacrificial support to maintain the integrity of the slope and contain the concrete from seeping through the stone wall and into the SPA will be provided in a worst-case construction scenario. Protection from construction run-off into the SPA will be implemented during construction along this section, refer to measures included in the CEMP (Appendix 5.1 of this EIAR).

An existing advertising billboard is present along the green area adjacent to the Dublin Road. It has two separate sides, each approximately 12m in length. The works require the removal of 6m in length of both sides of the billboard, with the remaining 6m to be maintained, during and post construction. The removal of the sections of the billboard will require the excavation around and removal of six vertical steel posts and the timber frame mounted on these posts. Existing lighting and associated cables are to be demounted from the section of billboard to be removed, with the remaining lights to be re-cabled as necessary. Existing buried electricity cables are to be diverted as required.

A portion of the landscaped area in front of the grounds of the G Hotel will be removed to facilitate footpath re-location and the construction of the raised adjacent cycle lane. This will require the landscaped area to be removed and excavated to allow the footpath/cycle lane to be constructed.

Temporary traffic management will be required to accommodate these works, including lane closures and the duration is estimated to be approximately 16 weeks.

5.5 Construction Methodology

This section provides an outline of how each element of the Proposed Scheme infrastructure will be constructed. It should be read in conjunction with the phasing set out in Section 5.2 and Section 5.3, and also with the traffic management stages set out in Section 5.5.2.3

5.5.1 Pre-Construction

Galway City Council will prepare the Construction Contract documents, which will include all applicable mitigation measures identified in this EIAR, as well as any additional measures required in any conditions attached to An Bord Pleanála's decision, should they grant approval.

The preparations will also include the need for additional investigative survey works (such as ground investigation and slit trenching to confirm the location of existing utilities) to supplement the information in the Construction Contract documents. Any such additional investigative survey works that could be deemed to be construction activities will follow the requirements of the CEMP, where necessary.

GCC will also serve notices on impacted landowners in accordance with the requirements of the Compulsory Purchase Order (CPO) process to ensure necessary lands are available for the construction works.

5.5.2 Preparatory and Site Clearance Works

Additional preparations will be required prior to commencing the road and street upgrade works, to confirm the construction methodology, such as additional investigative survey works (such as confirmatory invasive species surveys, ground investigation and slit trenching to confirm the location of existing utilities).

There will be elements of preparatory works, including establishing the Construction Compounds, demolition of houses at (20 St. Brendan's Avenue and 5/6 Headford Road), other demolition works (e.g., such as boundary walls), installation of fencing and signage, vegetation clearance and treatment of non-native invasive species, etc. required in preparation for the main construction activities.

5.5.2.1 Land Acquisition and Boundary Treatment

Condition surveys of properties adjacent to the Proposed Scheme that the works have the potential to affect will be undertaken prior to works commencing. Liaison with impacted landowners will be carried out in advance of commencement of boundary works to properties.

Boundary works will be commenced where both permanent and temporary land acquisition is required to ensure that sufficient space is available to construct the Proposed Scheme. Boundary treatments will be carried out on a section-by-section basis (with sections / sub-sections defined in Section 5.2), and in line with the traffic management Stages set out in Section 5.5.2.3.

This will be a mixture of boundary walls / fencing along industrial / commercial land, boundary walls along residential properties, fence posts along parks and temporary boundaries, as required. Any land temporarily acquired from a landowner will only be utilised for the purposes of undertaking boundary works or accommodation works related to the land in question.

Any lands acquired temporarily to facilitate construction work will be returned to landowners on completion of the works. Existing boundary walls or fencing being relocated will be constructed to match the existing conditions, unless otherwise agreed. The removal of trees, vegetation, lawns, paving etc will be minimised in so far as practicable.

5.5.2.2 Fencing

Fencing will be erected on a section-by-section basis (with sections / sub-sections defined in Section 5.2), and in line with the traffic management Stages set out in Section 5.5.2.3.

5.5.2.3 Construction Traffic Management Measures and Signage

Prior to commencing the construction works described below within a sub-section of the Proposed Scheme, temporary traffic management measures will be installed. The temporary traffic management measures, including measures for pedestrians, cyclists, public transport users, general traffic, proposed lane closures, road closures and diversions are discussed in detail in the Construction Traffic Management Plan in Appendix 5.1 in Volume 4 of this EIAR. Temporary traffic management signage will be put in place in accordance with the requirements of the Department of Transport's Traffic Signs Manual, Chapter 8, Temporary Traffic Measures and Signs for Roadworks (DTTS 2019), hereafter referred to as the Traffic Signs Manual.

5.5.2.4 Tree Protection

Trees to be retained within and adjoining the works areas will be suitably protected as necessary as per 'British Standard (BS) 5837:2012 Trees in Relation to Design, Demolition, and Construction' (British Standards Institution (BSI) 2012). Trees identified for removal will be removed in accordance with 'BS 3998:2010 Tree Work. Recommendations' (BSI 2010). The location of trees to be retained, and trees to be removed is shown on the Landscaping General Arrangement Drawings (BCG-LA-00-9001).

A suitably qualified arborist will be appointed by the contractor to monitor tree protection, and tree removal related activities. The design has been developed to ensure removal of trees has been minimised in so far as practicable. Where necessary, protective fencing will be erected, and mitigation measures will be put in place, prior to construction works commencing in the immediate vicinity.

Works required within the root protection area of trees to be retained will follow the arboricultural methodology included in Appendix 16.1 Arboricultural Report in Volume 4 of this EIAR. Further information on mitigation measures with regards to the removal, and protection of trees is provided in Chapter 12 (Biodiversity) of this EIAR and further information on the assessment of tree removal with regards to landscape and visual impact is provided in Chapter 16 (Landscape (Townscape) & Visual) of this EIAR.

5.5.2.5 Vegetation Clearance and Treatment of Non-Native Invasive Species

Vegetation (e.g., hedgerows, scrub, grassland) clearance and treatment of non-native invasive species (e.g., Japanese knotweed, Himalayan balsam, Giant hogweed) will be undertaken within the Proposed Scheme boundary, where necessary.

A suitably qualified specialist will be appointed by the contractor to monitor vegetation clearance, and treatment of non-native invasive species. Prior to construction, confirmatory invasive species surveys will be undertaken by the specialist to re-confirm the presence and / or extent of species within the footprint of the Proposed Scheme. Further information with regards to pre-construction ecological surveys and restrictions are provided in Chapter 12 (Biodiversity) of this EIAR. Vegetation identified for removal will be removed in accordance with 'BS 3998:2010 Tree Work. Recommendations' (BSI 2010) and best arboricultural practices as detailed and monitored by the specialist. The Invasive Species Management Plan (ISMP) for the control of invasive plant species on the Proposed Scheme is included in Appendix 5.1 CEMP in Volume 4 of this EIAR.

5.5.2.6 Archaeological Investigations

Galway City Council will procure the services of a suitably qualified archaeologist as part of its Employer's Representative team administering and monitoring the works. In addition, a suitably qualified archaeologist will be appointed by the contractor to monitor archaeological and cultural heritage matters during construction; to acquire any licenses / consents required to conduct the work, and to supervise and direct the archaeological measures associated with the Proposed Scheme in accordance with the Employer's Requirements. In the event of archaeological features or material being uncovered during the Construction Phase, all machine work will cease in the immediate area to allow the archaeologist time to inspect and record any such material. Further information on archaeological management is included in Section 15.5 in Chapter 15 (Archaeological Cultural Heritage and Architectural Heritage) of this EIAR.

5.5.2.7 Ground Investigations

Prior to construction localised confirmatory ground investigations will be undertaken to verify the results of the assessments, undertaken and reported in this EIAR.

Information on the specific ground investigations conducted along the Proposed Scheme have been outlined in Chapter 14 (Land, Soils, Geology & Hydrogeology) of this EIAR.

5.5.2.8 Construction Compounds

As part of preparatory works, the Construction Compounds will be set up, which will include installation of the necessary facilities including the site office, welfare facilities, etc. Controlled access to the Construction Compounds will be implemented, fencing will be erected, and lighting will be installed. The Construction Compounds will be secured with Closed-Circuit Television (CCTV), to ensure safe storage of all material, plant and equipment. Further information on the Construction Compounds is included in Section 5.5.3.14.

5.5.2.9 Lighting

The majority of the Proposed Scheme route is already artificially lit, however temporary lighting will be required at times along the Proposed Scheme at certain locations during the Construction Phase, as necessary. Where it is necessary to disconnect public lighting during the construction works or to undertake works outside of daylight hours where existing lighting is low, appropriate temporary lighting will be provided. Temporary lighting will also be installed at the Construction Compounds for the duration of the Construction Phase.

The standard of temporary lighting installed during the Construction Phase will meet the standard of the existing carriageway and will be appropriate to the speed and volume of traffic during construction. Temporary construction lighting will generally be provided by tower mounted floodlights, which will be cowled and angled downwards to minimise spillage of light from the site.

New permanent lighting and upgrades to the existing lighting infrastructure are also proposed as part of the Proposed Scheme's lighting strategy, the details of which are addressed in Section 4.6 (Basis of Infrastructure Design) in Chapter 4 (Proposed Scheme Description) of this EIAR.

5.5.2.10 Demolition

In some locations along the Proposed Scheme, items, such as houses (20 St. Brendan's Avenue and No. 5/6 Headford Road), walls, gates, fencing, lighting poles, bus stops, etc., will need to be removed or demolished. Demolition of structures will be carried out in a controlled manner, under supervision. All plant and equipment will be maintained in good working order and inspected in accordance with manufacturers recommended intervals. Demolition works areas will be appropriately hoarded and signposted. Best practice industry standard working methods will be used to minimise the generation of dust, noise and other environmental effects resulting from the demolitions as described in Chapter 7 (Air Quality) and Chapter 9 (Noise & Vibration) of this EIAR.

The impacts of materials arising from the Proposed Scheme demolitions are assessed in Chapter 17 (Waste & Resources) of this EIAR. Measures for managing demolition materials are included in the Construction Demolition Resource Waste Management Plan (CDRWMP) in Appendix 5.1 CEMP in Volume 4 of this EIAR.

5.5.3 Road and Street Upgrades

5.5.3.1 General

The Proposed Scheme will be constructed in a manner which will minimise, as much as practicable, any disturbance to residents, businesses and road users. Road and street upgrade works will be completed in a staged manner, as described in Section 5.3, whereby traffic of all modes will be managed to ensure construction can continue while ensuring the safety of all road users, and personnel, and maintaining flow of all modes of traffic wherever practicable.

5.5.3.2 Parking and Access

When roads and streets are being upgraded, there will be some temporary disruption / alterations to on-street and off-street parking provision, and access to premises in certain locations along the Proposed Scheme. Local arrangements will be made on a case-by-case basis to maintain continued access to homes and businesses affected by the works, at all times, where practicable. Details regarding temporary access provisions will be discussed with homes and businesses prior to construction starting in the area. The duration of the works will vary from property to property, but access and egress will be maintained at all times. The location of temporary land acquisition, proposed gates, and the relocation of existing gates are shown in the Fencing and Boundary Treatment Drawings (BCG- BW-00-9001) in Volume 3 of this EIAR.

Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

5.5.3.3 Earthworks

Topsoil and subsoil will be excavated as part of the Proposed Scheme; for foundations, bus stop shelters, signs, public lights, traffic signal poles, tree pits etc. This topsoil and subsoil may be temporarily stored at the Construction Compounds for reuse where practicable, in line with the principles of circular economy. The Proposed Scheme will aim to minimise the amount of materials brought onto the Proposed Scheme in so far as practicable. The acceptability of earthworks material for reuse will be determined, by testing and analysis, to determine if materials meet the specific engineering standards for their proposed end-use.

All earthworks will be managed having regard to the Transport Infrastructure Ireland (TII) Guidelines for the Management of Waste from National Road Construction Projects (TII 2017), and the Waste Management Act, 1996, as amended. The management of materials is discussed in Chapter 17 (Waste & Resources) of this EIAR. The overall estimated quantities of demolition, excavation and construction materials for the Proposed Scheme are outlined respectively in Table 17.7, Table 17.8 and Table 17.9 in Chapter 17 (Waste & Resources) of this EIAR.

5.5.3.4 Drainage

Adjustment or upgrade works will be required to service chambers and manholes, gullies, etc. Access manholes located in the footpaths will be lowered or raised to match the proposed carriageway levels, where the carriageway will be widened into the existing footways.

Specific controls and mitigation measures will be put in place to manage runoff and minimise pollution to receiving waterbodies during the Construction Phase of the Proposed Scheme. Further information with regards to drainage, and drainage design is included in Chapter 4 (Proposed Scheme Description), Chapter 13 (Water), Chapter 18 (Material Assets) of this EIAR and the Surface Water Management Plan (SWMP) in Appendix 5.1 CEMP in Volume 4 of this EIAR.

5.5.3.5 Utility Works

Realignment, upgrade or replacement of utilities and services will be required in conjunction with, or to accommodate the Proposed Scheme. Any such works to utilities and services will be along or immediately adjacent to the Proposed Scheme. A list of utility and service works along the Proposed Scheme is provided in Chapter 18 (Material Assets) of this EIAR.

Utilities and services, including overhead and underground, comprise amongst others:

- Water mains;
- Storm water and foul sewers;
- Fuel pipelines;
- Electricity ducts and cabling;
- Gas mains;
- Telecommunications and TV ducting and cabling; and
- Traffic signalling ducting and cabling.

The majority of utilities are anticipated to be retained and protected in their current position with the new works constructed over the top of existing infrastructure. Where there are poles or boxes within the footprint of the widening works, these will need to be temporarily relocated to enable the widening works to be completed.

The existing utilities will be protected where possible. Risks associated with diversions include:

- Programme - Diversion of some utilities includes work to be completed by Statutory Undertakers. Availability of resources and lead-in times for the diversion works are common issues which cause delay on construction schemes, particularly a scheme like the CCL works.
- Room for new services - Verges and footways are full of utilities (both known and unknown) – therefore finding space for the installation of new infrastructure is difficult.

Retaining the existing infrastructure in place is not without risk either, these risks include:

- Position of existing services - depending on the construction make-up of the proposed works, it may be required to lower/move the existing ducting – there may be other utilities or obstructions which may impede this. In some instances, a diversion may be required.

The programme and sequencing are based on the retention of the existing services in their current position with diversions only where highlighted in the information provided. Reasonable allowances have been made within the programme for dealing with these diversions.

Any further utility diversions needed to facilitate the new works could have a major effect on section durations. Detailed consultations should take place with Statutory undertakers in advance of the detailed design of the scheme and clear information regarding their requirements and proposals agreed in advance of the construction contract. Any utility diversions which require a long lead-in time for equipment should be procured in advance of the main construction contract.

5.5.3.6 Pavement and Carriageway Works

This section describes the pavement and carriageway works to be completed along the Proposed Scheme, including construction, or alterations to the carriageway, kerbs, parking and loading bays, footpaths, cycle tracks (cycle paths, cycle tracks, cycle lanes), bus stops (island, shared landing area, inline, layby) etc. The following options outline the pavement construction / reconstruction scenarios required along the Proposed Scheme:

- Where the existing road surfacing is showing signs of deterioration, the existing pavement will be replaced (i.e., road pavement and surfacing will be removed and replaced to similar levels as existing);
- Where the quality of the existing road pavement is poor or where the existing road will be widened, full depth road foundation and pavement reconstruction will be carried out; and
- In some instances, road overlay (i.e., the addition of new pavement / road surfacing material), with no excavation, will be provided.

Existing asphalt / bituminous layers will be removed using road planers, with plannings being recycled where possible, as is common practice. Following this, existing lower courses of road make-up or ground will be excavated in layers using mechanical excavators in order to segregate materials for reuse, recycling, or disposal as appropriate, with materials being transported using lorries. The new or rehabilitated pavement will then be constructed from formation level, in coordination with the installation of street furniture assets. Plant used in construction of the new road make-up will be excavators, rollers, dumpers, and lorries, as detailed in Section 5.5.3.13. Specialist road paving machines will be used to lay bituminous layers. Road markings and reflective road studs where appropriate will also be installed.

The choice of materials will include unbound or hydraulically bound granular materials for the foundation, hydraulically bound materials, hot or cold bituminous mixtures for base and binder layers and natural stone or concrete paving units, bituminous mixtures or concrete materials for the surface. Specialist products such as high friction surfacing treatments will also be applied to the surface of the pavement where appropriate.

5.5.3.7 Traffic Signal Junctions

During the works, the existing traffic signals will remain in operation, supplemented as necessary by temporary traffic signals, until such time as the new signals become operational.

The existing 34 signalized junctions along the Proposed Scheme will be upgraded to provide bus priority, enhanced pedestrian crossings and segregated cycling facilities in places. In general traffic signals will be replaced, and additional dedicated signals will be provided for buses, cyclists and pedestrians as appropriate. Extensive underground works will be required to provide additional ducts for traffic signal electrical and telecommunication cables, as described in Section 5.5.3.6, with associated chambers and control boxes above ground. Additional traffic monitoring equipment will be provided, including CCTV cameras and other detectors.

5.5.3.8 Ancillary Road Furnishings

The appointed contractor will install street furniture such as rubbish bins, signage, seats, lighting, benches, bollards, cycle racks and bus stops (including shelters and information displays etc.).

5.5.3.9 Landscaping

Where vegetation, grassed areas and hedgerows are disturbed during the works, these will be reinstated, and replaced, where practicable. New trees will be planted, in suitable tree pits where necessary, at various locations as shown in the Landscaping General Arrangement Drawings (BCG-LA-00-9001) in Volume 3 of this EIAR.

5.5.3.10 Structural Works

Retaining walls are proposed at two locations, one at College Road and one at Dublin Road.

The retaining wall at College Road is located along the boundary of Moneenageisha Court. A proposed new retaining wall (which retains a level difference of approximately 1.2m) will be constructed along the proposed new boundary. This wall will have an exposed face of approximately 2.4m on the College Road side. The wall will be a reinforced concrete wall and will require excavations of approximately 2.0m below existing ground level across the frontage of Moneenageisha Court with the temporary removal of the existing road parallel to College Road.

Carriageway widening works on the Lough Atalia side of Dublin Road, between Brothers of Charity and the existing billboard adjacent to the Huntsman Inn will require the construction of a retaining wall and a mass concrete gravity wall. The retaining wall will be required between the proposed Dublin Road widening and the footpath / greenway area to the south. The proposed new retaining wall (which retains a maximum level difference of approximately 1.0m) will be constructed along the proposed new boundary. This wall will have a maximum exposed face of approximately 2.15m on the Lough Atalia side. The wall will be a reinforced concrete wall and will require excavations of approximately 0.5m below existing ground level across the frontage of the Dublin Road boundary. A mass concrete gravity wall will be required underneath the realigned footpath / greenway and the bank of Lough Atalia, in order to prevent impact on the loose stone embankment as it enters the SPA.

The demolition of two end of terrace houses will necessitate the construction of two new gable walls at the boundaries of number 19 St. Brendan's Avenue and at number 4 Headford Road. Works will require temporary and support of these properties during demolition and the construction of 2 no. new gable walls.

5.5.3.11 Principal Structures

The principal structural works which form part of the Proposed Scheme are summarised in Table 5.6. Further details are provided in Section 5.5.3.19 to Section 5.5.3.21.

Table 5.6: Principal Structures

Structure Name	Structure Reference	Section Reference
Moneenageisha Court Retaining Wall	STR_RW_01	STR_RW_01_2
Dublin Road Retaining Wall	STR_RW_01	STR_RW_02_2

5.5.3.12 Construction Site Decommissioning

On completion of construction, all construction facilities and equipment such as plant, materials, temporary signage, laydown areas, and the Construction Compounds etc. will be removed. The areas which were occupied by the Construction Compounds will be reinstated – refer to the General Arrangement Drawings (BCG-GA-00-00 to BCG-GA-00-13) in Volume 3 of this EIAR.

5.5.3.13 Construction Plant and Equipment

In order to assess a reasonable worst case Construction Phase impact scenario, with regards to air quality, noise and vibration, an estimate of construction plant and equipment that will be necessary to construct the Proposed Scheme has been prepared, refer to Table 5.7.

The appointed contractor will select and utilise plant and equipment in a manner that ensures Construction Noise Thresholds, as defined in Chapter 9 (Noise & Vibration) of this EIAR, are not exceeded. Refer to Chapter 7 (Air Quality) and Chapter 9 (Noise & Vibration) of this EIAR for the Construction Phase air quality and noise and vibration assessments, and associated mitigation measures.

Table 5.7: Estimated Peak Daily Plant and Equipment Numbers

Plant / Equipment	**Plant and Equipment Numbers per Section**																			
Type	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**	**C1**	**C2**	**C3**	**C4**	**C5**
Lorry	4	8	2	4	4	4	4	8	10	8	8	4	4	8	4	4	6	8	12	8	12
Backhoe Mounted Hydraulic Breaker	2	2	1	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2
8t Excavator	1	2	1	1	1	1	1	2	2	2	2	1	1	2	1	1	1	2	2	2	2
13t (Rubber Wheeled) Excavator	0	1	0	0	0	1	0	1	1	1	1	0	0	1	0	0	1	1	1	1	1
16t (Rubber Wheeled) Excavator	1	1	0	1	1	1	1	1	2	1	1	1	0	1	1	1	1	1	1	1	1
6t Dumper	2	4	1	2	2	4	2	4	4	4	4	2	2	4	2	2	2	4	4	4	4
Road Planer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Road Sweeper	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Asphalt Paver	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Asphalt Roller	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3t Roller	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
50t Crane	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0

5.5.3.14 Construction Compounds

It is anticipated that three construction compounds will be utilised during the construction of the Proposed Scheme, two main compounds located at Galway Harbour Enterprise Park and a satellite compound at Galway Cathedral Car-Park.

The Construction Compound locations have been selected due to the amount of available space at these locations, their locations near the majority of the Proposed Scheme major works and their access to the Regional and Local Road network.

The locations of the Construction Compounds and Satellite Construction compound in relation to the Proposed Scheme are shown in Diagram 5.5. The main Construction Compounds will be located in the Galway Harbour Enterprise Park, within Galway Docks. These compounds are proposed to be split into two distinct locations due to available space. The appointed contractor's CTMP shall include measures for managing traffic accessing and egressing the Construction Compounds. This CTMP will require construction traffic to route along the access routes identified in Diagram 5.5 within the Galway Harbour Enterprise Park. The third compound will be located at the car-park of Galway Cathedral.

The first Construction Compound at Galway Harbour Enterprise Parks is approximately 2,180m^2 in area and will contain site offices, and welfare facilities for GCC and contractor personnel. Limited car parking will be allowed at this Construction Compound, in line with the principles of the Construction Stage Mobility Management Plan (CSMMP). The second Construction Compound at Galway Harbour Enterprise Park is approximately 2,710m^2 in area and will be used to store materials for reuse such as topsoil, subsoil, concrete, rock etc., together with materials delivered to site for use in the construction of the scheme, e.g. pipes and ducting. Items of plant and equipment will also be stored within this Construction Compounds including the provision of a crusher. The third compound, located at Galway Cathedral, is approximately 2,990m^2 in area and will also be used to store plant and materials, together with site personnel welfare facilities.

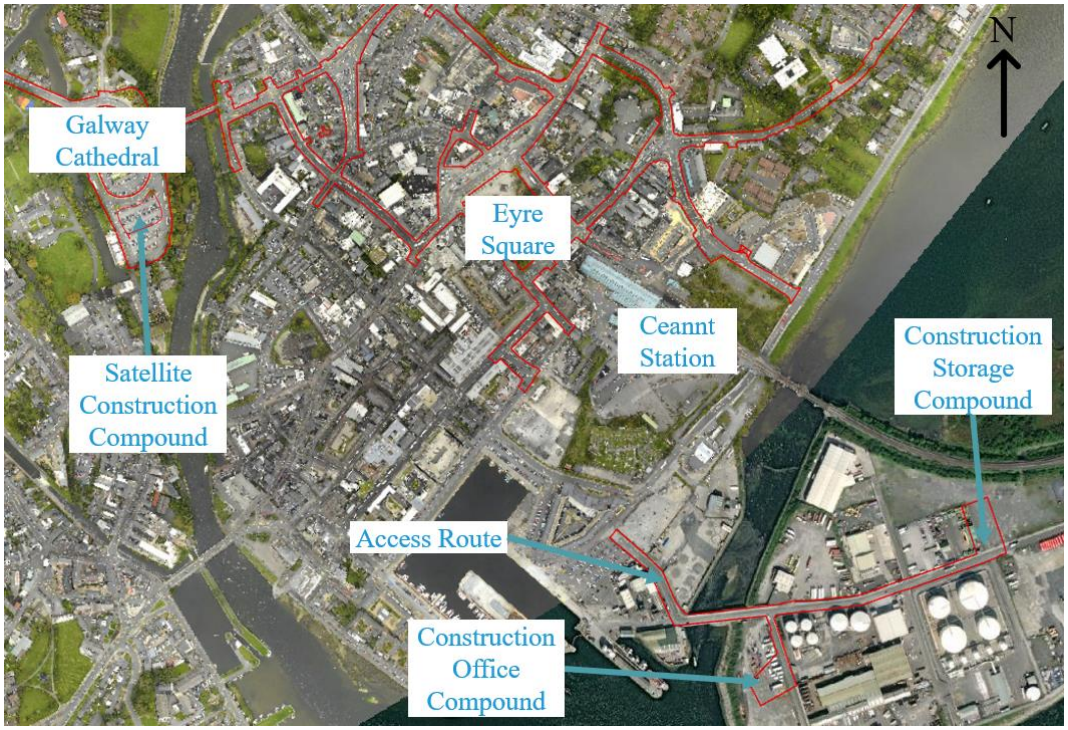

Diagram 5.5: Proposed Construction and Satellite Construction Compound locations

The Construction Compounds will be engineered with appropriate services. Water, wastewater, power, and communications connections will be organised by the appointed contractor.

At work areas along the Proposed Scheme, where permanent provisions (for the duration of the construction programme) are not practicable, appropriate temporary provisions will be made, including the use of generators if required. Temporary welfare facilities will need to be used, for example, portable toilets in the vicinity of works. Wastewater from temporary welfare facilities will be collected and disposed of to a suitably licenced facility.

Appropriate environmental management measures will be implemented at the Construction Compounds for example, to minimise the risk of fuel spillage, and to ensure that the Construction Compounds and the approaches to them are appropriately maintained

Following completion of the construction works, the main Construction Compound areas will be cleared and reinstated to match pre-existing conditions.

5.5.3.15 Construction Traffic Management

The Construction Traffic Management Plan (CTMP) has been prepared to facilitate the assessment of the potential impacts on traffic and transport along the Proposed Scheme. The CTMP includes details of the temporary traffic management measures that will be implemented during the construction of the Proposed Scheme. Refer to Diagram 5.6 for indicative traffic management routes.

The staging of construction and associated temporary traffic management measures has considered the receiving environment when developing the schedule of works.

The CTMP has given due consideration to facilitate the maximum practicable movement of people during the construction period through implementing the following hierarchy of transport mode users:

- Pedestrians;
- Cyclists;
- Public Transport; and
- General Traffic.

Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

The construction traffic management measures have been developed in accordance with the Traffic Signs Manual. Construction traffic management measures are summarised in Section 5.6.1.1, with further details (such as routing of construction vehicles, timings of material deliveries, etc.) included in the CTMP in Appendix 5.1 CEMP in Volume 4 of this EIAR.

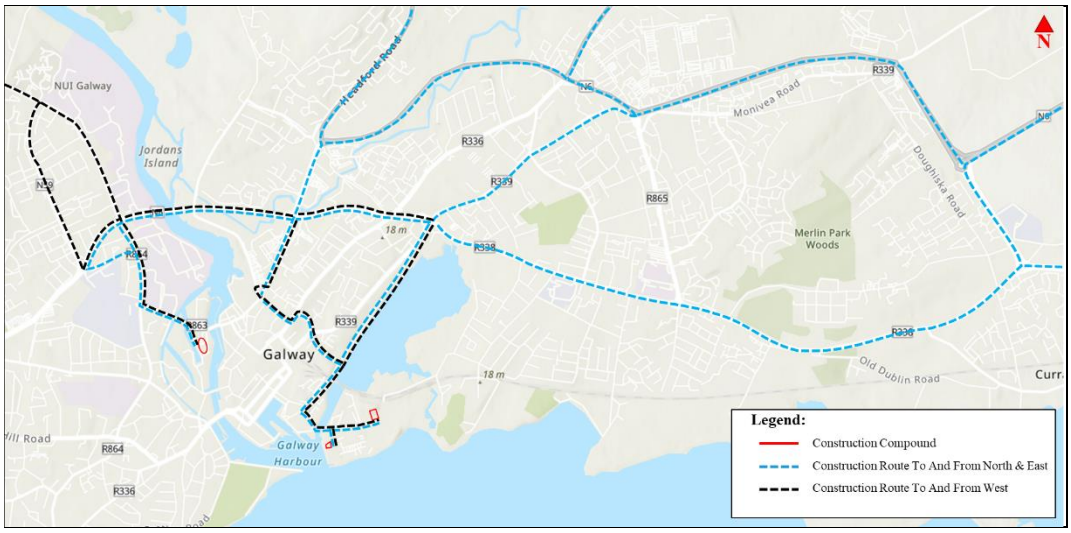

Diagram 5.6: Construction Haul Routes

5.5.3.16 Pedestrian and Cycle Provisions

The measures set out in Section 8.2.8 of the Traffic Signs Manual will be implemented, wherever practicable, to ensure the safety of all road users, in particular pedestrians (including able-bodied pedestrians, wheel-chair users, mobility impaired pedestrians, pushchair users) and cyclists. Therefore, where footpaths or cycle facilities are affected by construction, a safe route will be provided past the works area, and where practicable, provisions for matching existing facilities for pedestrians and cyclists will be made.

5.5.3.17 Public Transport Provisions

Existing public transport routes will be maintained throughout the duration of the Construction Phase of the Proposed Scheme (notwithstanding potential for occasional road closures / diversions as discussed in Section 5.5.4). Wherever practicable, bus services will be prioritised over general traffic. However, the temporary closure of sections of existing dedicated bus lanes will be required to facilitate the construction of new bus priority infrastructure that is being developed as part of the Proposed Scheme. Some existing bus stop locations will need to be temporarily relocated to accommodate the works. In such cases, bus stops will be safely accessible to all users and all temporary impacts on bus services will be determined in consultation with GCC and the service providers.

5.5.3.18 General Traffic Provisions

The roads and streets along the Proposed Scheme, will remain open to general traffic wherever practicable during the Construction Phase; however, lane closures, road closures and diversions will be necessary to facilitate construction.

Two-way traffic will generally be maintained along the Proposed Scheme, however in circumstances where there is not sufficient road width to allow two-way traffic (e.g. reduced lane width), single lane traffic controlled by a stop / go system of temporary traffic lights will be implemented with priority provided to traffic travelling towards the City Centre during the morning, and reversed during the afternoon where appropriate. Lane closures and route diversions will supplement this system if traffic volumes are heavy. Short delays may occur outside of the AM and PM peaks, for example as a result of vehicles accessing the works.

For most of the Proposed Scheme the existing carriageway width is sufficient to maintain full width two-way traffic throughout the works. However, where the carriageway width is restricted, at various sections throughout the Proposed Scheme. The construction works will be split into traffic management stages as described in 5.5.3.19 to Section 5.5.3.21.

5.5.3.19 Section A – University Road to Eyre Square, Woodquay and Headford Road

Section A1 - University Road

The proposed works will be undertaken in four main phases of traffic management:

- Phase 1 –Widening works on Northern footpath, traffic to be reduced to a single lane in each direction and realigned in narrow lanes to the South.
- Phase 2 – Widening works on Southern footpath, traffic to be reduced to a single lane in each direction and realigned in narrow lanes to the North. Traffic to operate on a shuttle system through pinch points.
- Phase 3 – Works will be undertaken out-of-hours. Traffic to be reduced to single lane shuttle working.

- Phase 4 - Close off the Canal Road Upper the petrol interceptor installation works for three days (to be undertake in conjunction with Phase 1 or 2 above).

Section A2 - Gaol Road and Galway Cathedral

Temporary traffic management will be required to accommodate these works, and the duration is estimated to be approximately four weeks.

The proposed works will be undertaken in in a single main phase of traffic management:

- Gaol Road (west of the cathedral) will be converted into a two-way traffic route and Gaol Road (east of the cathedral) will be closed to traffic form part of the works area. The carpark will form part of the works area for the duration of the scheme. Access to Nuns Island to be maintained for the duration.

Section A3 - Salmon Weir Bridge

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – Removal works on the southern footpath. Traffic to be reduced to single lane shuttle working.
- Phase 2 – Widening works on the northern footpath. Traffic to be reduced to single lane shuttle working.
- Phase 3 – Resurfacing of the bridge. This will require the closure of the bridge to vehicular traffic for one night.

Section A4 - Newtownsmith/Waterside

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – Closure of Waterside, between Courthouse Square and St. Vincent's Avenue. Pedestrian and cyclist permeability will be maintained.
- Phase 2 – Closure of Newtownsmith, between access to the river walk and St. Vincent's Avenue. Pedestrian and cyclist permeability maintained. HGV egress from Newtownsmith to be maintained under contractor control.
- Phase 3 – Full closure of Newtownsmith for all vehicles including HGV egress, for the installation of retractable bollards.

Section A5 - St. Vincent's Avenue/Walsh's Terrace

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – Footpath widening and drainage works on the northern footpath, traffic reduced to single lane shuttle running.
- Phase 2 – Footpath widening works on the southern footpath, traffic reduced to single lane shuttle running.
- Phase 3 – Road surfacing and raised table construction, traffic reduced to single lane shuttle running.

Section A6 - Dyke Road/Headford Road

The proposed works will be undertaken in four main phases of traffic management:

- Phase 1 – Closure of the road connecting Dyke Road to Headford Road adjacent to the Dyke Road carpark and completion of the widening on the northern side of this road and the footpath widening on the southern side of the road.
- Phase 2 – Closure of the Dyke Road, between the Headford Road and the Dyke Road car-park, with local access only maintained to the Plots. Widening of the road to the west, construction of the proposed cycle track and installation of the new footpath on the eastern side to be carried out under this rod closure.
- Phase 3 – Realignment and installation of new traffic signal controlled junctions, with one-way circulatory system in place, reduced to one lane.
- Phase 4 - Road surfacing, traffic reduced to single lane shuttle running.

Section A7 - St. Francis Street/Eglinton Street/Williamsgate Street

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 –Widening works on Northern footpath, traffic reduced to single lane shuttle operation with a temporary footpath on the Northern side.
- Phase 2 – Widening works on Southern footpath, traffic reduced to single lane shuttle operation with a temporary footpath on the Southern side.
- Phase 3 – Road surfacing works; traffic reduced to single lane shuttle working.

Section A8 - Wood Quay/Daly's Place/Mary Street

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – On Woodquay, works on eastern lane, traffic reduced to single lane in each direction and realigned in narrow lanes to the west.
- Phase 2 – On Woodquay, works on western lane and eastern footpath, traffic reduced to single lane in each direction and realigned in narrow lanes to the east.
- Phase 3 – On Daly's Place, Mary Street and a section of Woodquay, works undertaken out-of-hours; traffic reduced to single lane one-way operation.

5.5.3.20 Section B – Eyre Square, Forster Street, Dock Road, Bothar na Mban, Bothar Ui hEithir and Fairgreen Road

Section B1 - Bóthar na mBan/St. Brendan's Avenue

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – On St. Brendan's Avenue traffic reduced to single lane shuttle working.
- Phase 2 – On Bóthar na mBan, works on Eastern lane, traffic reduced to single lane in each direction and realigned in narrow lanes to the West.
- Phase 3 – On Bóthar na mBan, works on Western lane, traffic reduced to single lane in each direction and realigned in narrow lanes to the East

Section B2 - Prospect Hill

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – Between Eyre Square and Bóthar na mBan, works on Western lane, traffic reduced to single lane in each direction and realigned in a narrow lane to the East.
- Phase 2 – Between Eyre Square and Bóthar na mBan, works on Eastern lane, traffic reduced to single lane in each direction and realigned in a narrow lane to the West.
- Phase 3 – Work on Prospect hill and Bohermore junction, traffic reduced to single lane one-way.

Section B3 - Eyre Square North/Eyre Square East/Eyre Square South

The proposed works will be undertaken in four main phases of traffic management:

- Phase 1 – Realignment of the corner of Eyre Square North and Eyre Square East and also the corner of Eyre Square east and Forster Street, traffic to operate on a one-way shuttle system through these junctions.
- Phase 2 – Works on Eyre Square North, with the existing access road closed to all traffic. Access for deliveries to be maintained via Rosemary Avenue and Eyre Street.
- Phase 3 – Works on Rosemary Avenue and Eyre Street, with roads to be closed to vehicular access for the duration of the works.
- Phase 4 – Road surfacing works to be carried out under single lane shuttle operation.

Section B4 - Victoria Place/ Merchant's Road/ Queen Street

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – On Merchants Road and Queen Street, traffic reduced to single lane one-way, works to be undertaken on alternating footpaths.

- Phase 2 – On Forthill Street, works on Northern lane, traffic reduced to single lane one-way, works to be undertaken on alternating footpaths.
- Phase 3 – Overnight closure of Merchants Road (Forthill Street to Queen Street) and Queen Street to Dock Road, for the installation of raised tables.
- Phase 4 – Single lane operation on all routes during road surfacing works.

Section B5 - Forster Street

The proposed works will be undertaken in two main phases of traffic management:

- Phase 1 –Widening works on Northern footpath, traffic reduced to single lane shuttle working.
- Phase 2 – Widening works on Southern footpath, traffic reduced to single lane shuttle working.

Section B6 - College Road/Forster Street/Fairgreen Road/Bóthar Uí Eithir junction

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – reduce approaches to sign lanes and the installation of a mini-roundabout, with actively controlled pedestrian crossings, island removal and footpath widening to be undertaken.
- Phase 2 – shuttle-controlled operation with road crossings and traffic signal installation to be carried out;
- Phase 3 – overnight junction closure to facilitate surfacing works.

Section B7 - Bóthar Uí Éithir

The proposed works will be undertaken in two main phases of traffic management:

- Phase 1 – Works on the Eastern lane, traffic reduced to single lane one-way and realigned to the West.
- Phase 2 – Works on the Western lane, traffic reduced to single lane one-way and realigned to the East

Section B8 - Fairgreen Road

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – Works on the northern/eastern side, traffic reduced to single lane in each direction and realigned in narrow lanes to the south/west.
- Phase 2 – Works on the southern/western side, traffic reduced to single lane in each direction and realigned in narrow lanes to the East.
- Phase 3 –Works to be undertaken out-of-hours including road-crossing trenches and road surfacing; traffic reduced to single lane shuttle working.

5.5.3.21 Section C – College Road to Dublin Road

Section C1 – College Road (to junction with Lough Atalia Road)

The proposed works will be undertaken in two main phases of traffic management:

- Phase 1 –Widening works on the northern footpath including footpath widening and drainage installation, traffic reduced to single lane shuttle working.
- Phase 2 – Widening works on southern footpath, traffic reduced to single lane shuttle working.

Section C2 - College Road/Lough Atalia Road junction

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 –Removal of existing islands. Temporary pedestrian routes and crossing to be provided. Existing traffic operation maintained.
- Phase 2 – Construction of the realignment of College Road through a green area; existing traffic operation to be maintained;
- Phase 3 – Construction of landscaped area; traffic to be switched over to proposed future arrangement.

Section C3 - College Road (to junction at Moneenageisha)

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – Works on the western side, traffic reduced to a single lane in each direction and realigned in narrow lanes to the east.
- Phase 2 – Works on the eastern side, traffic reduced to single lane in each direction and realigned in narrow lanes to the west.
- Phase 3 – Road surfacing works in the carriageway, traffic reduced to single lane in each direction and realigned as required to complete the works.

Section C4 - Moneenageisha junction

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – Existing island removal and carriageway widening. Traffic to be reduced to a single lane approach on all arms during the works.
- Phase 2 - Bus Gate installation and footpath widening. Traffic to be reduced to a single lane approach on Dublin Road and College Road approaches.
- Phase 3 – Road surfacing, full junction closure over 2 -3 consecutive nights.

Section C5 - R338 Dublin Road

The proposed works will be undertaken in three main phases of traffic management:

- Phase 1 – Works on the southern side, including road widening, traffic reduced to three lanes on the Dublin Road and realigned in narrow lanes to the north.
- Phase 2 – Works on the northern side, traffic reduced to three lanes on the Dublin Road and realigned in narrow lanes to the south.
- Phase 3 – Road surfacing works in the carriageway, traffic reduced to single lane in each direction and realigned as required to complete the works.

5.5.4 Road Closures and Diversions

Road closures and diversions will be carried out during the Construction Phase of the Proposed Scheme. However, these measures will be minimised wherever possible, likely to be short lived and only required for limited activities. Where necessary, road closures and diversions will take into consideration the impact on road users, residents, businesses etc. Road closures and diversions will be carried out with regard to the Traffic Signs Manual.

All road closures and diversions will be determined by Galway City Council, in consultation with An Garda Siochana, as necessary. Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

5.5.5 Interface with Other Projects

The likely timelines of the Proposed Scheme construction works have considered the potential for simultaneous construction of, and cumulative impacts with other infrastructure projects and developments which are proposed along, or in the vicinity of, the Proposed Scheme. The likely significant cumulative impacts caused by the Proposed Scheme in combination with other existing or planned projects were identified and assessed in Chapter 20 (Cumulative Impacts & Environmental Interactions) of this EIAR.

Interface liaison will take place on a case-by-case basis through Galway City Council, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

5.6 Construction Environmental Management

5.6.1 Construction Environmental Management Plan

As stated in Section 5.1, a Construction Environmental Management Plan (CEMP) has been prepared for the Proposed Scheme and is included as Appendix 5.1 in Volume 4 of this EIAR. The CEMP will be updated by GCC prior to finalising the Construction Contract documents for tender, so as to include any additional measures required pursuant to conditions attached to An Bord Pleanála's decision. It will be a condition of the Employer's Requirements that the

successful contractor, immediately following appointment, must detail in the CEMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR. The CEMP has regard to the guidance contained in the TII Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan, and the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

Details of mitigation measures proposed to address potential impacts arising from construction activities are described in Chapter 6 (Traffic & Transport) to Chapter 20 (Cumulative Impacts & Environmental Interactions) as appropriate and are summarised in Chapter 21 (Summary of Mitigation & Monitoring Measures) of this EIAR.

A number of sub-plans have also been prepared as part of the CEMP and these are summarised in the following sections. For the avoidance of doubt, all of the measures set out in the CEMP and the sub-plans appended to this EIAR will be implemented in full by the appointed contractor to the satisfaction of GCC.

5.6.1.1 Construction Traffic Management Plan

The Construction Traffic Management Plan (CTMP) has been prepared to demonstrate the manner in which the interface between the public and construction-related traffic will be managed and how vehicular movement will be controlled, refer to Appendix 5.1 of Volume 4 of this EIAR. It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the CTMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála, should they grant approval. Further details on the assessment of construction traffic, and traffic related mitigation measures are provided in Chapter 6 (Traffic & Transport) of this EIAR.

5.6.1.2 Invasive Species Management Plan

The Invasive Species Management Plan (ISMP) has been prepared which provides the strategy to be adopted in order to manage and prevent the spread of the non-native invasive plant species. Non-native invasive plant species were identified in close proximity to the Proposed Scheme during ecological surveys. It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the ISMP how it is intended to complete the works in accordance with the Employer's Requirements, and will be subject to GCC's approval. Further details on the assessment of non-native invasive species, and associated mitigation measures are provided in the ISMP.

5.6.1.3 Surface Water Management Plan

The Surface Water Management Plan (SWMP) has been prepared which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the

Construction Phase of the Proposed Scheme. It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the SWMP how it is intended to effectively implement all the applicable measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval.

5.6.1.4 Construction and Demolition Resource and Waste Management Plan

The Construction and Demolition Resource and Waste Management Plan (CDRWMP) has been prepared which provides the strategy that will be adopted in order to ensure that optimum levels of reduction, re-use and recycling are achieved.

It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the CDRWMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval. Further details on waste management are provided in Chapter 17 (Waste & Resources) of this EIAR.

5.6.1.5 Environmental Incident Response Plan

The Environmental Incident Response Plan (EIRP) has been prepared to ensure that in the unlikely event of an incident (environmental, or non-environmental), response efforts are prompt, efficient, and suitable for the particular circumstances. The EIRP details the procedures to be undertaken in the event of a significant release of sediment into a watercourse, or a significant spillage of chemical, fuel or other hazardous substances (e.g., concrete), non-compliance incident with any permit or licence, or other such risks that could lead to a pollution incident, including flood risks. It will be a condition of the Employers Requirements that the successful contractor, immediately following appointment must detail in the EIRP, the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval.

5.6.2 Mitigation Measures

Mitigation and monitoring measures have been identified as environmental commitments and overarching requirements which shall avoid, reduce or offset potential impacts which could arise throughout the Construction Phase of the Proposed Scheme. These mitigation and monitoring measures which are relevant to the Construction Phase of the Proposed Scheme are detailed in Chapter 6 (Traffic & Transport) to Chapter 20 (Cumulative Impacts & Environmental Interactions) and summarised in Chapter 21 (Summary of Mitigation & Monitoring Measures) and Appendix 5.1 CEMP in Volume 4 of this EIAR.

5.6.3 Working Hours

The construction working hours will be time restricted in accordance with the Construction Contract. Normal construction working hours will be restricted to between 07:00 and 19:00 on weekdays. Night-time, Saturday and Sunday working will be required during certain periods to minimise the impact on road traffic movements during the daytime, for example at busy road junctions and in commercial areas, and for such works as pavement / road surfacing. The planning of such works will take consideration of sensitive receptors, in particular any nearby residential areas.

5.6.4 Personnel Numbers

Throughout the Construction Phase there will be some variation in the numbers of personnel working on site. It is anticipated there will be approximately 70-80 personnel directly employed across the Proposed Scheme, rising to 100 personnel at peak construction.

5.6.5 Construction Health and Safety

The requirements of the Safety, Health and Welfare at Work Act 2005, the Safety, Health and Welfare at Work (Construction) Regulations, 2013 and other relevant Irish and EU safety legislation will be complied with at all times. As required by the Regulations, a Health and Safety Plan will be formulated which will address health and safety issues from the design stages through to the completion of the Construction Phase. This plan will be reviewed as the Proposed Scheme progresses. The contents of the Health and Safety Plan will follow the requirements of the Regulations. In accordance with the Regulations, a “Project Supervisor Design Process” has been appointed and “Project Supervisor Construction Stage” will be appointed as appropriate.

5.7 References

Association for Petroleum and Explosives Administration (APEA) and Energy Institute (2011) Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations.

British Standards Institution (2010). British Standard 3998:2010 Tree Work. Recommendations.

British Standards Institution (2012). British Standard 5837:2012 Trees in Relation to Design, Demolition, and Construction. Recommendations.

Construction Industry Research and Information Association (2015). Environmental Good Practice on Site Guide, 4th Edition.

Department of Transport, Tourism and Sport (2019). Chapter 8, Temporary Traffic Measures and Signs for Roadworks, Traffic Signs Manual.

Transport Infrastructure Ireland (2007). Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.

Transport Infrastructure Ireland (2017). The Management of Waste from National Road Construction Projects.

Directives and Legislation

Safety, Health and Welfare at Work (Construction) regulations 2013.

Safety, Health and Welfare at Work Act 2005, as amended.

Waste Management Act 1996, as amended.

Chapter 06
Traffic & Transport

Contents

6 Traffic and Transport

6.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the potential traffic & transport impacts associated with the Construction and Operational Phases of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) Scheme (hereafter referred to as the Proposed Scheme).

The chapter describes the traffic and transport impacts in accordance with the requirements of the relevant Environmental Protection Agency's (EPA) guidance on the information to be contained in EIARs (2022).

The Proposed Scheme, as described in detail in Chapter 4 (Proposed Scheme Description), has an overall length of approximately 6.7km, and routes along University Road, St. Vincent's Avenue, St. Francis Street, Eglinton Street, Eyre Square, Forster Street, College Road and Dublin Road and also encompasses numerous roads within the city centre.

The Proposed Scheme includes an upgrade of the existing bus priority alongside changes to pedestrian and cycle facilities. The Proposed Scheme includes a substantial increase in the level of bus priority in Galway, including the provision of additional lengths of bus lane.

Throughout the Proposed Scheme the environment for cycling will be enhanced, primarily through the removal of traffic from the Cross-City Link. Where traffic cannot be reduced or removed, segregated cycle facilities will be provided where feasible. Throughout the Proposed Scheme pedestrian facilities will be upgraded, additional signalised crossings provided, and entry treatment provided across side road junctions.

Table 6.1 summarises the changes which will be made to the existing transport environment along the corridor as a result of the Proposed Scheme.

Table 6.1: Summary of Proposed Scheme

Total Length of Proposed Scheme	**6.7km**	
Bus Priority	**Existing (km)**	**Proposed Scheme (km)**
Bus Lanes		
Inbound	0.3	1.6
Outbound	0.3	0.9
Bus Priority through Traffic Management		
Inbound	0	1.5
Outbound	0	2.2
Total Bus Priority (both directions)	0.6	6.2

Total Length of Proposed Scheme	**6.7km**	
Bus Priority	**Existing (km)**	**Proposed Scheme (km)**
Bus Measures		
Proportion of Route with Bus Priority Measures	10%	100%
Cycle Facilities – Segregated		
Inbound	0	0.7
Outbound	0	0.5
Cyclist Facilities – Non-segregated		
Inbound	0	2.3
Outbound	0	2.3
Total Cyclist Facilities (both directions)	0	5.8
Proportion Segregated (including Quiet Street Treatment)	0%	95%
Other Features		
Number of Traffic Signal Controlled Junctions	5	10
Number of Signal Crossings	10	21

The following drawings (listed in Table 6.2) should be read in conjunction with this chapter.

Table 6.2: Drawing Number and Description

Drawing Series Number	**Description**
BCG-GA-00-00-12	General Arrangement
BCG-CS-01-01-06	Typical Cross Sections
BCG-TS-00-00-12	Traffic Signs and Road Markings

Cumulative impacts of Traffic and Transport, along with other topics, can be found in Chapter 20 (Cumulative Impacts & Environmental Interactions) of this EIAR, as well as in Appendix 6.1 (Transport Modelling Report) in Volume 4 of this EIAR.

6.1.1 Aim and Objectives of the Proposed Scheme

The aim of the Proposed Scheme is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in Galway City, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the works, applicable to the Traffic and Transport assessment of the Proposed Scheme, are to:

- Enhance the capacity and potential of the public transport system by improving bus speeds, reliability and punctuality through the provision of bus priority measures and bus lanes to provide priority to bus movement over general traffic movements;
- Enhance the potential for cycling by providing a safe network for cycling;

- Support the delivery of an efficient, low carbon and climate resilient public transport service, which supports the achievement of Ireland's emission reduction targets;
- Enable compact growth, regeneration opportunities and more effective use of land in Galway, for present and future generations, through the provision of safe and efficient sustainable transport networks;
- Improve accessibility to jobs, education and other social and economic opportunities through the provision of improved sustainable; connectivity and integration with other public transport services; and
- Ensure that the public realm is carefully considered in the design; and development of the transport infrastructure and seek to enhance key urban focal points where appropriate and feasible.

The planning and design of the Proposed Scheme has been guided by these aims and objectives, with the need for the Proposed Scheme described in detail in Chapter 4 (Proposed Scheme Description) of this EIAR.

People Movement

The aims and objectives outlined above are underpinned by the central concept and design philosophy of 'People Movement'. People Movement is the concept of the optimisation of roadway space and/or the prioritisation of the movement of people over the movement of vehicles along the route and through the junctions along the Proposed Scheme. The aim being the reduction of journey times for higher person carrying capacity modes (bus, walking and cycling), which in turn provides significant efficiencies and benefits to users of the transport network and the environment.

A typical double-deck bus takes up the same road space as three standard cars but typically carries 50-100 times the number of passengers. On average, a typical double-deck bus carries approximately 60-70 passengers making the bus typically 20 times more efficient in providing people movement capacity within the equivalent spatial area of three cars. These efficiency gains can provide a significant reduction in road network congestion where the equivalent car capacity would require 50 or more vehicles based on average occupancy levels. Consequently, by prioritising the movement of bus over cars, significantly more people can be transported along the limited road space available. Similarly, cyclists and pedestrians require significantly less roadway space than general traffic users to move safely and efficiently along the route. Making space for improved pedestrian infrastructure can significantly benefit this sustainable mode and encourage greater use of this mode.

With regards to this traffic and transport chapter, People Movement is the key design philosophy and the Proposed Scheme impacts (both Positive and Negative) have been assessed on that basis.

6.1.2 Iterative Design Process and Mitigation by Design

Throughout the development of the Preliminary Design for the Proposed Scheme there have been various design stages undertaken based on a common understanding of the maturity of the design at a given point in time. Part of this

process was to ensure the environmental and transport impacts were mitigated to the greatest extent possible during design development and to enable information on potential impacts to be provided from the various Environmental Impact Assessment (EIA) and Transport Impact Assessment (TIA) disciplines back into the design process for consideration and inclusion in the proposals. This resulted in mitigation being embedded into the design process by the consideration of potential environmental impacts throughout the Preliminary Design development. A multi-tiered modelling framework, as described in Appendix 6.1 (Transport Modelling Report) in Volume 4 of this EIAR, was developed to support this iterative design process,

Diagram 6.1 below illustrates this process whereby the emerging design for the Proposed Scheme has been tested using the transport models as part the iteration. The transport models provided an understanding of the benefits and impacts of the proposals (mode share changes, traffic redistribution, bus performance etc.) with traffic flow information also informing other environmental disciplines (such as Air Quality, Noise and Vibration, Climate etc.) which in turn allowed feedback of potential impacts into the design process to allow for changes and in turn mitigation to be embedded in the designs. The design process included physical changes and adjustments to traffic signals including changes to staging, phasing and green times to limit traffic displacement to the greatest extent possible as well as traffic management arrangements and/or turn bans where appropriate. This ensured that any displaced traffic was kept to a minimum and was maintained on higher capacity roads, whilst continuing to meet scheme objectives along the Proposed Scheme.

The iterative process concluded when the design team were satisfied that the Proposed Scheme met its required objectives (maximising the people movement capacity of the Proposed Scheme) and that the environmental impacts and level of residual impacts were reduced to a minimum.

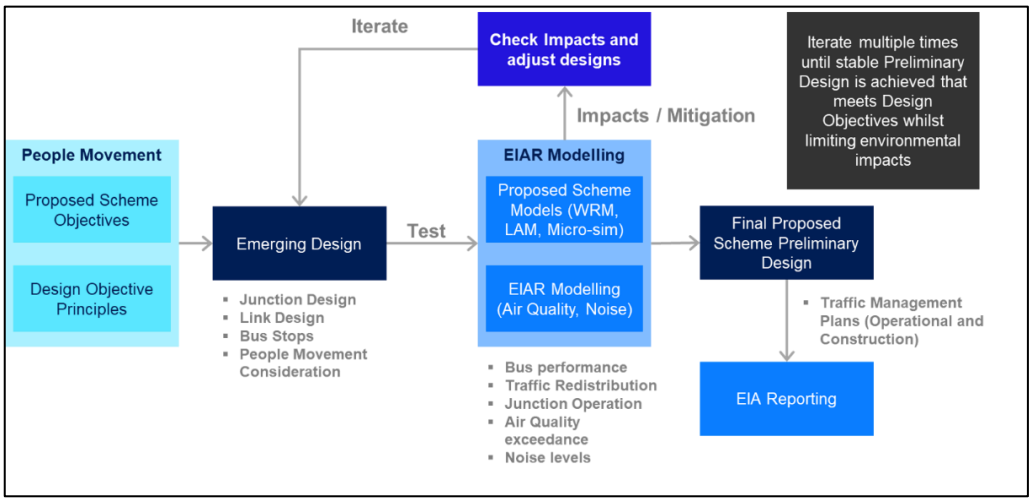

Diagram 6.1: Proposed Scheme Impact Assessment and Design Interaction

The impacts presented in this chapter are based on the final Preliminary Design for the Proposed Scheme which includes the embedded mitigation developed as part of the iterative design process described above.

6.2 Guidelines

This chapter outlines the relevant transport guidelines applicable to the Proposed Scheme. Alignment of the Proposed Scheme with current guidance at all levels is an important determining factor in planning decisions. The following sections demonstrate that the Proposed Scheme has this alignment and thus is compliant with transport and planning guidance.

Details of the national, regional and local transport policy application to the Proposed Scheme are outlined in Chapter 2 (Need for the Proposed Scheme).

6.2.1.1 Traffic and Transport Assessment Guidelines

To determine the traffic and transport impact that the Proposed Scheme has in terms of an increase in general traffic flows on the direct and indirect study areas, a robust assessment has been undertaken, with reference to Transport Infrastructure Ireland's (TII) most recent Traffic and Transport Assessment Guidelines (TII 2014).

This document is considered best practice guidance for the assessment of transport impacts related to changes in traffic flows due to proposed developments and is an appropriate means of assessing the impact of general traffic trip redistribution on the surrounding road network.

According to Section 1.3 of the Traffic and Transport Assessment Guidelines (TII 2014):

'a Traffic and Transport Assessment is a comprehensive review of all the potential transport impacts of a proposed development or re-development, with an agreed plan to mitigate any adverse consequences'.

The guidelines aim to provide a framework to promote an integrated approach to development, ensuring that proposals promote more efficient use of investment in transportation infrastructure which reduces travel demand and promotes road safety and sustainable travel. The document is considered best practice guidance for the assessment of transport impacts related to changes in traffic flows due to proposed developments and is generally an appropriate means of assessing the traffic and transport impact of additional trips on the surrounding road network.

6.2.1.2 Design Manual for Urban Roads and Streets

The Design Manual for Urban Roads and Streets (DMURS) (DTTS 2019) promotes an integrated street design approach within urban areas (i.e. cities, towns, and villages) focused on:

- Influence by the type of place in which the street is located; and
- Balancing the needs of all users.

A further aim of this Manual is to put well designed streets at the heart of sustainable communities to promote access by walking, cycling and public transport.

The principles, approaches and standards set out in this Manual apply to the design of all urban roads and streets (with a speed limit of 60 km/h or less), except: (a) Motorways (b) In exceptional circumstances, certain urban roads and streets with the written consent of Sanctioning Authorities.

The Manual is underpinned by a holistic design-led approach, predicated on a collaborative and consultative design process. There is specific recognition of the importance to create secure and connected places that work for all, characterised by creating new and existing streets as attractive places with high priority afforded to pedestrians and cyclists while balancing the need for appropriate vehicular access and movement.

To achieve a more place-based/integrated approach to road and street design, the following four core principles are promoted within the manual:

- Connected Networks - To support the creation of integrated street networks which promote higher levels of permeability and legibility for all users, and with emphasis on more sustainable forms of transport;
- Multi-Functional Streets - The promotion of multi-functional, place-based streets that balance the needs of all users within a self-regulating environment;
- Pedestrian Focus - The quality of the street is measured by the quality of the environment for the user hierarchy pedestrians considered first; and
- Multi-disciplinary Approach - Greater communication and co-operation between design professionals through the promotion of a plan-led, multidisciplinary approach to design.

6.2.1.3 Traffic Signs Manual (Chapter 8: Temporary Traffic Measures and Signs for Roadworks)

The Traffic Signs Manual (DTTS, 2019) promotes safety, health and welfare for road workers and users. The manual details the traffic signs which may be used on roads in Ireland, including sign layout, sign symbols, the circumstances in which they are required, and the associated rules for positioning them.

Of direct relevance to the assessment of traffic and transport impacts, Chapter 7 - Road Markings outlines the function of road markings, the legalities of road markings and the application of road markings on roads in Ireland. Chapter 8 - Temporary Traffic Measures and Signs for Roadworks outlines the application of temporary traffic management (TTM) at work sites on public roads; this chapter offers instructions and guidance to road users in relation to the use of TTM and outlines the signs to be used at roadworks.

6.2.1.4 Traffic Management Guidelines

The Traffic Management Guidelines (DOT, 2002) provides guidance on a number of issues including, but not limited to, traffic planning, traffic calming and management, incorporation of speed restraint measures and the provision of suitably designed facilities for public transport users and vulnerable road users.

A core component of the Guidelines is rooted in decision making and balancing priorities, including those that are in conflict with one another. The Guidelines

identifies common objectives to be addressed when managing the transport network:

- Environmental improvement;
- Congestion relief;
- Capacity improvement;
- Safety;
- Accessibility;
- Economic vitality; and
- Politics.

The Proposed Scheme has been designed and assessed with reference to the set of guidance documents listed throughout this section.

6.3 Methodology

6.3.1 Study Area

The direct and indirect impacts have been considered with reference to the following study area extents (as shown in Diagram 6.2):

- Direct Study Area – The Proposed Scheme (i.e. the transport network within the red line boundary); and
- Indirect Study Area – This is the area of influence the Proposed Scheme has on changing traffic volumes above a defined threshold with reference to TII's Traffic and Transport Assessment Guidelines (May 2014)

Diagram 6.2: Study Area

6.3.2 Proposed Scheme Impact Assessment Modelling Tools

This section summarises the various transport modelling tools that have been developed and used to inform the preparation of this chapter of the EIAR. The purpose of each tool has been detailed and its use for each element of the Proposed Scheme has been defined.

The modelling tools that have been developed do not work in isolation but instead work as a combined modelling system driven by the NTA's Western Regional Model (WRM) as the primary source for multi-model demand and trip growth. Demand information is then passed to the cordoned Local Area Model (LAM) and a micro-simulation model which have been refined and calibrated to represent local conditions to a greater level of detail than that contained in the WRM.

In summary, there are three tiers of transport modelling which have been used to assess the Proposed Scheme (see Diagram 6.3):

- **Tier 1 (Strategic Level):** The NTA's Western Regional Model (WRM) is the primary tool which has been used to undertake the strategic modelling of the Proposed Scheme and has provided the strategic multi-modal demand outputs for the proposed forecast years;
- **Tier 2 (Local Level):** The LAM has been developed to provide a more detailed understanding of traffic movement at a local level. The LAM is a subset model created from the WRM and is a more refined road network model used to provide consistent road-based outputs to inform this chapter. This includes information such as road network speed data, traffic redistribution impacts the Operational Phase. The LAM also provides traffic flow information for the micro-simulation model; and
- **Tier 3 (Corridor Level):** A micro-simulation model of the full 'end to end' corridor has been developed for the Proposed Scheme. The primary role of the micro-simulation model has been to support the ongoing development of junction designs and traffic signal control strategies and to provide bus journey time information for reporting purposes.

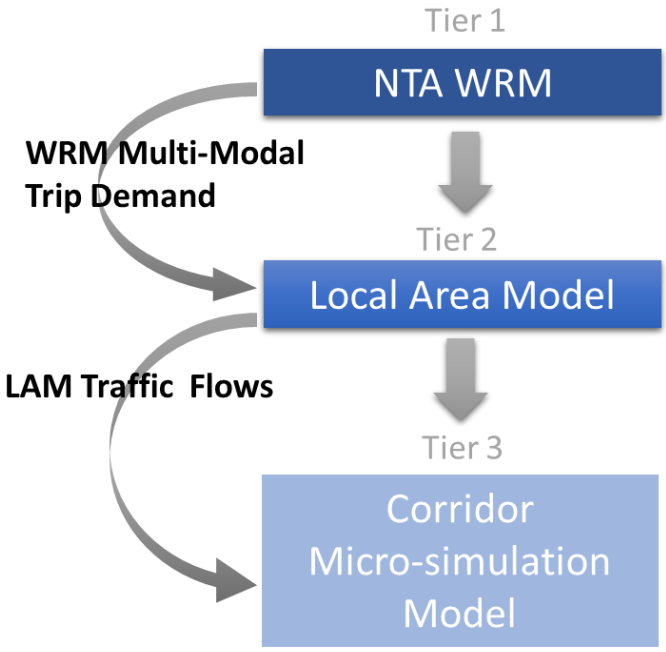

Diagram 6.3: Proposed Scheme Modelling Hierarchy

Further detail on the transport model development process, the traffic data inputs used, the calibration, validation and forecast model development for the suite of transport models can be found in Appendix 6.1 (Transport Modelling Report) in Volume 4 of this EIAR.

6.3.3 Appraisal Method for the Assessment of Impacts

6.3.3.1 Overview

This section details the methodologies that have been used to assess the potential traffic and transport impacts of the Proposed Scheme during both the Construction and Operational Phases. The assessments have been carried out as follows:

- Outlining the Assessment Topics;
- Determining the Predicted Magnitude of Impacts;
- Defining the Sensitivity of the Environment; and
- Determining the Significance of Effects.

The above approach has been carried out in accordance with procedures described in the Guidelines to be Contained in EIARs (EPA 2022) and methodologies outlined in the 'Traffic and Transport Assessment Guidelines (TII 2014), using a Multi-Modal Level of Service (LoS) approach.

6.3.3.2 Outlining Assessment of Topics

The traffic and transportation impacts have been broken down into the following assessment topics for both the Construction and Operational Phases:

The qualitative assessments:

- Pedestrian Infrastructure: The changes to the quality of the pedestrian infrastructure as a result of the Proposed Scheme;
- Cycling Infrastructure: The changes to the quality of the cycling infrastructure as a result of the Proposed Scheme;
- Bus Infrastructure: The changes to the quality of the bus infrastructure as a result of the Proposed Scheme; and
- Parking / Loading: The changes to the availability of parking and loading as a result of the Proposed Scheme.

The quantitative assessments, which have been undertaken using the Proposed Scheme modelling tools described previously:

- People Movement: An assessment has been carried out to determine the potential impact that the Proposed Scheme will have on the projected volume of people (by mode – Walking, Cycling, Bus and General Traffic) moving along the Proposed Scheme during the Operational Phase only;
- Bus Performance Indicators: The changes to the projected journey times and reliability for buses as a result of the Proposed Scheme; and
- General Traffic: The direct and indirect impacts on general traffic using the Proposed Scheme and surrounding road network.

6.3.3.3 Determining the Predicted Magnitude of Impacts

The methodology used for determining the predicted magnitude of impacts has considered the traffic and transport conditions of the environment before and after the Proposed Scheme is in place.

The impact assessments have been carried out using the following scenarios:

- 'Do Nothing' – The 'Do Nothing' scenario represents the current baseline traffic and transport conditions study area without the Proposed Scheme in place and other GTS projects, outlined in Section 6.2. This scenario forms the reference case by which to compare the Proposed Scheme ('Do Something') for the qualitative assessments only.
- 'Do Minimum' – The 'Do Minimum' scenario (Opening Year 2023, Design Year 2038) represents the likely traffic and transport conditions of the study area, including for any transportation schemes which have taken place, been approved or are planned for implementation as part of the GTS, without the Proposed Scheme in place. This scenario forms the reference case by which to compare the Proposed Scheme ('Do Something') for the quantitative assessments.
- 'Do Something' – The 'Do Something' scenario represents the likely traffic and transport conditions of the study area including for any transportation schemes which have taken place, been approved or are planned for implementation, with the Proposed Scheme in place (i.e. the Do Minimum scenario with the addition of the Proposed Scheme). The Do Something scenario has been broken into two phases:

- Construction Phase (Construction Year 2023) – This phase represents the single worst-case period which will occur during the construction of the Proposed Scheme;
- Operational Phase (Opening Year 2023, Design Year 2038) – This phase represents when the Proposed Scheme is fully operational.
    - Opening Year assessment is based on the same network as the base year plus other committed schemes;
    - Design year assessment is based in the context of the full implementation of the GTS network re-design (including the Galway City Ring Road) in both the Do Minimum and Do Something scenarios, with the Proposed Scheme servicing the new GTS services.

The changes between the Do Minimum and Do Something scenarios have been presented in either a positive, negative or neutral Quality of Impact as a result of the Proposed Scheme, depending on the assessment topic. A high, medium, low or negligible rating has been applied to each impact assessment to determine the Magnitude of Impact.

Level of Service Impact Assessment

To outline the changes in conditions between the Do Minimum and Do Something scenarios a Level of Service (LoS) approach has been developed for the impact assessments, where appropriate. This concept allows a straightforward comparison of two differing scenarios using a series of metrics specifically developed for this purpose.

The concept of LoS was originally developed in the United States' Transportation Research Board's (TRB) Highway Capacity Manual (HCM, 2000). Under this concept, potential values for a performance measure are divided into six ranges, with each range assigned a letter grade ranging from "A" (highest quality) to "F" (lowest quality). LoS concepts are applied universally throughout the world, and have their basis in Highway Capacity Manual and, particularly for bus network assessments, in the Transit Capacity and Quality of Service Manual (TRB 2003).

LoS concepts are not target based or rigid in their application and bespoke versions are developed to suit the particular receiving environment of the scheme under consideration or the particular user problems that the scheme and/or project is seeking to address. A mix of quantitative and qualitative indicators can be used and summarised as a LoS. The process enables integrated planning and decision making across all modes rather than any specific mode which can create a bias in the assessment process (e.g. focusing on Car Volume over Capacity (V/C)). It is intended that the LoS framework for the Proposed Scheme will provide an easily understandable summary of the impact of each assessment topic, where applied.

6.3.3.4 Defining the Sensitivity of the Environment

The impact assessment sensitivities established for the Traffic and Transport Chapter have been informed using the following data sources:

- OpenStreet / Google Maps – to identify community facilities, and open spaces within 50m of the Proposed Scheme; and

- The LAM (NavStreets) and Google Traffic data – to identify the capability of roads to cater for traffic volumes and existing congested junctions / road links.

The content of Table 6.3 outlines the sets of sensitivity ratings that have been applied to the impact assessments, depending on whether the assessment location is directly within the corridor, or indirectly associated with the corridor.

Table 6.3: Traffic & Transport Sensitives

Assessment Area	Sensitivity			
	High	Medium	Low	Negligible
Proposed Scheme Sensitives	Sections of the Proposed Scheme that are in the vicinity of community facilities such as schools or colleges, neighbourhood centres; AND currently experiencing congestion for pedestrians, cyclists, buses or general traffic	Sections of the Proposed Scheme that currently experience congestion for pedestrians, cyclists, buses or general traffic that have not been identified as high sensitivity	Sections of the Proposed Scheme near public open space, nature conservation areas, residential areas that have not been identified as medium or high sensitivity	Areas of low sensitivity to traffic flows i.e. isolated sites or areas with a high standard road network
Indirect Associated Area	Category 5: Low capacity, low operating speeds. Local and minor roads.	Category 4: High capacity, moderate operating speeds. Roads connecting between neighbourhoods.	Category 3 roads: High capacity, high operating speeds (less than Category 2). Roads connecting Category 2 roads.	Category 1: High capacity, high operating speeds. Roads connecting between major cities or urban areas; and

6.3.3.5 Determining the Significance of Effects

The Significance of Effects rating has been established using Table 6.4, which was derived from Diagram 3.5 of the EPA Guidelines on EIARs. This enables the sensitivities and magnitudes of impact to determine the significance of a particular effect. For example, a section of a Proposed Scheme with a High sensitivity and a Long-term, Medium, Positive impact would have a potential 'Positive, Very Significant and Permanent' effect. A section of a Proposed Scheme with a low sensitivity and a short-term low negative impact would have a potential 'Negative, Slight and Temporary' effect.

Table 6.4: Significance of Effects Matrix for Traffic and Transport Chapter

Description Impact	**Sensitivity of Existing Environment**			
	High	**Medium**	**Low**	**Negligible**
High	Profound	Very Significant	Moderate	Slight
Medium	Very Significant	Significant	Moderate	Not Significant
Low	Moderate	Moderate	Slight	Not Significant
Negligible	Not Significant	Not Significant	Not Significant	Imperceptible

The definitions for the Significance of Effects ratings for the Proposed Scheme ranging from Imperceptible to Profound are outlined in Table 6.5.

Table 6.5: EIAR Impact Significances

Significance of Effects (EPA)	**Typical Criteria Descriptors**
Imperceptible	An effect capable of measurement but without significant consequences.
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics

Potential mitigation and monitoring measures have been considered for assessments that result in a negative effect and significant or higher (i.e. significant, very significant or profound).

6.3.4 Data Collection and Collation

The assessment of the Traffic & Transport impacts of the proposed scheme has two distinct parts namely, qualitative methods which consider the physical

changes to transport networks and quantitative methods which are based upon traffic modelling. The following sections describe the data collection and collation for each method of assessment.

6.3.4.1 Qualitative Assessment Data Collection

Site Surveys

A walkover of the route of the Proposed Scheme was undertaken and photographs were used to record locations of particular importance. This ensures an up to date record of the existing environment was used to complete the qualitative assessment. The surveys focussed on the following aspects which are relevant to the assessment:

- Provision for the movement of pedestrians, cyclists and vehicles;
- Location of, and facilities at, bus stops; and
- Existing parking and loading facilities.

These surveys were supplemented by specially commissioned aerial orthophotography along the full length of the Proposed Scheme.

Mapping Data

Two sources of mapping data have been used to inform the analysis, NavStreets and OpenStreet Map.

NavStreets is a street-level GIS dataset which covers the Republic of Ireland, including the proposed scheme area. Two sets of data from this dataset have been used to inform the EIAR:

- Road Network: Functional Class of each road link in the road network, which is a road type indicator, reflecting traffic speed and volume, as well as the importance and connectivity of the road. The Functional Class information has been used to help inform the metrics for identifying the sensitivities of roads in the indirect study area; and
- Points of Interest: NavStreets contains information on a wide range of "points of Interest". This has been referred to when identifying sensitive community receptors, such as schools, healthcare facilities, places of worship, retail clusters, etc, when determining how sensitive a particular location is to changes in terms of traffic and transport facilities.

OSM and NavStreets have been supplemented by OpenStreet Map which is an open-source database of geographic data (i.e. Points of Interest, Land Use and Places of Worship). This has been used to further identify community facilities and open spaces in proximity to the Proposed Scheme.

6.3.4.2 Quantitative Assessment Data Collection

This section discusses the data collection undertaken to inform the quantitative assessment metrics set out in Section 6.3.4.2. Further detail can be found in Appendix 6.1 (Transport Modelling Report) in Volume 4 of this EIAR.

Existing Data Review (Gap Analysis)

A review of existing traffic survey data available for the area of interest was undertaken from the following sources:

- Galway City Council: A mixture of Automatic Traffic Counts (ATC) and Junction Turning Counts (JTC) from previous studies covering a range of years.

Information on bus passenger volumes was already available and included in the modelling process as part of the WRM base model calibration and validation as well as ticketing data.

Junction Turning Counts (JTCs)

The JTCs are 24-hour counts broken down into 15-minute segments over a full day. All main junctions along the Proposed Scheme have been included and provide information on the volume, and types of vehicles, making turning movements at each location. This data is utilised within the models to ensure that the flow of vehicles through the main junctions on the network is being represented accurately.

Automatic Traffic Counts (ATCs)

The ATC data provides information on:

- The daily and weekly profile of traffic along the Proposed Scheme; and
- Busiest time periods and locations of highest traffic demand on the network.

The ATCs were taken for an entire week. A summary of the collected data can be found in Appendix 6.1 (Transport Modelling Report) in Volume 4 of this EIAR.

Road and Bus Journey Time Data

Bus Journey Time Data

Bus Journey time data for the Proposed Scheme was provided by the National Transport Authority (NTA) from the Automatic Vehicle Location (AVL) dataset used to monitor bus performance. The data provides information on bus travel time and dwell times at existing bus stops and has been used to inform the development of the transport models used to assess the impacts of the Proposed Scheme.

TomTom Road Journey Time Data

Road Journey time data for the Proposed Scheme models has been sourced from TomTom, who calculate journey times using vehicle position data from GPS-enabled devices and provide this on a commercial basis to a number of different users. The NTA purchased a license to access the anonymised Custom Area Analysis dataset through the TomTom TrafficStats portal. The NTA has an agreement with TomTom to provide travel time information covering six areas of Ireland and for certain categories of road.

The data is provided in the form of a GIS shapefile and accompanying travel time database file. The shapefile contains topographical details for each road segment, which is linked to the travel time database via a unique link ID. The database file then contains average and median travel time, average and median speed, the standard deviation for speed, the number of observations and percentile speeds ranging from 5 to 95 for each link.

TomTom Data Processing

In order to compare the journey times of specific links and routes between the TomTom data and the road assignment models, the two datasets were linked. After importing both the road assignment model and TomTom networks into the GIS environment, ensuring both datasets are in the same coordinate system, the selected routes were then linked using a spatial join functionality.

Before applying the data to the models, it was checked to ensure that it was fit for purpose. The review included checks of the number of observations that form the TomTom average and median times and checks of travel times against Google Maps travel times.

The TomTom Custom Area Analysis dataset was processed to provide observed journey times against which the strategic and micro-simulation models could be validated along the Proposed Scheme route.

TomTom Data Application

The processed journey time data was used to validate the LAM and the micro-simulation models at an end-to-end travel time level, with intermediate segment travel times used to inform the calibration of both models. Further information about the journey time validation process can be found in Appendix 6.1 (Transport Modelling Report) in Volume 4 of this EIAR.

6.4 Baseline Environment

6.4.1 Overview

This section provides an overview of the existing traffic and transport conditions in the area surrounding the scheme and is informed by desk-based research. These baseline conditions have been identified so the context of the Proposed Scheme and its potential impacts on the local highway and transport network can be fully understood.

The scheme has been divided into 11 sections, outlined in Diagram 6.4: below. The extent of each section is described below:

- Section 1: University Road to St. Francis Street Junction;
- Section 2: St. Francis Street to Eglinton Street;
- Section 3: Eyre Square to Forster Street;
- Section 4: College Road (Forster Street to Lough Atalia Road);
- Section 5: College Road (Lough Atalia Road to Moneenageisha Junction);
- Section 6: R338 Dublin Road;

- Section 7: Fairgreen Road;
- Section 8: Bóthar Uí Eithir and Prospect Hill;
- Section 9: Bothar na mBan/ St. Brendan's Avenue / Dyke Road/ Headford Road;
- Section 10: Woodquay / Walsh's Terrace / Daly's Place / Mary Street; and
- Section 11: Forthill Street / Merchants Road / Queen Street.

It is of note that the bus frequency data is based on services from the two main operators: City Direct and Bus Eireann. Whilst other operators do service the study area, these services are minor in comparison to the two main operators.

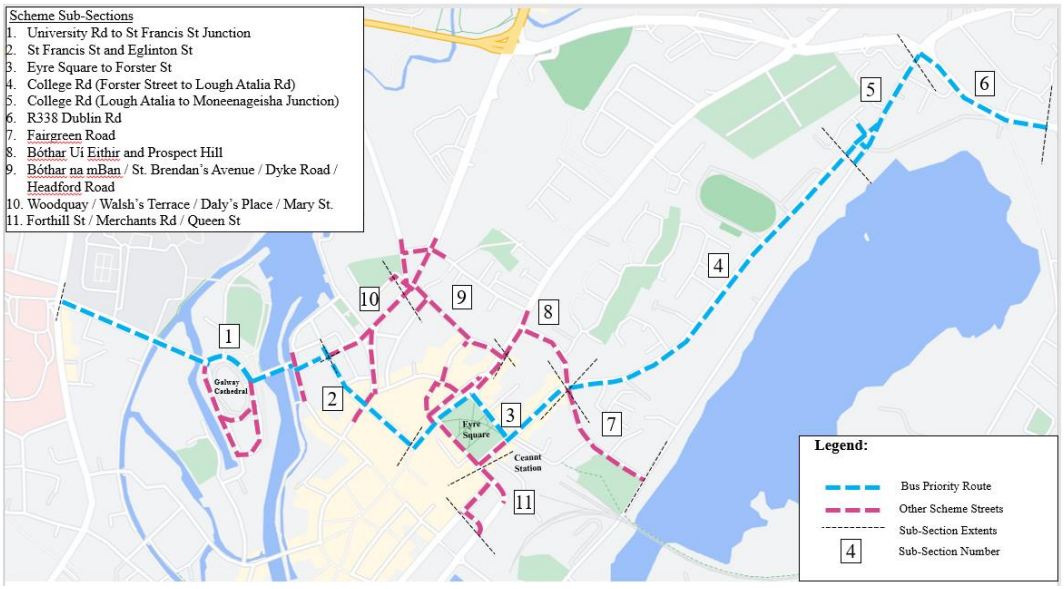

Diagram 6.4: Sections of Proposed Scheme

6.4.1.1 Mode Share

The existing average mode share across a 24 hour period along the whole corridor is shown in Diagram 6 below. This data has been extracted from the WRM model, for a 2019 base scenario.

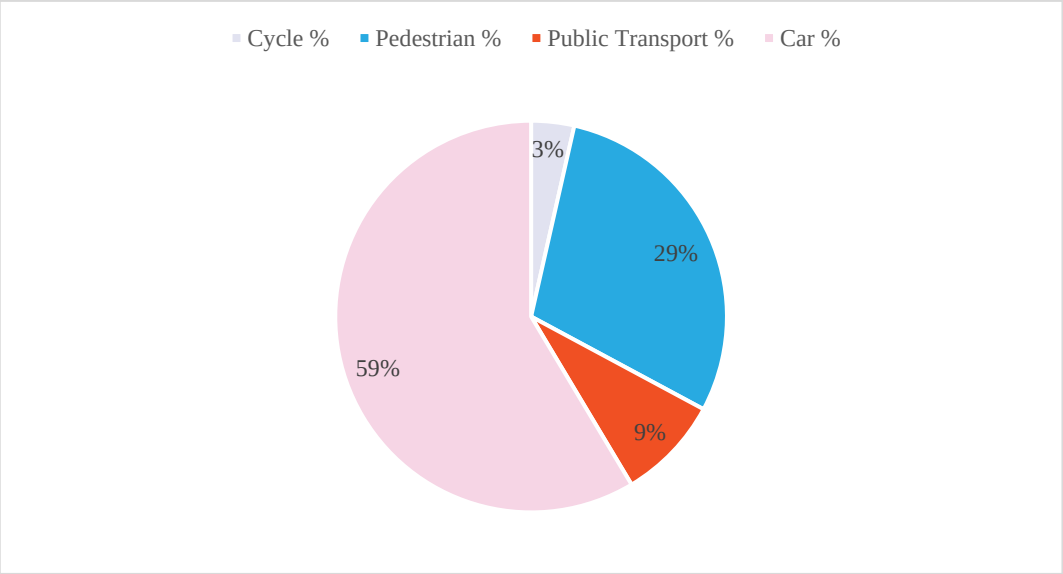

Diagram 6.5: Existing Mode Share

The diagram demonstrates that car is the most common form of transport at 59% of the mode share. Pedestrian is the second most common form of transport at 29%. Cyclists only make up 3% of the total mode share.

6.4.1.2 Existing Junction Capacity

The average capacity at key junctions during the AM peak is shown in Diagram 6.6 below. It is noted that a number of junctions are located outside of the direct study area, however, these junctions may be impacted through the addition of the Proposed Scheme, due to the redistribution of general traffic. The diagrams only show junctions operating with above an 85% volume over capacity (V/C) ratio.

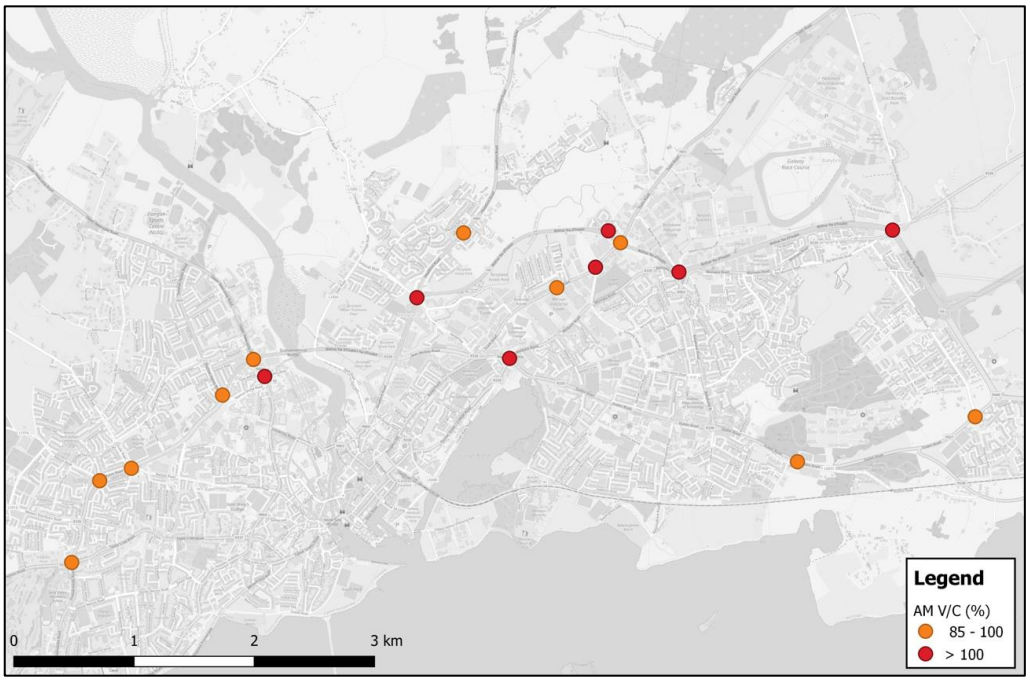

Diagram 6.6: Junction Capacity AM Peak

Diagram 6.7 demonstrates that, in total, seven junctions are currently operating over theoretical capacity during the AM Peak Hour (>100% V/C ratio). 10 junctions are operating with a V/C ratio of between 85% and 100%.

The average capacity at key junctions during the PM peak is shown in Diagram 6.7: below.

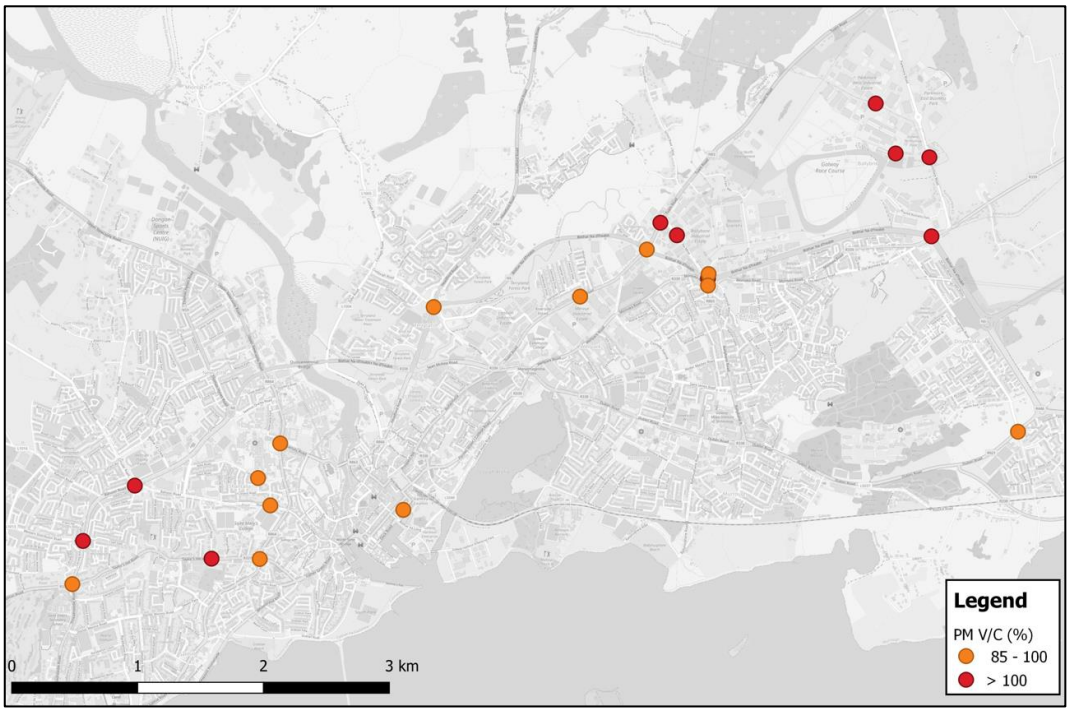

Diagram 6.7: Junction Capacity PM Peak

Diagram 6.7: demonstrates that a total nine junctions are currently operating over theoretical capacity during the PM Peak Hour (>100% V/C ratio). 12 junctions are operating between 85% and 100% theoretical capacity.

6.4.1.3 Automatic Vehicle Location Journey Times

Automatic Vehicle Location (AVL) systems are required for service control of buses, communications with drivers, and the current generation of real-time information for on-street displays, websites, and mobile apps. The information recorded by AVL is also central to the tracking of operational performance by following metrics on routes such as punctuality (journey times) and stops serviced. Therefore, by taking a sample of this AVL dataset, a picture can be formed of the average journey times for various services including their reliability.

A sample was taken for the 404 bus route in the month of November in 2019 between two stops which correspond to the start and end points of the proposed scheme as shown in Diagram 6.8 (to the west on University Road, near the junction with Newcastle Road and to the east on the Dublin Road via the Lakeview School).

Diagram 6.8: 404 Bus Route covered by AVL Data

The data was analysed for the average weekday in November 2019 for both eastbound and westbound services and a profile across the 7:00 – 19:00 period was generated. Table 6.6 and Diagram 6.9 show the journey times in the westbound direction.

Table 6.6: AVL Journey Time Data – Average Weekday (Westbound Services)

Time	Average Planned Running Time (min)	Average Actual Running Time (min)	25% of Buses reaching the 2nd stop within this time	75% of Buses reaching the 2nd stop within this time	95% of Buses reaching the 2nd stop within this time
07:00	16	16	14	18	20
07:30	18	16	14	18	19
08:00	18	17	15	19	21
08:30	13	15	12	18	21
09:00	13	17	14	20	22
09:30	16	16	14	19	20
10:00	16	17	14	20	22
10:30	17	19	14	24	28
11:00	17	17	13	21	23
11:30	17	19	17	22	24
12:00	17	18	16	19	20
12:30	16	17	15	19	20
13:00	16	20	16	23	26
13:30	16	18	14	23	27
14:00	16	17	14	20	23
14:30	16	18	13	24	28
15:00	16	16	13	19	22

Time	Average Planned Running Time (min)	Average Actual Running Time (min)	25% of Buses reaching the 2nd stop within this time	75% of Buses reaching the 2nd stop within this time	95% of Buses reaching the 2nd stop within this time
15:30	16	17	14	21	23
16:00	16	21	17	26	30
16:30	16	20	14	27	31
17:00	16	24	19	30	34
17:30	16	20	16	25	28
18:00	16	18	13	23	26
18:30	16	16	13	18	20

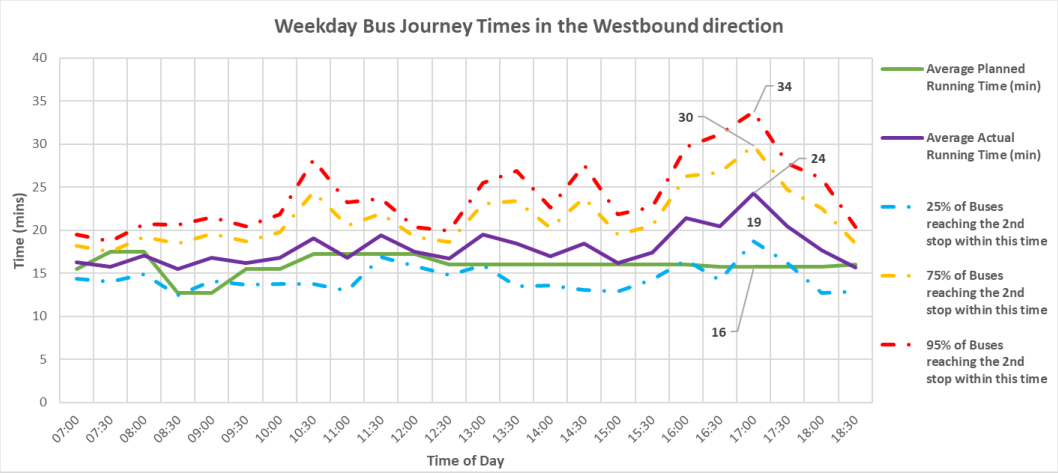

Diagram 6.9: Average Weekday Bus Journey Time Profile (Westbound Services)

For the westbound services, the AVL data shows a high degree of variability in journey times across the entire day with the worst periods occurring around 10:30 A.M. and from midday onwards with the peak occurring in the evening peak hour around 17:00 P.M. At this time, we see the average running time is expected to be 16 minutes between the two stops (on the Dublin Road and on University Road) but the average is actually 24 minutes (a 54% increase), with 75% of buses reaching the 2nd stop within 30 minutes (89% increase) and 95% of buses reaching the 2nd stop within 34 minutes (114% increase).

Table 6.7 and Diagram 6.10 show the journey times in the eastbound direction.

Table 6.7: AVL Journey Time Data – Average Weekday (Eastbound Services)

Time	Average Planned Running Time (min)	Average Actual Running Time (min)	25% of Buses reaching the 2nd stop within this time	75% of Buses reaching the 2nd stop within this time	95% of Buses reaching the 2nd stop within this time
07:00	17	18	16	19	20
07:30	17	16	14	17	18
08:00	20	18	16	21	23

Time	Average Planned Running Time (min)	Average Actual Running Time (min)	25% of Buses reaching the 2nd stop within this time	75% of Buses reaching the 2nd stop within this time	95% of Buses reaching the 2nd stop within this time
08:30	20	16	12	20	23
09:00	17	14	11	16	18
09:30	17	14	11	16	19
10:00	17	14	12	16	18
10:30	17	15	13	17	19
11:00	17	16	15	18	19
11:30	17	17	13	20	22
12:00	18	17	14	20	22
12:30	18	19	15	23	26
13:00	18	20	15	25	29
13:30	18	21	9	33	41
14:00	20	21	12	29	35
14:30	20	19	11	28	34
15:00	20	22	15	28	33
15:30	20	28	19	37	44
16:00	25	38	18	57	71
16:30	25	33	22	45	53
17:00	22	23	16	31	36
17:30	22	18	14	22	25
18:00	14	14	12	16	17
18:30	14	15	10	19	23

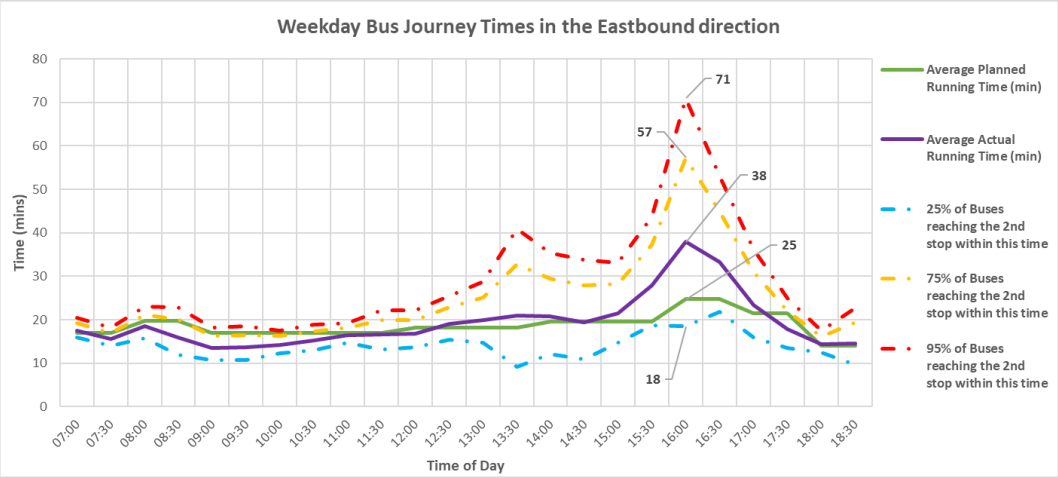

Diagram 6.10: Average Weekday Bus Journey Time Profile (Eastbound Services)

For the eastbound services, the AVL data shows a high degree of variability in journey times from midday onwards with the peak occurring in the evening around 16:00 P.M. At this time, we see the average running time is expected to be 25 minutes between the two stops (on University Road and on the Dublin Road) but the average is actually 38 minutes (a 53% increase), with 75% of buses reaching the 2nd stop within 57 minutes (131% increase) and 95% of buses reaching the 2nd stop within 71 minutes (187% increase).

6.4.2 Section 1 – University Road to St Francis Street Junction

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 1 of the Proposed Scheme, between University Road and the St Francis Street.

Section 1 comprises University Road, Gaol Road, Salmon Weir Bridge, St. Vincent's Avenue, Newtownsmith and Waterside.

6.4.2.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 1 of the Proposed Scheme. The footpaths are all a minimum of 1.8m wide.

There are several controlled pedestrian crossings along Section 1 which benefit from tactile paving and dropped kerbs. Controlled crossings can be found at the following locations:

- Signalised pedestrian crossings on all four arms of the University Road / Newcastle Road Junction;
- Signalised pedestrian crossing on University Road, approximately 46m west from University Road / Canal Road Upper junction; and
- A signalised pedestrian crossing on the southern arm at the University Road/ Gaol Road Junction.

Uncontrolled crossings across priority junctions at side roads benefit from dropped kerbs.

Further details of the baseline pedestrian facilities (i.e. routing, directness, accessibility, crossing and footpath widths) at the junctions along Section 1 of the Proposed Scheme are included in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

6.4.2.2 Cycling Infrastructure

There is no on or off-road cycle infrastructure along Section 1 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

There are stands for TFI cycle hire facility at the following locations:

- 32 stands at University Hospital Galway, immediately to the west of the Newcastle Road / University Road junction;
- 20 stands at (Galway) Cathedral on University Road, 50m to the northwest of the University Road (Salmon Weir Bridge) / Gaol Road junction; and
- 20 stands at Gaol Road, immediately to the east of the Nun's Island / Gaol Road junction.

6.4.2.3 Bus Infrastructure

Bus Priority Measures

There are no bus lanes along Section 1 of the Proposed Scheme.

Bus Stop Facilities

There are currently three bus stops along Section 1 of the Proposed Scheme. The westbound bus stop is as follows:

- Stop 523031 on University Road, at the University Road/NUI Galway junction - flag and pole stop with real time information

The eastbound bus stops are as follows:

- Stop 522561 on University Road, at the University Road/NUI Galway junction - provides a shelter and timetable information
- Stop 523181 on University Road, to the north of Galway Cathedral – flag and pole stop with timetable information

The main bus services which operate along Section 1 are outlined in Table 6.8.

Table 6.8: Section 1 – Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
402	Shangort Road – Knocknacarra – Taylors Hill Road – University Road – Eyre Square – Dublin Road (G Hotel) – Merlin Park Terminus	30 mins	30 mins – 1 hour
404	Oranmore – Dublin Road – College Road – Eyre Square – University Road – Thomas Hynes Road – Westside Shopping Centre	30 mins	30 mins
405	Gort Na Bro (B&Q) – Seamus Quirke Road – University Road – Eyre Square – Tuam Road – Ballybane Road – Ballybane Industrial Estate	20 mins	20 mins – 30 mins
410	Cappagh Road – Knocknacarra – Upper Salthill Road – University Road – Eyre Square	1 hour	1-2 hrs (no Sunday service)
411	Cappagh Road – Ballymoneen Road – Rahoon Road – University Road – Eyre Square	30 mins	30 mins
412	Cappagh Road – Ballymoneen Road – Seamus Quirke Road – Eyre Square	30 mins	NA

Service	Route	Typical Service Frequency	
		Weekday	Weekend
414	Barna – Cappagh Road – Western Distributor Road – Rahoon Road – Eyre Square	2/3 services daily	NA
424	Costello – Barna – Upper Salthill Road – Galway Bus Station	Only one bus daily for this section of the Proposed Scheme	NA

6.4.2.4 General Traffic

University Road (R863)

University Road is a single carriageway with one lane travelling in each direction. It extends to Newcastle Road to the west and St Vincent's Avenue to the east. Salmon Weir Bridge is situated along University Road, it has one traffic lane in each direction and footpaths on both side of the road.

Gaol Road

Gaol Road has an orbital layout around Galway Cathedral and the cathedral car park, joining to University Road on either side of the cathedral. There is a one-way system around the car park and on the western side of the cathedral. The road is two-way between the car park and the cathedral and on the eastern side of the cathedral, connecting to University Road at Salmon Weir Bridge.

Newtownsmith

Newtownsmith is a narrow carriageway (two-way traffic permitted). It connects to the R863 to the north and the Newtownsmith / Bowling Green / Mary Street junction to the south.

St. Vincent's Avenue (R863)

Within Section 1 of the Proposed Scheme, St. Vincent's Road routes between Salmon Weir Bridge and the St Francis Street / Courthouse Square four-arm signalised junction.

St Vincent's Avenue is a single carriageway with one lane travelling in each direction, which widens to two lanes in the eastbound direction approaching the junction with St. Francis Street.

6.4.2.5 Parking & Loading Facilities

The on-street and off-street parking facilities along Section 1 of the Proposed Scheme are outlined below.

On-street pay and display parking is in operation between 08:30 – 18:30 on Monday – Saturday and 13:00 – 18:00 on Sunday at the following locations:

- University Road – Pay and display parking and one loading bay (three spaces) located on sections to the west of Salmon Weir Bridge. 17 parking spaces are present.
- Gaol Road – Two (nine spaces) bus set down areas located on the eastern side of the road. Pay and display parking and loading bay located on the western side of the road, prior to the Gaol Road / Gaol Road junction. Four tour buses only parking spaces located prior to the Gaol Road/ University Road western junction. 10 parking spaces and two accessible spaces are present.
- Newtownsmith – Pay and display parking and one loading bay (three spaces) on one side of the road. Double yellow lines present on the other side of the road. 10 parking spaces are present.
- St Vincent's Avenue (R863) – no parking spaces present.

Galway Cathedral car park is located within the study area and is accessed from Gaol Road, comprising 152 parking spaces and five accessible spaces. It is a pay-on-foot car park. Charges are operational Monday – Sunday across a 24-hour period.

Parish of Cathedral Car Park is located within the study area and is accessed from Gaol Road comprising 150 parking spaces. It is a pay and display car park. Charges are operational 24hrs on Monday – Saturday and is free on Sundays.

In addition to the above, the following car parks are accessed from the roads within Section 1 of the Proposed Scheme, but are not included within the direct study area:

- Our Lady's College Galway, accessed from Newtownsmith, comprising 50 spaces one of which is an accessible space. Permit parking only during school hours, pay and display parking outside of school hours from 18:00-21:00 Monday – Friday and 08:00-21:00 Saturday – Sunday (Term time) and 08:00-21:00 Monday- Sunday (outside of term time);
- Newtownsmith Car Park, accessed from the south west of Newtownsmith, comprising 40 spaces one of which is an accessible space. Pay and display car park. Charges are operational between 08:30 – 18:30 on Monday – Saturday and 13:00 – 18:00 on Sunday.

Market Square and Bowling Green, and NUI Galway are also located in the vicinity of the section and provide off-street parking.

6.4.3 Section 2 – St. Francis Street to Eglinton Street

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 2 of the Proposed Scheme, along St. Francis Street, Eglinton Street and Williamsgate Street.

6.4.3.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 2 of the Proposed Scheme. The footpaths are all a minimum of 1.8m wide.

Controlled pedestrian crossings in Section 2 of the Proposed Scheme that benefit from tactile paving and dropped kerbs are located:

- On all four arms at the St. Vincent's Avenue / St. Francis Street / Courthouse Square junction.

Uncontrolled crossings across priority junctions at side roads benefit from dropped kerbs.

Further details of the baseline pedestrian facilities (i.e. routing, directness, accessibility, crossing and footpath widths) at the junction are included in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

6.4.3.2 Cycle Infrastructure

There is no on or off-road cycle infrastructure (or stands for the cycle hire facility) along Section 2 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

6.4.3.3 Bus Infrastructure

Bus Priority Measures

There are no bus lanes along Section 2 of the Proposed Scheme.

Bus Stop Facilities

There are currently two bus stops along Section 2 of the Proposed Scheme. The westbound bus stops are as follows:

- Stop 523021 on St. Francis Street, to the north of St. Francis Street / Eglinton Street / Dalys Place / Mary Street junction – flag and pole stop, with real time information.

The eastbound bus stops are as follows:

- Stop 522591 on St. Francis Street, to the north of St. Francis Street / Eglinton Street / Dalys Place / Mary Street junction - flag and pole stop with timetable information

The main bus services which operate along Section 2 are outlined in Table 6.9.

Table 6.9: Section 2 - Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
402	Shangort Road – Knocknacarra – Taylors Hill Road – University Road – Eyre Square – Dublin Road (G Hotel) – Merlin Park Terminus	30 mins	30 mins – 1 hr
404	Oranmore – Dublin Road – College Road – Eyre Square – University Road – Thomas Hynes Road – Westside Shopping Centre	30 mins	30 mins
405	Gort Na Bro (B&Q) – Seamus Quirke Road – University Road – Eyre Square – Tuam Road – Ballybane Road – Ballybane Industrial Estate	20 mins	20 mins – 30 mins
407	Eyre Square – Francis Street - Headford Road – Tirrellan Heights – Bothair an Choiste	20 mins	30 mins – 1hr
410	Cappagh Road – Knocknacarra – Upper Salthill Road – University Road – Eyre Square	1 hr	1-2 hrs (no Sunday service)
411	Cappagh Road – Ballymoneen Road – Rahoon Road – University Road – Eyre Square	30 mins	3 0mins
412	Cappagh Road – Ballymoneen Road – Seamus Quirke Road – Eyre Square	30 mins	NA
414	Barna – Cappagh Road – Western Distributor Road – Rahoon Road – Eyre Square	2/3 services daily	NA
424	Costello – Barna – Upper Salthill Road – Galway Bus Station	Only one bus daily for this section of the Proposed Scheme	NA

6.4.3.4 General Traffic

St. Francis Street / Eglinton Street / Williamsgate Street (R863)

S.t Francis Street, Eglinton Street and Williamsgate Street are single carriageways with one lane travelling in each direction, with loading bays on the eastern side of the road between Dalys Place and William Street. It is noted that William Street, located to the south of Eglinton Street, is pedestrianised.

There are double yellow lines on both sides of Williamsgate Street.

6.4.3.5 Parking & Loading Facilities

The parking and loading facilities along Section 2 of the Proposed Scheme are as follows:

- St Francis Street – Double yellow lines present on both sides of the road. No parking spaces are available.

- Eglinton Street – One loading bay (six spaces) present on the eastern side of the road and double yellow present lines on the western side of the road. Time-plated clearway present which can fit up to nine parking spaces, where activity can occur outside of clearway hours of 11:00-19:30 Monday – Saturday.
- Williamsgate Street – Double yellow lines present on both sides of the road. One loading bay/ clearway (three spaces) present in the vicinity of Logues and the GBC Galway Bakery Company.

6.4.4 Section 3 – Eyre Square to Forster Street

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 3 of the Proposed Scheme, between Eyre Square, Prospect Hill and Forster Street.

Section 3 comprises Eyre Square, Rosemary Avenue, Eyre Street, Prospect Hill up to the Prospect Hill / Bothar Na mBan junction, and Forster Street up to the Bóthar Bhreandain Uí Eithir / Forster Street / Fairgreen Road junction.

6.4.4.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 3 of the Proposed Scheme. The footpaths are all a minimum of 1.8m wide along the majority of this route, however some pinch points are present along Forster Street, Rosemary Avenue and Eyre Street. In addition, Eyre Square west is fully pedestrianised and Rosemary Avenue has a section which is fully pedestrianised.

There are several controlled pedestrian crossings along Section 3 which benefit from tactile paving and dropped kerbs. Controlled crossings can be found at the following locations,

- A pelican pedestrian crossing on Williamsgate Street at Williamsgate Street / Rosemary Avenue junction;
- On the southern and western arms signalised at the Eyre Square / Prospect Hill junction;
- On the eastern and southern arms signalised at the Victoria Place / Eyre Square junction; and
- On the eastern, southern and northern arms signalised at the Eyre Square / Forster Street / Station Road junction.

Uncontrolled crossings across priority junctions at side roads benefit from dropped kerbs.

Further details of the baseline pedestrian facilities (i.e. routing, directness, accessibility, crossing and footpath widths) at the junctions along Section 3 of the Proposed Scheme are included in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

6.4.4.2 Cycle Infrastructure

There is no on or off-road cycle lane infrastructure along Section 3 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

There are stands for TFI cycle hire facility at the following locations:

- 24 stands at Brown Doorway on Eyre Square, 20m to the northeast of the Rosemary Avenue / Eyre Square junction; and
- 10 stands at Eyre Square South, 10m to the northwest of the Eyre Square / Forster Street / Station Road junction.

6.4.4.3 Bus Facilities

Bus Priority Measures

A bus lane is present on Forster Street in the eastbound direction, operating Monday to Saturday between 16:00 and 19:00. No other bus lanes are present along Section 3 of the Proposed Scheme.

Bus Stop Facilities

There are currently 10 bus stops along Section 3 of the Proposed Scheme. The westbound bus stops are as follows:

- Stop 5 on Eyre Square, 35m north from the Eyre Square / St Patricks Avenue junction – provides a shelter, seating and real time information;
- Stop 6 on Eyre Square, 20m north from the Eyre Square / St Patricks Avenue junction - provides a shelter, seating and real time information;
- Stop 7 on Eyre Square, 15m southeast from the Eyre Square / St Patricks Avenue junction – provides a shelter and real time timetable information;
- Stop 8 on Eyre Square, 30m southeast from the Eyre Square / St Patricks Avenue junction – provides a shelter, seating and real time information;
- Stop 9 on the southern corner of Eyre Square – provides a shelter, seating and real time information;
- Stop 524361 on Forster Street, 60 southwest from the Bóthar Bhreandain Uí Eithir / Forster Street / Fairgreen Road junction - flag and pole stop with timetable information.

The eastbound bus stops are as follows:

- Stop 1 on Eyre Square, between Rosemary Avenue and Prospect Hill – provides a shelter, seating and real time information;
- Stop 2 on Eyre Square, between Rosemary Avenue and Prospect Hill – provides a shelter and timetable information;
- Stop 3 on Eyre Square, between Rosemary Avenue and Prospect Hill -– provides a shelter, seating and real time information;
- Stop 4 on Eyre Square, between Rosemary Avenue and Prospect Hill– provides a shelter, seating and real time information.

The main bus services which operate along Section 3 are outlined in Table 6.10.

Table 6.10: Section 3 - Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
401	Parkmore Road – Monivea Road – Forster Street – Eyre Square – Salthill Road Lower	20 mins	20 mins
402	Shangort Road – Knocknacarra – Taylors Hill Road – University Road – Eyre Square – Dublin Road (G Hotel) – Merlin Park Terminus	30 mins	30 mins – 1hour
404	Oranmore – Dublin Road – College Road – Eyre Square – University Road – Thomas Hynes Road – Westside Shopping Centre	30 mins	30 mins
405	Gort Na Bro (B&Q) – Seamus Quirke Road – University Road – Eyre Square – Tuam Road – Ballybane Road – Ballybane Industrial Estate	20 mins	20 mins – 30 mins
407	Eyre Square – Francis St - Headford Road – Tirrellan Heights – Bothair an Choiste	20 mins	30mins – 1hour
409	Eyre Square – Dublin Road – Doughiska Road – Parkmore Road	10 mins	10mins– 20mins
411	Cappagh Road – Ballymoneen Road – Rahoon Road – University Road – Eyre Square	30 mins	30mins
412	Cappagh Road – Ballymoneen Road – Seamus Quirke Road – Eyre Square	30 mins	NA
414	Barna – Cappagh Road – Western Distributor Road – Rahoon Road – Eyre Square	2/3 services daily	NA
424	Costello – Barna – Upper Salthill Road – Galway Bus Station	1 – 2 hours	NA

6.4.4.4 General Traffic

Eyre Street

Eyre Street is a single lane, one-way road travelling eastbound between Rosemary Avenue and Eyre Square. It is right turn only from Eyre Street onto Eyre Square.

Rosemary Avenue

Rosemary Avenue is a paved single lane road between Eyre Square and Eyre Street. Rosemary Avenue yields to Eyre Street and there is no left turn permitted onto Eyre Street.

Eyre Square (R866)

Eyre Square has one lane of traffic travelling in each direction to the north and south of the square. Eyre Square East is one-way with two lanes travelling northbound. Eye Square to the west of the square is a pedestrian zone from Monday to Sunday between 11:00 and 06:00, i.e. it allows vehicles for loading activities each morning only.

Prospect Hill (R336)

Prospect Hill is a one-way road comprising with two lanes travelling eastbound between Eyre Square East and the Prospect Hill / Bothar Na mBan junction to the west within Section 3 of the Proposed Scheme.

Forster Street (R339)

Forster Street is a one-way road with one traffic lane and a bus lane travelling westbound. The bus lane is operational Monday – Saturday between 16:00 and 19:00. The road extends from the Bóthar Bhreandain Uí Eithir / Forster Road / Fairgreen Road junction to the east and connects Eyre Square to the west.

6.4.4.5 Parking & Loading Facilities

The parking and loading facilities along Section 3 of the Proposed Scheme is as follows:

- Eyre Street – Double yellow lines present on both sides of the road. No parking spaces are available.
- Rosemary Avenue – Double yellow lines present on both sides of the road. A bus set down area is present in front of the Imperial Hotel.
- Eyre Square East – Provides two taxi ranks (eight spaces) on the eastern of the road, operating Monday to Sunday between 18:30 and 06:00. In addition, two loading bays (six spaces) which also operate as taxi ranks from Monday to Sunday between 06:00 and 11:00 are present. Double yellow lines present on the reminder of the road.
- Eyre Square North – provides a bus set down area (six spaces) on the northern side of the road. There are double yellow lines on the southern side. One loading bay (two spaces), one taxi rank (14 spaces) and two accessible spaces are present.
- Prospect Hill – Provides four accessible parking spaces, a taxi rank (11 spaces) and two loading areas (eight spaces) on the southern side of the road, to the west of the Prospect Hill / Bóthar Na mBan junction. It is noted that informal parking for one vehicle occurs on the clearway, despite the clearway being 24hrs designation.
- Forster Street – Double yellow lines present on the southern side of the road. One loading area / taxi rank (six spaces) is present on the northern side, with operates 08:30-15:30 Monday – Saturday, for a maximum stay of 30mins. Section of bus lane present which operates from 16:00-19:00 Monday – Saturday. Eight parking spaces and two accessible spaces are present.
- Bothar Irwin – Located just outside of the study area, containing three pay and display spaces and one accessible space.

The Galway (Ceannt) Train Station off-street car park is located outside of the direct study area, but accessed from Eyre Square south, comprising 90 parking

spaces. Pay-on-foot[1] car park. Charges are operational Monday – Sunday across a 24hr period.

6.4.5 Section 4 – College Road (Lough Atalia to Fairgreen)

This section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 4 of the Proposed Scheme, along College Road.

Section 4 comprises of College Road between the Bóthar Bhreandain Uí Eithir / Forster Road / Fairgreen Road junction and College Road / Lough Atalia Road junction.

6.4.5.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 4 of the Proposed Scheme. The footpaths are a minimum of 1.8m wide along the majority of the route, however a pinch point with sub-standard footpath width is present in the vicinity of the Magdalene Convent.

There are no controlled pedestrian crossings along Section 4 of the Proposed Scheme, aside from signalised crossings on each arm of the junction at the start of this section.

There are various uncontrolled crossings across priority junctions at side roads along this section of the Proposed Scheme.

6.4.5.2 Cycle Infrastructure

There is no on or off-road cycle infrastructure along Section 4 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

There are stands for TFI cycle hire facility at the following location:

- 18 stands at Galway City Hall, 45m to the west of the junction of Forster Street / College Road / access to Galway City Council.

6.4.5.3 Bus Facilities

Bus Priority Measures

There are no bus lanes along Section 4 of the Proposed Scheme.

Bus Stop Facilities

There are currently six bus stops along Section 4 of the Proposed Scheme. The westbound bus stops are as follows:

[1] Pay-on-foot is a time-based charging system, whereby payment is made at the end of the parking period, on exit. This different from pay and display, whereby payment is on time-estimated, at the beginning of the parking period, on arrival.

- Stop 523691 on College Road, at the College Road / Glenmore junction – flag and pole stop with timetable information;
- Stop 523681 on College Road, adjacent to Galway Greyhound Stadium – flag and pole stop with timetable information;
- Stop 523671 on College Road, 55m southwest to College Road / Loyola Park junction – provides a shelter and timetable information.

The eastbound bus stops are as follows:

- Stop 523251 on College Road, at the College Road/ Loyla Park junction - flag and pole stop with timetable information;
- Stop 523231 on College Road, at the College Road / Glenmore junction – flag and pole stop with timetable information;
- Stop 523241 on College Road, adjacent to Greyhound Track carpark – indented flag and pole stop with timetable information.

The main bus services which operate along Section 4 are outlined in Table 6.11.

Table 6.11: Section 4 - Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
401	Parkmore Road – Monivea Road – Forster Street – Eyre Square – Salthill Road Lower	20 mins	20 mins
404	Oranmore – Dublin Road – College Road – Eyre Square – University Road – Thomas Hynes Road – Westside Shopping Centre	30 mins	30 mins
409	Eyre Square – Dublin Road – Doughiska Road – Parkmore Road	10 mins	10 mins – 20 mins

6.4.5.4 General Traffic

Forster Street / College Road (R339)

Forster Street within Section 4 is a single carriageway with one lane travelling in each direction. It extends from the Bóthar Bhreandain Uí Eithir / Forster Road / Fairgreen Road junction to the west and becomes College Road at the access to the Galway City Council building.

College Road is a single carriageway with one lane travelling in each direction and parking bays on either side.

6.4.5.5 Parking & Loading Facilities

The parking facilities along Section 4 of the Proposed Scheme are as follows:

- Forster Street (R339) – Double yellow lines present on both sides of the road.
- College Road (R339) – Sections of pay and display parking present. Double yellow lines present on the rest of the road. 64 parking spaces, three accessible spaces and two loading areas (six spaces) present. On-street pay and display

parking charges are in operation between 08:30 – 18:30 on Monday – Saturday and 13:00 – 18:00 on Sunday.

The Galway Sportsground car park is situated outside of the direct study area and is accessed from College Road. It comprises 100 parking spaces and is a Pay and display car park. Charges are operational between 08:30 – 18:30 on Monday – Saturday and 13:00 – 18:00 on Sunday.

Galway City Council and Connacht Rugby Sports Ground are located in the vicinity of the section and provide off-street parking.

6.4.6 Section 5 – College Road (Lough Atalia to Moneenageisha)

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 5 of the Proposed Scheme.

Section 5 comprises College Road between the College Road / Loyola Park / Lough Atalia Road junction and the Moneenageisha Road / Dublin Road / Wellpark Road/ College Road junction.

6.4.6.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 5 of the Proposed Scheme. The footpaths are all a minimum of 1.8m wide.

Controlled pedestrian crossings along Section 5, which benefits from tactile paving and dropped kerbs, can be found at the following locations:

- On the Lough Atalia Road and College Road (west) arms of the College Road / Loyola Park / Lough Atalia Road four-arm signalised junction.

Further details of the baseline pedestrian facilities (i.e. routing, directness, accessibility, crossing and footpath widths) at the junction are included in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Uncontrolled crossings across priority junctions at side roads benefit from dropped kerbs.

6.4.6.2 Cycle Infrastructure

There is no on or off-road cycle infrastructure along Section 5 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

There are stands for TFI cycle hire facility at the following location:

- 40 stands at Lough Atalia, 30m to the south of the College Road / Lough Atalia Road junction.

6.4.6.3 Bus Facilities

Bus Priority Measures

There are no bus lanes along Section 5 of the Proposed Scheme.

Bus Stop Facilities

There are no bus stops along Section 5 of the Proposed Scheme.

The main bus services which route along Section 5 are outlined in Table 6.12.

Table 6.12: Section 5 - Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
401	Parkmore Road – Monivea Road – Forster Street – Eyre Square – Salthill Road Lower	20 mins	20 mins
404	Oranmore – Dublin Road – College Road – Eyre Square – University Road – Thomas Hynes Road – Westside Shopping Centre	30 mins	30 mins
409	Eyre Square – Dublin Road – Doughiska Road – Parkmore Road	10 mins	10 mins – 20 mins

6.4.6.4 General Traffic

College Road (R339)

College Road comprises is a single carriageway with two lanes travelling eastbound and one lane travelling westbound.

6.4.6.5 Parking & Loading Facilities

College Road Private Parking –Four private parking areas are located off College Road just outside the study area, as below:

- Gleann Noinin – 58 spaces; and
- Circle K – 11 spaces.
- Moneenageisha Court – 24 spaces; and
- Bayview B&B – 12 spaces.

6.4.7 Section 6 – R338 Dublin Road

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 6 of the Proposed Scheme, comprising Dublin Road between the Moneenageisha junction and to the entrance to the Brothers of Charity.

6.4.7.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 6 of the Proposed Scheme. The footpaths are all a minimum of 1.8m wide.

Controlled pedestrian crossings along Section 6, which benefit from tactile paving and dropped kerbs, can be found at the following locations:

- On all arms at the College Road / Moneenageisha Road / Wellpark Road / Dublin Road four-arm signalised junction.

Further details of the baseline pedestrian facilities (i.e. routing, directness, accessibility, crossing and footpath widths) at the junction are included in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Uncontrolled crossings across priority junctions at side roads benefit from dropped kerbs.

6.4.7.2 Cycling Infrastructure

There is no cycle infrastructure westbound along Section 6 of the Proposed Scheme, however, cyclists share the bus lane travelling eastbound.

There are no stands for the TFI cycle hire facility along this section.

6.4.7.3 Bus Facilities

Bus Priority Measures

There is a bus lane present for the eastbound movement on Dublin Road from approximately 80m after the Moneenageisha junction, which operates 24 hours, Monday to Sunday.

Bus Stop Facilities

There are currently two bus stops along Section 6 of the Proposed Scheme. The westbound bus stops are as follows:

- Stop 522971 on Dublin Road, 60m southeast to the College Road / Moneenageisha Road / Wellpark Road / Dublin Road junction – shelter with timetable information

The eastbound bus stops are as follows:

- Stop 522691 on Dublin Road, 150m southeast to College Road / Moneenageisha Road / Wellpark Road / Dublin Road junction – flag and pole stop with timetable information

The main bus services which operate along Section 6 are outlined in Table 6.13.

Table 6.13: Section 6 - Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
402	Shangort Road – Knocknacarra – Taylors Hill Road – University Road – Eyre Square – Dublin Road (G Hotel) – Merlin Park Terminus	30 mins	30 mins – 1hr
404	Oranmore – Dublin Road – College Road – Eyre Square – University Road – Thomas Hynes Road – Westside Shopping Centre	30 mins	30 mins
409	Eyre Square – Dublin Road – Doughiska Road – Parkmore Road	10 mins	10 mins – 20 mins

6.4.7.4 General Traffic

Dublin Road

Dublin Road within Section 6 comprises a dual carriageway with two lanes travelling in each direction along the majority of the scheme. To the west of the Dublin Road / Sáilín junction, the westbound lane is a single lane, which widens to two lanes from the Sáilín junction. A bus lane is present for eastbound movements only. The road extends from the Moneenageisha Road / Wellpark Road / Dublin Road / College Road junction to the Dublin Road / Brothers of Charity entrance.

6.4.7.5 Parking & Loading Facilities

There are no parking or loading facilities along Section 6 of the Proposed Scheme.

Wellpark Retail Centre and The G Hotel & Spa are located in the vicinity of the section and provide off-street parking.

6.4.8 Section 7 – Fairgreen Road

This section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 7 of the Proposed Scheme, along Fairgreen Road between Forster Street and Lough Atalia Road.

6.4.8.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 7 of the Proposed Scheme. The footpaths are all a minimum of 1.8m wide.

There are no controlled crossings within this section. Uncontrolled crossings across priority junctions at side roads benefit from dropped kerbs.

6.4.8.2 Cycle Infrastructure

There is no on or off-road cycle infrastructure along Section 7 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

There are stands for TFI cycle hire facility at the following location:

- 17 stands at Fairgreen, 20m to the south-east of the Fairgreen Road / Station Road junction.

6.4.8.3 Bus Infrastructure

Bus Priority Measures

There are no bus lanes along Section 7 of the Proposed Scheme.

Bus Stop Facilities

There is currently one coach stop along Section 7 of the Proposed Scheme. This coach stop is not served by the two main bus operators in Galway (City Direct and Bus Eireann).

City Link and Air Coach operate on Fairgreen Road providing long distance coach services to areas such as Dublin and Cork. Dublin services operate approximately every 2-4 hours on weekdays.

6.4.9 General Traffic

Fairgreen Road

Fairgreen Road is a single carriageway street, generally with one lane travelling in each direction. The southbound carriageway widens into two lanes on approach to the Fairgreen Road / Lough Atalia Road junction. The northbound carriageway widens into two lanes on approach to the Fairgreen Road / Forster Street junction.

6.4.9.1 Parking & Loading Facilities

The parking and loading facilities along Section 7 of the Proposed Scheme are as follows:

- Fairgreen Road – 24 hour loading bay (five spaces) and taxi rank (10 spaces) on western side of the road. Double yellow lines present elsewhere. It is noted that informal parking for up to seven vehicles occurs along a section of the footpath between the taxi rank and road.

The following car parks are accessed from the roads within Section 7 of the Proposed Scheme, but are not included within the direct study area:

- The City Park at City Centre at Fairgreen Road is accessed from Fairgreen Road, comprising 410 parking spaces. It is a pay on foot car park with charges operating 24 hours, Monday – Sunday.

- Galway Coach Station is accessed of Fairgreen Road, comprising 168 parking spaces. It is a pay and display car park with charges operating 24 hours, Monday -Sunday.
- The Galmont Hotel & Spa is accessed of Fairgreen Road, comprising 240 spaces. It is a pay and display car park with charges operating 24 hours, Monday – Sunday.

6.4.10 Section 8 – Bóthar Uí Eithir and Prospect Hill

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 8 of the Proposed Scheme, comprising Prospect Hill between the Bóthar Na mBan and Bóthar Bhreandain Uí Eithir and the full length of Bóthar Uí Eithir.

6.4.10.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 8 of the Proposed Scheme. The footpaths are all a minimum of 1.8m wide with the exception of a short section of sub-standard footpath width in the vicinity of 38 Prospect Hill and a short section of footpath in the vicinity of St. Patricks Church.

There are two controlled pedestrian crossings along Section 8, which benefit from tactile paving and dropped kerbs, and can be found at the following locations:

- Pelican crossing of Prospect Hill, approximately 20m north of the Prospect Hill / Bóthar Bhreandain Uí Eithir junction.
- On all arms of the Bóthar Bhreandain Uí Eithir / Forster Street / Fairgreen Road four-arm signalised junction.

There is one uncontrolled crossing across a priority junction at a side road for this section of the Proposed Scheme.

Further details of the baseline pedestrian facilities (i.e. routing, directness, accessibility, crossing and footpath widths) at the junction are included in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

6.4.10.2 Cycle Infrastructure

There is no on or off-road cycle infrastructure along Section 8 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

There are stands for TFI cycle hire facility at the following location:

- 14 stands at County Hall, 20m to the northeast of the Bóthar Na mBan / Prospect Hill junction.

6.4.10.3 Bus Infrastructure

Bus Priority Measures

There is a bus lane travelling southbound along Bóthar Uí Eithir, operating 24 hours Monday to Sunday.

Bus Stop Facilities

There is currently one bus stop along Section 8 of the Proposed Scheme. The bus stop is an eastbound service (Stop 523211) on Bóthar Uí Eithir, 55m east to the Prospect Hill / Bóthar Uí Eithir junction. It is a flag and pole stop with timetable information only.

The main bus services which route along Section 8 are outlined in Table 6.14.

Table 6.14: Section 8 - Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
401	Parkmore Road – Monivea Road – Forster Street – Eyre Square – Salthill Road Lower	20 mins	20 mins
402	Shangort Road – Knocknacarra – Taylors Hill Road – University Road – Eyre Square – Dublin Road (G Hotel) – Merlin Park Terminus	30 mins	30 mins – 1hour
404	Oranmore – Dublin Road – College Road – Eyre Square – University Road – Thomas Hynes Road – Westside Shopping Centre	30 mins	30 mins
405	Gort Na Bro (B&Q) – Seamus Quirke Road – University Road – Eyre Square – Tuam Road – Ballybane Road – Ballybane Industrial Estate	20 mins	20 mins – 30 mins
409	Eyre Square – Dublin Road – Doughiska Road – Parkmore Road	10 mins	10 mins – 20 mins
412	Cappagh Road – Ballymoneen Road – Seamus Quirke Road – Eyre Square	30 mins	NA
414	Barna – Cappagh Road – Western Distributor Road – Rahoon Road – Eyre Square	2/3 services daily	NA

6.4.10.4 General Traffic

Prospect Hill (R336)

Prospect Hill within Section 8 of the Proposed Scheme is a one-way road travelling eastbound, comprising two lanes.

Bóthar Bhreandain Uí Eithir (R336)

Bóthar Bhreandain Uí Eithir comprises a one-way road travelling southbound, with two general traffic lanes and a bus lane.

6.4.10.5 Parking & Loading Facilities

There are no parking and loading facilities along Section 8 of the Proposed Scheme.

6.4.11 Section 9 – Bothar na mBan/ St. Brendan's Avenue / Dyke Road/ Headford Road

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 9 of the Proposed Scheme, along St Brendan's Avenue and Bóthar Na mBan, between Headford Road and Prospect Hill and along Headford Road, Walsh's Terrace, O'Donoghue's Terrace and Dyke Road.

6.4.11.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 9 of the Proposed Scheme, with the exception of the eastern side of Dyke Road. These footpaths are all a minimum of 1.8m wide. Along St. Brendan's Avenue, between Bother na mBan and Headford Road there is only a footpath present on the southern side of the road. This footpath is sub-standard with a width of approximately 1.2m.

There is one controlled pedestrian crossing along Section 9 of the Proposed Scheme.

- On all arms at the Headford Road / St Brendan's Avenue / Dyke Road four-arm signalised junction.

There are various uncontrolled crossings across priority junctions at side roads along this section of the Proposed Scheme which benefit from dropped kerbs.

Further details of the baseline pedestrian facilities (i.e. routing, directness, accessibility, crossing and footpath widths) at the junction are included in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

6.4.11.2 Cycle Infrastructure

There is no on or off-road cycle infrastructure along Section 9 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

There are stands for TFI cycle hire facility at the following location:

- 19 stands at Headford Road, 30m to the north of the Dyke Road / Headford / St Bridget's Place junction.

6.4.11.3 Bus Facilities

Bus Priority Measures

There are no bus lanes along Section 9 of the Proposed Scheme.

Bus Stop Facilities

There are no bus stops along Section 9 of the Proposed Scheme.

The main bus services which route along Section 9 of are outlined in Table 6.15.

Table 6.15: Section 9 - Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
407	Eyre Square – Francis Street - Headford Road – Tirrellan Heights – Bothair an Choiste	20mins	30mins – 1hour
412	Cappagh Road – Ballymoneen Road – Seamus Quirke Road – Eyre Square	30 mins	N/A

6.4.11.4 General Traffic

St Brendan's Avenue

St Brendan's Avenue is a single carriageway with one lane travelling in each direction.

Bóthar Na mBan

Bóthar Na mBan is a single carriageway with one lane travelling in each direction. There are two right turn pockets for movements into a private surface car park adjacent to St Brendan's Avenue and the Corrib Centre off-street multi-storey car park.

Headford Road

Headford Road within Section 9 generally comprises a single carriageway with one lane for northbound traffic and two lanes for southbound traffic.

Dyke Road

Dyke Road is a single carriageway with one lane travelling in each direction. Within the direct study area, it routes north from the Headford Road / Dyke Road / St Brendan's Avenue junction and the east back towards Headford Road, forming a triangular shape.

6.4.11.5 Parking & Loading Facilities

The parking and loading facilities along Section 9 of the Proposed Scheme are as follows:

- St Brendan's Avenue – Double yellow lines present on both sides of the road for the section associated with the scheme. 48 pay and display spaces on the rest of the road.

- Bóthar Na mBan – Bus set down area (two spaces) present on the eastern side of the road. Loading bay (three spaces) present outside of the TK Maxx store.

operating 24 hours Monday to Saturday. Double yellow lines present along the rest of the road.

- Headford Road (R866) – Indented parking bay on the northern wide of Headford Road between St Brendan's Avenue and St Bridget's Place, able to accommodate two cars; and Double yellow lines present on the rest of the road.
- Dyke Road – Double yellow lines present on both sides of the road on the major and minor arms. No parking present on this road.

Bothar Na mBan provides access to Corrib Shopping Centre off-street car park, comprising 576 parking spaces. It operates as a pay on foot car park, 24 hours Monday – Saturday.

6.4.12 Section 10 –Woodquay / Walsh's Terrace / Daly's Place / Mary Street

This section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 10 of the Proposed Scheme, between Mary Street and Woodquay, comprising Mary Street, St. Vincent's Avenue, Daly's Place, Woodquay and a section of Headford Street until the Headford Street/ Dyke Road / St Brendan's Avenue junction.

6.4.12.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 10 of the Proposed Scheme. Where there are footpaths, they are all a minimum of 1.8m wide. The footpaths are generally minimum of 1.8m wide, however, narrower on both sides of the road to the south of Mary Street.

There is one controlled pedestrian crossing along Section 10, which benefits from tactile paving and dropped kerbs, at the following location:

- A pelican crossing on Headford Road, adjacent to the Headford Road / Riverside junction.

Uncontrolled crossings across priority junctions at side roads benefit from dropped kerbs.

Further details of the baseline pedestrian facilities (i.e. routing, directness, accessibility, crossing and footpath widths) at the junction are included in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

6.4.12.2 Cycle Infrastructure

There is no on or off-road cycle infrastructure along Section 10 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

There are stands for TFI cycle hire facility at the following location:

- 20 stands at Wood Quay on Corrib Terrace, immediately to the north of the Corrib Terrace / Woodquay Street junction.

6.4.12.3 Bus Facilities

Bus Priority Measures

There are no bus lanes along Section 10 of the Proposed Scheme.

Bus Stop Facilities

There are currently two bus stops along Section 10 of the Proposed Scheme. The westbound bus stop is as follows:

- Stop 525411 on Headford Road, at the Headford Road / Woodquay Street junction – shelter and timetable information

The eastbound bus stop is as follows:

- Stop 523711 on Headford Road, at the Headford Road / Woodquay Street junction – flag and pole stop and timetable information.

The main bus services which operate along Section 10 are outlined in Table 6.16.

Table 6.16:Section 10 - Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
407	Eyre Square – Francis St - Headford Road – Tirrellan Heights – Bothair an Choiste	20 mins	30 mins – 1hr

6.4.12.4 General Traffic

St. Vincent's Avenue / Headford Road (R866)

St. Vincent's Avenue and Headford Road within Section 10 generally comprises a single carriageway with one lane travelling in each direction.

Woodquay Street

Woodquay Street has a one lane for northbound and southbound movements respectively, which are separated by a car parking area in the middle. It routes between Dalys Place / Eyre Street to the south and Headford Road to the north.

Daly's Place

Daly's Place is a one-way street travelling eastbound. It routes between St Francis Street / Mary Street/ Daly's Place/ Eglinton Street junction to the west and merges with Eyre Street to the east.

Mary Street

Mary Street is a one-way street comprising two lanes, travelling eastbound. It routes between the Mary Street / Bowling Green/ Newtownsmith / Abbeygate Street Upper junction to the west and the St Francis Street / Mary Street / Daly's Place / Eglinton Street junction to the east.

6.4.12.5 Parking & Loading Facilities

The parking and loading facilities along Section 10 of the Proposed Scheme are as follows:

- St Vincent's Avenue / Headford Road (R866) – Six Pay and display parking and loading bays located on Headford Road.
- Woodquay – Contains pay and display parking spaces operational from 08:30-18:30 Monday – Saturday and 13:00-1800 on Sunday. Further parking provided in the middle of the road splitting the lanes into a one-way movement. Approximately 64 parking spaces are present, of which two are accessible spaces. One loading bay (two spaces) and one taxi rank (two spaces) is present.
- Walsh's Terrace – Located off Headford Road, containing five pay and display spaces.
- Dalys Place – Double yellow lines present on both sides of the road. No parking spaces are available.

The Riverside off-street car park is outside of the direct study area but accessed from Headford Road, comprising 20 parking spaces. Pay and display car park. Charges are in operation between 08:30 – 18:30 on Monday – Saturday and 13:00 – 18:00 on Sunday.

6.4.13 Section 11 – Forthill Street / Merchants Road / Queen Street

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 11 of the Proposed Scheme, between Victoria Place and Bóthar Na nDuganna, comprising Queen Street, Merchants Road and Forthill Street.

6.4.13.1 Pedestrian Infrastructure

There are footpaths and street lighting along both sides of the road throughout Section 11 of the Proposed Scheme. The footpaths are all a minimum of 1.8m wide for the majority of this section with some sections on the southern side of Merchants Road falling below this over short sections.

There are three controlled pedestrian crossings along Section 11, which benefit from tactile paving and dropped which can be found at the following location:

- Pelican crossing of Victoria Place where the road meets Eyre Square.

Uncontrolled crossings across priority junctions at side roads benefit from dropped kerbs.

Further details of the baseline pedestrian facilities (i.e. routing, directness, accessibility, crossing and footpath widths) at the junctions along Section 11 of the Proposed Scheme is included in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

6.4.13.2 Cycle Infrastructure

There is no on or off-road cycle infrastructure along Section 11 of the Proposed Scheme. Cyclists are expected to share the traffic lanes in both directions.

6.4.13.3 Bus Infrastructure

Bus Priority Measures

There are no bus lanes along Section 11 of the Proposed Scheme.

Bus Stop Facilities

There is currently one bus stop along Section 11 of the Proposed Scheme. The bus stop is an eastbound service (Stop 524501) on Merchants Road, at the Merchants Road / Victoria Place junction. This stop comprises a flag and pole, with timetable information.

The main bus services which operate along Section 11 are outlined in Table 6.17.

Table 6.17: Section 11 - Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
401	Parkmore Road – Monivea Road – Forster Street – Eyre Square – Salthill Road Lower	20 mins	20 mins

6.4.13.4 General Traffic

Victoria Place

Victoria Place is a single carriageway with one lane travelling in each direction. It becomes one way at the Merchant Road junction, comprising two lanes travelling southbound. It routes between Eyre Square and Queen Street.

Merchants Road (R336)

Merchants Road within Section 11 is one-way travelling eastbound and comprises one lane between Forthill Street and Victoria Place.

Forthill Street

Forthill Street is a one-way road with one lane travelling southbound between Merchants Road and Queen Street.

Queen Street

Queen Street within Section 11 is a one-way road travelling westbound and comprises one lane between Victoria Place and Bóthar Na nDuganna.

6.4.13.5 Parking & Loading Facilities

The parking and loading facilities along Section 11 of the Proposed Scheme are as follows:

- Victoria Place – Double yellow lines present on both sides of the road. Contains a bus set down on the northern side of the road.
- Merchants Road – Pay and display parking and taxi spaces on the southern side of the road and double yellow lines on the northern side. Eight parking spaces were identified, of which two are accessible parking spaces. Tour bus set down area (two spaces) present.
- Forthill Street – Contains a bus set down and pick up area (one space) on the eastern side of the road. Pay and display parking spaces provided on both sides of the road. Approximately 19 parking spaces are provided.
- Queen Street – Contains pay and display parking and a bus set down area on the northern side of the road between Forthill and Bóthar Na nDuganna, comprising approximately 10 parking spaces.
- On-street pay and display parking charges are in operation between 08:30 – 18:30 on Monday – Saturday and 13:00 – 18:00 on Sunday.

The following car parks are accessed from the roads within Section 11 of the Proposed Scheme, but are not included within the direct study area:

- Q car park is accessed from Merchants Road, comprising 444 parking spaces. It is a pay on foot car park with charges operating 24 hours, Monday – Sunday.
- Hynes Yard multi-storey car park is accesses from Dock Road, comprising 480 spaces. It is a pay on foot car park with charges operating 24 hours, Monday – Sunday.

6.5 Potential Impacts

This section presents potential impacts that may occur due to the Proposed Scheme, in the absence of mitigation. This informs the need for mitigation or monitoring to be proposed (Section 6.6). Predicted 'residual' impacts taking into account any proposed mitigation is presented in Section 6.7.

6.5.1 Characteristics of the Proposed Scheme

The characteristics of the Proposed Scheme are described in detail in Chapter 4 (Proposed Scheme Description).

6.5.2 Do Nothing Scenario

With regards to this chapter, the 'Do Nothing' scenario means there would be no changes to existing transport infrastructure, so infrastructure provision for buses, pedestrians and cyclists would remain the same. The streetscape would continue to be based around the movement and parking requirements of private cars instead of people. High levels of traffic are associated with discouraging pedestrian and cyclist activity and this activity would be further discouraged as traffic congestion remains the same or increases. The baseline situation of congestion and journey time reliability issues for buses would also continue, and potentially be exacerbated over time as traffic congestion increases in line with travel demand growth.

6.5.3 Do Minimum Scenario

Do Minimum Transport Schemes

The full list of schemes in relation to the Do Minimum scenario can be found in Appendix 6.1 (Transport Modelling Report) in Volume 4 of this EIAR. The Do Minimum network is defined for 2023 and 2038.

Do Minimum Transport Demand

The transport demand changes for the 2023 and 2038 assessment year have been included within this chapter, using travel demand forecasting from the WRM. This accounts for planned growth contained with the NPF. The NPF recognises that Galway, as one of Ireland's five biggest cities, will play an important role in driving the economy. The projected population growth within Galway City and its suburbs is expected to grow by 50-60% by 2040, or up to a total of 120,000 individuals.

Based on WRM estimates, the predicted mode share in the Do Minimum 2023 and 2038 scenarios can be seen in Diagram 6.11 and Diagram 6.12 respectively. In general, car use is expected to decrease from 57% to 53% between 2023 and 2038. Pedestrian, cyclist and public transport trips are all expected to increase.

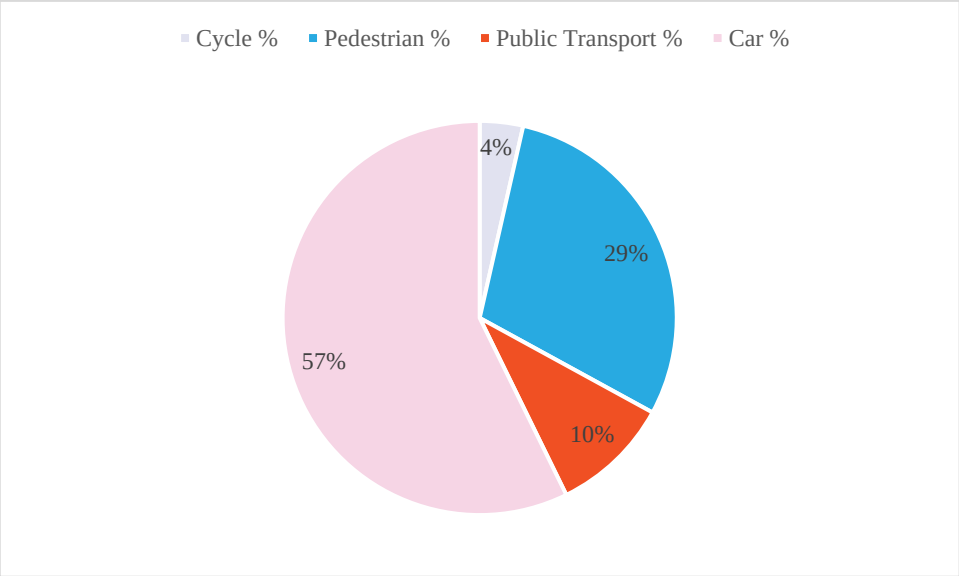

Diagram 6.11: 2023 Do Minimum Mode Share

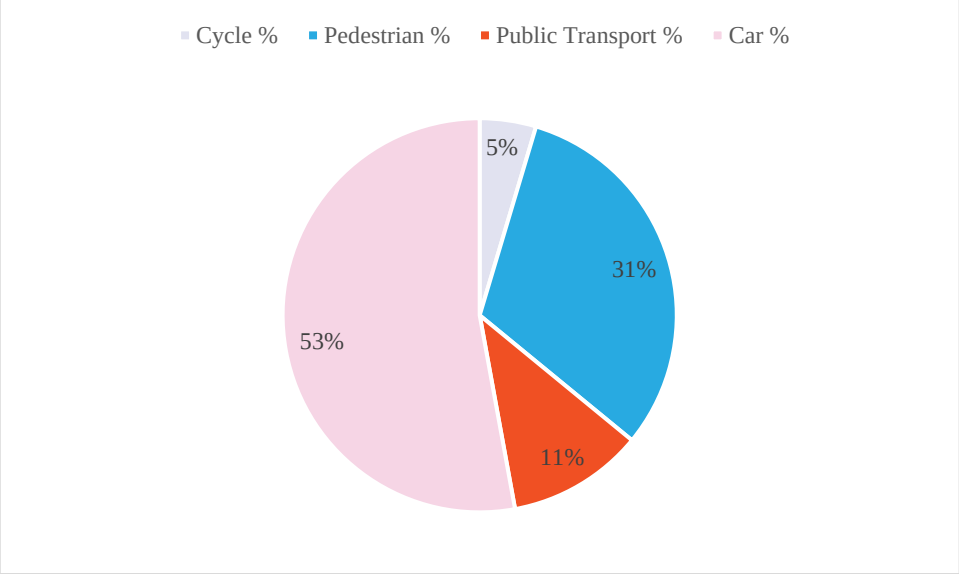

Diagram 6.12: 2038 Do Minimum Mode Share

6.5.4 Do Something Scenario

The Do Something scenario represents the likely conditions with the Proposed Scheme in place. The traffic and transport elements of the Proposed Scheme are presented in detail in Chapter 4 (Proposed Scheme Description) of the EIAR.

Based on the WRM, the predicted mode share in the Do Something 2023 and 2038 scenarios can be seen in Diagram 6.13 and Diagram 6.14 respectively. In general, car use is expected to decrease from 55% to 51% between 2023 and 2038 in the Do Something scenario. Pedestrian, cyclist and public transport trips are all expected to increase.

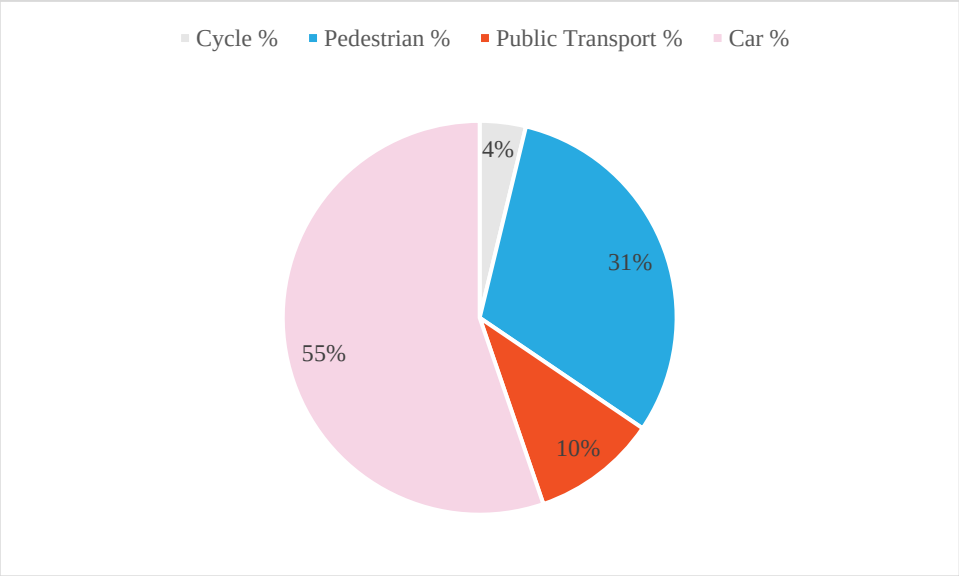

Diagram 6.13: 2023 Do Something Mode Share

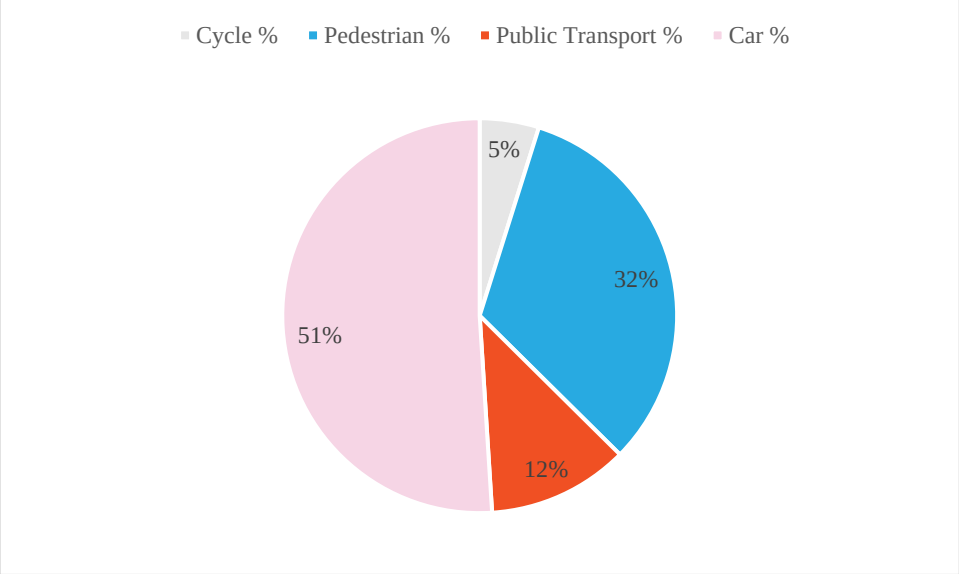

Diagram 6.14: 2038 Do Something Mode Share

6.5.5 Construction Phase

This section considers the potential temporary traffic and transport impacts that construction of the Proposed Scheme will have on the direct and indirect study areas during the construction phase.

Chapter 5 (Construction) of the EIAR has been prepared to demonstrate the likely approach that will be taken to construct the Proposed Scheme. A high-level construction strategy has been prepared and should be referred to in this section. This assessment, as outlined herein, provides an overview of the potential traffic and transport impacts of the Construction Phase based on the information in this strategy.

The appointed contractor will be requirement to prepare and implement a comprehensive Construction Traffic Management Plan (CTMP). In preparing the CTMP for the proposed works, the appointed contractor will be required to give consideration where practicable to facilitate and identify opportunities for the maximum movement of people during the construction period through implementing the following hierarchy of transport mode users:

- Pedestrians;
- Cyclists;
- Public Transport; and
- General Traffic.

6.5.5.1 Description of Construction Works

The Proposed Scheme has been divided into the following three principal sections, and multiple sub-sections, in relation to construction:

- Section A - University Road to Eyre Square, Woodquay and Headford Road:
  - Section A1 – University Road
  - Section A2 – Gaol Road & Galway Cathedral
  - Section A3 – Salmon Weir Bridge
  - Section A4 – Newtownsmith / Waterside
  - Section A5 – St Vincent's Avenue / Walsh's Terrace
  - Section A6 – Dyke Road / Headford Road
  - Section A7 - St. Francis Street/Eglinton Street/Williamsgate Street
  - Section A8 - Woodquay/Daly's Place/Mary Street
- Section B - Eyre Square to Dock Road, Bothar na mBan to College Road
  - Section B1 - Bóthar na mBan/St. Brendan's Avenue
  - Section B2 - Prospect Hill
  - Section B3 - Eyre Square North/Eyre Square East/Eyre Square South
  - Section B4 - Victoria Place/Merchant's Road/Queen Street
  - Section B5 - Forster Street
  - Section B6 - College Road/Forster Street/Fairgreen Road/Bóthar Uí hEithir junction
  - Section B7 - Bóthar Uí hÉithir
  - Section B8 - Fairgreen Road
- Section C - College Road to Dublin Road
  - Section C1 - College Road (Forster Street to Lough Atalia Road)
  - Section C2 - College Road/Lough Atalia Road junction
  - Section C3 - College Road (to junction at Moneenageisha)
  - Section C4 - Moneenageisha junction
  - Section C5 - R338 Dublin Road

The location of each principal section and the various sub-sections can be seen in Diagram 6.15, Diagram 6.16 and Diagram 6.17.

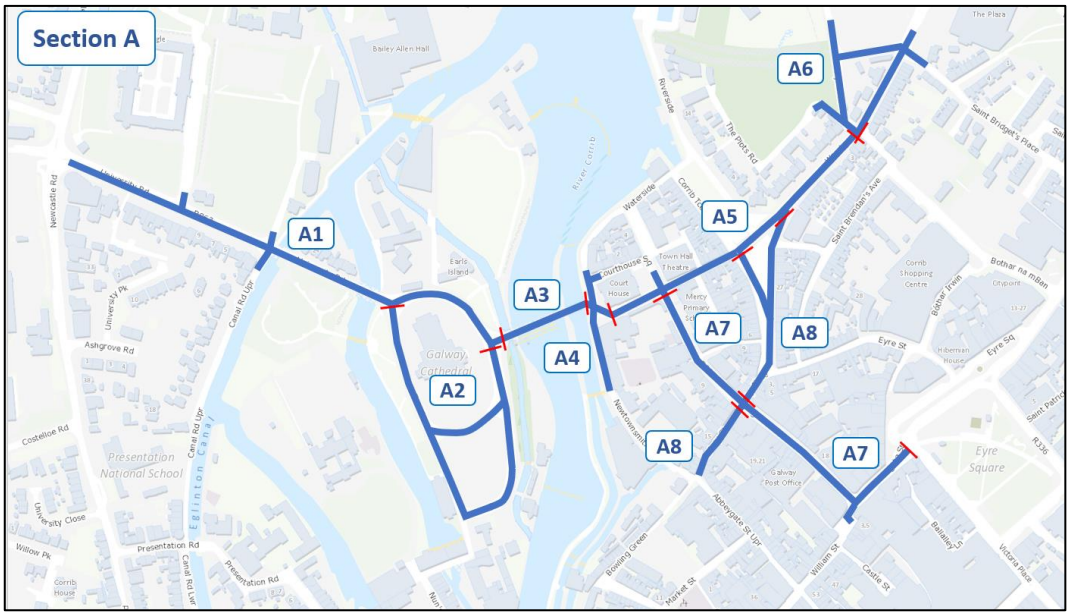

Diagram 6.15: Proposed Sub Sections of Construction Phase - Section A

Diagram 6.16: Proposed Sub Sections of Construction Phase - Section B

Diagram 6.17: Proposed Sub Sections of Construction Phase – Section C

6.5.6 Construction Programme

It is expected that construction will commence in Q4 2023, with construction works anticipated to take approximately 18 – 20 months. Individual activities will have varying durations. A minimum of three work areas are expected to be in construction simultaneously (one from Section A, one from Section B and one from Section C).

6.5.6.1 Construction Route

The appointed contractor's CTMP shall include measures for managing traffic in and out of the construction compounds. Construction vehicles will be directed to access work sections via the Proposed Scheme and dedicated routes on the National and Regional Road Network where practicable, to minimise use of the local road network. The following National and Regional roads are envisaged to form dedicated Construction Access Routes for construction vehicles to travel to and from the construction works (as shown in red in Diagram 6.18).

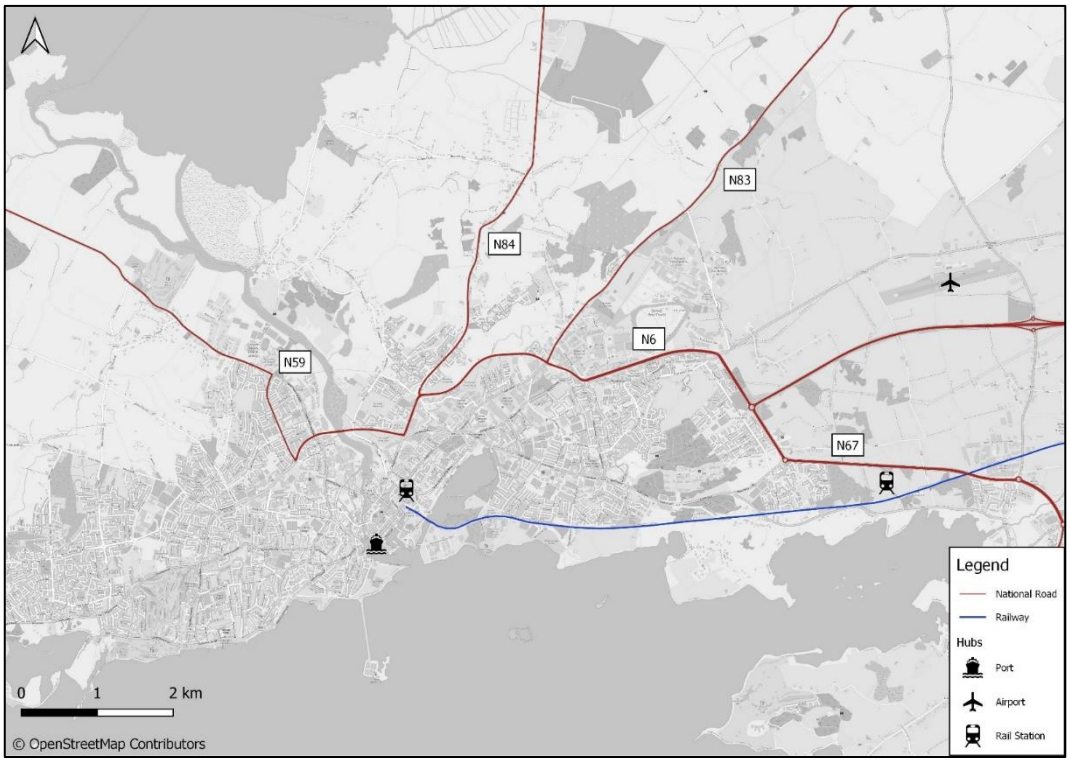

Diagram 6.18: National Roads Used for Construction

6.5.6.2 Potential Construction Impact

Overview

Construction of the Proposed Scheme has the potential to impact people's day-to-day activities along the corridor while the works are underway. Chapter 5 (Construction) of this EIAR identifies impactful activities, considers their effect, and identifies mitigation measures to reduce or remove their impact insofar as practicably possible.

For construction activities on or adjacent to public roads, all works will be undertaken in accordance with DOT's 'Traffic Signs Manual, Chapter 8 Temporary Traffic Measures and Signs for Roadworks' and associated guidance. Chapter 5 (Construction) of the EIAR contains temporary traffic management proposals for the Proposed Scheme. These proposals maintain safe distances between road users and road workers, depending on the type of construction activities taking place and existing site constraints. Temporary diversions, and in some instances temporary road closures, may be required where a safe distance cannot be maintained to undertake works necessary to complete the Proposed Scheme. All road closures and diversions will be determined by Galway City Council. The need for temporary access restrictions will be confirmed with residents and businesses prior to their implementation.

Pedestrian Provisions

As described in Chapter 5 (Construction) of the EIAR, pedestrians may be temporarily impacted by construction activities along the Proposed Scheme corridor. Pedestrian diversions and temporary surface footpaths will be used to facilitate pedestrian movements around work areas. Access to local amenities, such as to bus stops, traffic crossings, private dwellings, and businesses, may be temporarily altered but access will be maintained.

Due consideration will be given to pedestrian provisions in accordance with Section 8.2.8 of the DTTS Chapter 8, Temporary Traffic Measures and Signs for Roadworks of the Traffic Signs Manual (DTTS 2019a) and the DTTS Temporary Traffic Management Design Guidance (DTTS 2019b), to ensure the safety of all road users, in particular pedestrians (including able-bodied pedestrians, wheel-chair users, mobility impaired pedestrians, pushchair users etc.). Therefore, where footpaths are affected by construction, a safe route will be provided past the works area, and where practicable, provisions for matching existing facilities for pedestrians. Due consideration will also be given to the need for temporary ramps, and measures for accessible users, where changes in elevation are temporarily introduced to facilitate works and footpath diversions. Entrance points to the construction zone will be controlled as required.

Cycling Provisions

Cyclists may be temporarily impacted by construction activities along the Proposed Scheme corridor. As part of Temporary Traffic Management arrangements, the appointed Contractor will give due consideration to cyclist provision in accordance with Section 8.2.8 of the DTTS Chapter 8, Temporary Traffic Measures and Signs for Roadworks of the Traffic Signs Manual (DTTS 2019a) and the DTTS Temporary Traffic Management Design Guidance (DTTS 2019b), including the use of site-based risk assessments. Therefore, where cycle tracks are affected by construction, a safe route will be provided past the work area, and where practicable, provisions for matching existing facilities for cyclists will be made.

Public Transport Provisions

Existing public transport routes will be maintained throughout the duration of the Construction Phase of the Proposed Scheme (notwithstanding potential for occasional road closures / diversions as described in Chapter 5 (Construction) of the EIAR.
Wherever practicable, bus services will be prioritised over general traffic. However, the temporary closure of sections of existing dedicated bus lanes may be required to facilitate the construction of new bus priority infrastructure that is being developed as part of the Proposed Scheme. It is also likely that some existing bus stop locations may need to be temporarily relocated to accommodate the works. In such cases operational bus stops will be safely accessible to all users.

Parking and Loading

Parking and loading locations may be temporarily impacted by construction activities along the Proposed Scheme corridor. There may be temporary

restrictions to on-street parking and loading facilities. The appointed contractor will discuss temporary traffic management measures with the road authority and directly affected residents/business with the aim of minimising disruption.

General Traffic

The Proposed Scheme will be constructed to ensure the mitigation of disturbance to residents, businesses and existing traffic. Localised temporary lane or road closures may be required for short periods. Details of illustrative temporary traffic management measures to facilitate construction of the Proposed Scheme are included in Chapter 5 (Construction) of the EIAR. Each sub section in relation to the construction strategy outlines phases of traffic management and associated road/ lane closures – see the construction strategy for further details.

Construction Traffic Generation

Site Operatives: It is expected that there will be 70 to 80 staff directly employed across the Proposed Scheme, rising to 100 staff at peak construction.

Typical work hours on site are between 08:00 and 18:00, meaning that staff will typically arrive and depart outside of the AM and PM peak hours.

The appointed contractor will prepare a Construction Stage Mobility Management Plan (CSMMP) which will be developed prior to construction to actively discourage personnel from using private vehicles to travel to site. The CSMMP will promote the use of public transport, cycling and walking by personnel. Private parking at the Construction Compound will be limited. Vehicle-sharing will be encouraged, subject to public health guidelines, where travel by private vehicle is a necessity e.g. for transporting heavy equipment. A combination of CSMMP measures, as well as work shift patterns, means that fewer than 10 trips by private vehicle are envisaged to and from site during peak periods.

Heavy Goods Vehicles (HGVs): Additional construction traffic will be generated during the Construction Phase of the Proposed Scheme, for the purpose of the following:

- Clearance of existing site material and waste;
- Deliveries of construction material; and
- Removal of construction waste material.

Chapter 5 (Construction) of this EIAR provides a breakdown of the expected operation for the construction of the Proposed Scheme during each subsection. It should be noted that the CTMP will control vehicular movement along the construction route, including restrictions on the number of HGVs accessing and egressing the construction works throughout the day to mitigate the impacts to general traffic on the surrounding road network.

Based on construction activities associated with the Proposed Scheme, a maximum of 26 HGV trips are estimated to access / egress the construction works over a 10 hour period. This equates to an average of 2 – 3 HGVs in the AM and PM peak hours.

Given that the above impacts are minimal and comfortably below the thresholds set out in TII's Guidelines for Transport Assessments, it is considered appropriate to define the general potential traffic impacts of the Construction Phase as negligible and having a Not Significant and Temporary effect. Therefore, no further analysis is required for the purpose of this assessment.

It should be noted that further detail on the restrictions to construction vehicle movements during the peak periods of the day will be contained within the appointed contractor's CTMP prior to construction.

Construction Phase Summary

The contents of Table 6.18 present a summary of the potential impacts of the Proposed Scheme during Construction Phase.

Table 6.18: Summary of Construction Phase Impacts

Assessment Topic	Description of Effect	Potential Impact / Significance of Effect
Walking	Restrictions to pedestrians along Proposed Scheme.	Negative, Slight and Temporary
Cycling	Restrictions to cyclists along Proposed Scheme	Negative, Moderate and Temporary
Bus	Restrictions to public transport along Proposed Scheme.	Negative, Slight and Temporary
Parking and Loading	Restrictions to parking / loading along Proposed Scheme.	Negative, Slight and Temporary
General Traffic	Restrictions to general traffic along Proposed Scheme	Negative, Moderate and Temporary
Construction Traffic	Restrictions to construction traffic along Proposed Scheme	Negative, Slight and Temporary

6.5.7 Operational Phase

The impact assessment for the Operational Phase has been outlined in terms of a qualitative (walking, cycling, bus infrastructure and parking / loading) and quantitative (bus journey times / reliability, general traffic and people movement) impact analysis, which are outlined in the following sections.

6.5.7.1 Qualitative Assessment Methodology

The structure of the qualitative assessment is consistent with the Baseline Environment (Section 6.4) and Chapter 4 (Proposed Scheme Description), whereby the Proposed Scheme has been split into 11 sections.

This has allowed for a more detailed analysis of the quality of the infrastructure proposals per section. The approach for each qualitative assessment is outlined below.

Pedestrian Infrastructure

The impacts to the quality of the Pedestrian Infrastructure as a result of the Proposed Scheme have been considered with reference to any changes to the existing pedestrian facilities along footpaths and crossing locations. Reference has been made to the overall changes along the full length of the Proposed Scheme and the impact assessment primarily focuses only on the pedestrian facilities at junctions to provide a direct comparison between the Do Minimum and Do Something scenarios.

Where the Proposed Scheme introduces a change to a junction layout, the impact on pedestrians has been assessed using a set of criteria which has been derived from guidance listed in the references section of this report (Section 6.2). The contents of Table 6.19 outline the assessment criteria for each junction.

Table 6.19: Pedestrian Junction Assessment Criteria

Aspect	Indicator
Routing	Are pedestrian crossings (signalised or uncontrolled) available on all arms?
Directness	Where crossings are available, do they offer direct movements which do not require diversions or staggered crossings i.e., no or little delay required for pedestrians to cross in one direct movement?
Accessibility	Where crossings exist, are there adequate tactile paving, dropped kerbs and road markings for pedestrians (including able-bodied, wheelchair users, mobility impaired and pushchairs)?
Widths	Are there adequate footpath and crossing widths in accordance with national standards?

The LoS rating demonstrated in Table 6.20 has been applied to each junction for both the Do Minimum and Do Something scenarios based on whether the above indicators have been met.

Table 6.20: Pedestrian Junction Assessment LoS

LoS	Indicators Met (of Total of 4)
A	4
B	3
C	2
D	1
E	0

When comparing the Do Minimum and Do Something scenarios for pedestrians, the terms outlined in Table 6.21 have been used to describe the impact, based on the changes in the Qualitative Pedestrian LoS rating.

Table 6.21: Description of Impact for Pedestrian Qualitative Assessment

Magnitude of Impact	Change in LoS Rating
High	3 to 4
Medium	2

Low	1
Negligible	0

To establish the Significance of Effect for the impacts of the Pedestrian Infrastructure, as a result of the Proposed Scheme, a sensitivity rating has been applied to each junction in accordance with the methodology set out in Section 6.3.3.

Cycling Infrastructure

The impacts to the quality of the cycling infrastructure as a result of the Proposed Scheme have been considered with reference to the changes in physical provision for cyclists provided during the Do Minimum and Do Something scenarios. The NTA's National Cycle Manual's Quality of Service (QoS) Evaluation criteria have been adapted for use in assessing the cycling qualitative impact along the Proposed Scheme. The refined cycling facilities criteria are as follows:

- **Segregation:** a measure of the separation between vehicular traffic and cycling facilities;
- **Number of adjacent cyclists / width:** the capacity for cycling two abreast and / or overtaking ('2+1' accommodates two abreast plus one overtaking); and
- **Junction Treatment:** a measure of the treatment of cyclist traffic at existing junctions.

The contents of Table 6.22 outline the assessment criteria with reference to the corresponding LoS ratings.

Table 6.22: Cycling Assessment Criteria

LoS	Segregation	No. of adjacent cyclists/width		Junction treatment
A+	High degree of separation. Minimal delay	2+1	2.5m	Cyclists get green signal priority at signalised junctions / has priority across uncontrolled junctions
A	Well separated at mid-link with some conflict at intersections	1+1	2.0m	Toucan crossings at signalised junctions for cyclists along CBC / Protected junctions not already classified as A+ for junction treatment
B	On-road cycle lanes or carriageway designated as 'quiet cycle routes'	1+1	1.75m	Cyclists share green time with general traffic and cycle lanes continue through the junction, for junctions not already classified as A or A+ for junction treatment
C	Bicycle share traffic or bus lanes	1+0	1.25m	Cyclists share green time with general traffic with cycle facilities (advanced stacking locations / cycle lanes) available up to the junction but don't continue through
D	No specific bicycle facilities	1+0	0.75m	No specific bicycle facilities

When comparing the Do Minimum and Do Something scenarios for cyclists, the terms outlined in Table 6.23 have been used to describe the impact, based on the changes in the Qualitative Cycling LoS rating.

Table 6.23: Description of Impact for Cycling Qualitative Assessment

Magnitude of Impact	Change in LoS Rating
High	3 to 4
Medium	2
Low	1
Negligible	0

To establish the Significance of Effect for the impacts of the cycling infrastructure, as a result of the Proposed Scheme, a sensitivity rating has been applied to each assessed section in accordance with the methodology set out in Section 6.3.3.

Bus Infrastructure

The implementation of the Proposed Scheme will result in changes in the quality of bus infrastructure provision along the route, including dedicated bus lanes and bus stop upgrades / relocations. Improvement in bus priority measures will reduce the interaction between buses and general traffic and reduce the likelihood of delays.

The qualitative impact assessment has been undertaken based on the following factors:

- Provision of bus lanes and associated bus priority measures;
- Bus stop provision; and
- Changes to the existing bus stop facilities:
- Real-time information;
- Timetable information;
- Shelters;
- Seating;
- Accessible kerbs; and
- Removal of indented drop off areas, where appropriate.

The magnitude of impact of the Proposed Scheme, applied to the qualitative review of the above factors, is set out in Table 6.24.

Table 6.24: Magnitude of Impact for Bus Users Qualitative Assessment

Impact	Description of Impact / Proposed Changes
High positive	Significant benefit for bus users with no disbenefits
Medium positive	Positive impact for bus stop users with benefits outweighing any minor disbenefits.
Low positive	Slight benefit for users with benefits outweighing any disbenefits.
Negligible impact	Marginal impact to user buses where any benefits or disbenefits are offset.

Impact	Description of Impact / Proposed Changes
Low negative	Slight negative impact for users with disbenefits marginally outweighing benefits.
Medium negative	Negative impact for bus users with benefits not outweighing any disbenefits.
High negative	Complete removal of provision.

To establish the Significance of Effect for the impacts of the bus infrastructure, as a result of the Proposed Scheme, a sensitivity rating has been applied to each assessed section in accordance with the methodology set out in Section 6.3.3.

Parking and Loading

The impacts of the Proposed Scheme on parking and loading provision have been assessed through a comparison of the availability of spaces or lengths of bay in the Do Minimum (baseline environment) and Do Something scenarios. The assessment has taken the parking information and considers the impact of any changes on the general availability of parking and loading in the vicinity of the Proposed Scheme. It classifies parking into the following categories:

- Designated Paid Parking;
- Disabled Permit Parking;
- Designated Loading Bays;
- Designated Taxi Ranks and;
- Informal Parking (i.e. parking alongside the kerb which is unrestricted).

Significance ratings for the impacts of any changes in parking provision have been generated for each specific instance of change and for each section of the Proposed Scheme. The ratings are based upon professional judgement and experience and consider:

- The magnitude of change in parking availability;
- The availability of alternative parking; and
- Nearby land uses, such as businesses.

Note that the parking and loading assessment has been undertaken as a qualitative analysis based on the above criteria and does not generate a resulting LoS rating.

6.5.7.2 Section 1 – University Road to St Francis Street Junction

Pedestrian Infrastructure Changes

- The key infrastructural changes to the pedestrian link along Section 1 of the Proposed Scheme are the following:
- Raised entry treatment on the northern arm of the uncontrolled junction at University Road / NUIG, with signalised pedestrian crossing on University Road;
- Widened pedestrian footpaths along University Road;
- Raised junction at the University Road / Canal Road Upper uncontrolled junction;

- Existing kerbs to be realigned to provide improved traffic management and pedestrian facilities at University Road/ Gaol Road uncontrolled junction to the northwest of Galway Cathedral;
- Raised table at the University Road / NUIG uncontrolled junction to the north of Galway Cathedral;
- Existing University Road / Gaol Road junction to the east of Galway Cathedral to be transformed into signalised pedestrian crossing, with the southern arm to be pedestrianised;
- Raised table at Gaol Road to the southeast of Galway Cathedral; and
- Splitter island at Gaol Road to the southwest of Galway Cathedral with raised table on the eastern and southern arm.

The assessment of the qualitative impacts on the Pedestrian Infrastructure for Section 1 of the Proposed Scheme are summarised in Table 6.25 along with the accompanying sensitivity for each junction and the resultant significance of effect. A detailed breakdown of the assessment at each junction can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Table 6.25: Section 1 – Significance of Effects for Pedestrian Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
University Road / NUIG (southwest to President's Lawn)	B	A	Low	High	Positive, Moderate and Long-term
University Road / Canal Road Upper	E	A	High	High	Positive, Profound and Long-term
University Road / NUIG (north of Galway Cathedral)	C	B	Low	High	Positive Moderate and Long-Term
University Road / Gaol Road	C	A	Medium	High	Positive, Very Significant and Long-term
Gaol Road (Southeast of Galway Cathedral)	E	B	Medium	Low	Positive, Moderate and Long-term
Gaol Road (Southwest of Galway Cathedral)	E	C	Low	Low	Positive, Slight and Long-term
Section Summary	**D**	**B**	**Medium**	**Medium**	**Positive, Significant and Long-term**

The contents of Table 6.25 demonstrate that the Proposed Scheme will have a Positive, Significant and Long-term impact on the quality of the pedestrian infrastructure along the R863 University Road to Saint Francis Street Junction during the Operational Phase.

The LoS during the Do Minimum scenario ranges between E and B, with three of the six impacted junctions along this section given the low E ratings. These ratings have been determined using the previously referenced assessment criteria set out in Table 6.20. The LoS will improve to an A rating at three of the impacted junctions, a B rating at two of the impacted junctions and a C rating at one of the impacted junctions, in the Do Something scenario. This is a result of the proposed improvements to the existing pedestrian facilities in the form of additional crossing locations, increased pedestrian directness, provision of traffic calming measures to reduce vehicle speeds, improved accessibility and increased footpath and crossing widths. All proposed facilities have been designed in accordance with the principles of DMURS and the National Disability Authority (NDA) 'Building for Everyone: A Universal Design Approach' (NDA 2020) with regards to catering for all users, including those with disabilities.

Overall, it is anticipated that there will be Positive, Significant and Long-term effect to the quality of the pedestrian infrastructure along Section 1 of the Proposed Scheme, during the Operational Phase. A detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Cycling Infrastructure

The following section sets out the qualitative impacts on the cycling receptor for Section 1 of the Proposed Scheme. The results are summarised in Table 6.26, along with the accompanying sensitivity for each section and the resultant significance of impact.

The key cycling improvements along Section 1 of the Proposed Scheme can be summarised as follows:

- Provision of dedicated bus lanes in the eastbound direction from Fisheries Field entrance to Waterside, and in the westbound direction from St Vincent's Avenue crossing to Fisheries Field entrance. This is considered a positive for cyclists, with safer road space available due to less general motorised vehicles.
- Provision of cycling infrastructure providing connectivity between Courthouse Square and the Salmon Weir Bridge in the form of a 3.0m wide two-way cycle track on a paved pedestrian area.

The contents of Table 6.26 outline the cycling qualitative assessment along Section 1 of the Proposed Scheme, which sets out the overall Do Minimum LoS and the Do Something LoS and the description of impact. Please refer to Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR which outlines in further detail the methodology behind each LoS rating given to the Do Minimum and Do Something scenarios.

Table 6.26: Section 1 – Cycling Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect

Salmon Weir Bridge to Waterside	D	B	Medium	Medium	Positive, Significant and Long-term
Newtownsmith from Corrib Bridge to Waterside	D	B	Medium	Low	Positive, Moderate and Long-term
St Vincent's Ave from Waterside to St Francis St	D	B	Medium	High	Positive, Very Significant and Long-term
Section Summary	**D**	**B**	**Medium**	**Medium**	**Positive, Significant and Long-term**

The contents of Table 6.26 demonstrate that the scheme will have a Positive, Significant and Long-term effect on the cycling environment along Section 1 of the Proposed Scheme, including the orbital route around the Galway Cathedral.

The Do Minimum Los has been determined using the previously referenced assessment criteria set out in Table 6.22. The LoS rating of the cycling facilities will improve from D in the Do Minimum to B in the Do Something along the entirety of Section 1 of the Proposed Scheme. This is a result of a reduction in traffic and improved cycling infrastructure as part of the Proposed Scheme.

The findings of the cycling assessment fully align with the objective of the Proposed Scheme, applicable to the Traffic and Transport assessment of the Proposed Scheme, to 'Enhance the potential for cycling by providing a safe network for cycling'.

Section 1.7.3 in the National Cycle Manual states, that in relation to cyclist hierarchy of provision, traffic reduction is a priority, before the provision of segregated cycle lanes to create an attractive environment for cyclists. The Proposed Scheme is designed to reduce traffic significantly and therefore aligns with this hierarchy.

Bus Infrastructure

The proposed changes to the bus stop infrastructure along Section 1 of the Proposed Scheme are outlined in Table 6.27 below.

Table 6.27: Section 1 – Changes in Bus Infrastructure

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop

Inbound (Eastbound)	University Road (NUIG Main Gate) No.522561	30m North-West of NUI Galway Main Gate	Retained	Bus Shelter No Seating Paper timetable	Bus shelter with seating & facilities to incorporate RTPI	N/A
Inbound (Eastbound)	Galway Cathedral No. 523181	North-East Galway Cathedral, 50m after crossing Salmon Weir Bridge	Relocated	Bus Stop Pole Paper timetable	Bus shelter with seating & facilities to incorporate RTPI	Stop moved closer to pedestrian crossing
Outbound (Westbound)	NUIG Main Gate No. 523031	35m south-east of NUI Galway Main Gate	Retained	RTPI Bus Stop Pole Paper timetable	Bus shelter with seating & facilities to incorporate RTPI	N/A
Outbound (Westbound)	Galway Cathedral No. 522571	North-East Galway Cathedral, 50m after crossing Salmon Weir Bridge	New	Bus Stop Pole Paper timetable	Bus shelter with seating & facilities to incorporate RTPI	New outbound stop to correspond with existing inbound stop

The contents of Table 6.27 indicate that there are considerable improvements to the bus stop facilities along Section 1 of the Proposed Scheme with the provision of shelters, seating, the facilities to incorporate real-time information, and accessible kerbs throughout.

The layout of the relocated and new bus stops is considered to better serve the existing and future catchment and be closer to existing pedestrian crossing facility for improved convenience. This is assessed as providing an overall Positive, Moderate and Long-term effect for bus passengers.

Parking & Loading

The proposals will impact on existing parking and loading along Section 1 of the Proposed Scheme. The contents of Table 6.28 present a summary of the proposed changes along Section 1 of the Proposed Scheme.

Table 6.28: Section 1 – Overall Changes in Parking / Loading Spaces

Location	Parking Type	Do Minimum	Do Something	Change
University Road	Pay & Display / Residential	17	13	-4
	Loading Bay	1 bay (3 spaces)	1 bay (3 spaces)	0
Gaol Road	Tour Bus Stop	4	0	-4
	Disabled Bays	2	2	0
	Bus Set Down	2 bays (9 spaces)	4	-5
Newtownsmith	Paid/ Commercial	10	6	-4
	Loading Bay	1 bay (3 spaces)	1 bay (3 spaces)	0
Galway Cathedral*	Bus Parking	0	10	+10
	Disabled Bays/ Commercial	5	5	0
	Paid/ Commercial	158	42	-116
Total		**211**	**88**	**-123**

**Note, this is an off-street car park.*

Overall, there are approximately 211 current parking spaces affected along Section 1 of the Proposed Scheme. Under the proposals, 88 parking / loading spaces will be lost, the majority lost from Galway Cathedral car park. It is noted that there are other on-street parking locations and off-street parking locations surrounding the corridor, which provide ample parking opportunities.

There are approximately 39 parking spaces within a 200m distance of University Road, which are located on Ash Grove, University Park, Canal Road Upper. There are approximately 175 parking spaces within a 200m distance of Gaol Road and Galway Cathedral which are unaffected by the Proposed Scheme. There are approximately 40 parking spaces within a 200m distance of Newtownsmith within Newtownsmith Car Park.

The changes are considered to have a Negative, Moderate and Long-term effect overall, due to the number of spaces lost, compared to the spaces available within the local area. This effect is considered acceptable in the context of the aim of the Proposed Scheme, to provide enhanced walking, cycling and bus infrastructure on this key access corridor. In addition to this, reducing parking within the city centre links with national and regional policy requirements to shift away from private car use as a form of traffic demand management, and help meet Ireland's climate action target.

More information in relation to detailed parking proposals can be found in Appendix 6.3 (Preliminary Parking Survey Report) in Volume 4 of this EIAR.

6.5.7.3 Section 2 – St. Francis Street and Eglinton Street

Pedestrian Infrastructure Changes

The key infrastructural changes to the pedestrian link along Section 2 of the Proposed Scheme are the following:

- Realigned and improved pedestrian facilities at the St. Vincent's Avenue / St. Francis Street / Courthouse Square signalised junction.
- Signalised junction and pedestrian crossings at the St. Francis Street / Dalys Place / Eglinton Street / Mary Street junction
- Signalised pedestrian crossing at St. Francis Street, approximately 15m to the south of the St. Francis Street / St. Anthony's Place junction; and
- Raised table at the Eglinton Street / Williamsgate Street intersection.

The assessment of the qualitative impacts on the pedestrian infrastructure for Section 2 of the Proposed Scheme is summarised in Table 6.29 along with the accompanying sensitivity for each junction and the resultant significance of impact.

Table 6.29: Section 2 – Significance of Effects for Pedestrian Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
St Vincent's Avenue / St Francis Street / Courthouse Square	B	A	Low	High	Positive, Moderate and Long-term
St Francis Street / Dalys Place / Eglinton Street / Mary Street	B	A	Medium	High	Positive, Very Significant and Long-term
Section Summary	**B**	**A**	**Low**	**High**	**Positive, Moderate and Long-term**

The contents of Table 6.29 demonstrate that the Proposed Scheme will have a Positive, Moderate and Long-term impact on the quality of the pedestrian infrastructure at junctions along the R866 Saint Francis Street to Eglinton Street.

The LoS during the Do Minimum scenario is B at both junctions. These ratings have been determined using the previously referenced assessment criteria set out in Table 6.20. The LoS will improve to an A rating at both the impacted junctions in the Do Something scenario. This is a result of the proposed improvements to the existing pedestrian facilities in the form of additional crossing locations, increased pedestrian directness, provision of traffic calming measures to reduce vehicle speeds, improved accessibility and increased footpath and crossing widths. All proposed facilities have been designed in accordance with the principles of

DMURS and Building for Everyone: A Universal Design Approach (NDA 2020) with regards to catering for all users, including those with disabilities.

Overall, it is anticipated that there will be Positive, Moderate and Long-term effect to the quality of the pedestrian infrastructure along Section 2 of the Proposed Scheme, during the Operational Phase, which aligns with the overarching aim to provide enhanced walking infrastructure on the corridor. A detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Cycling Infrastructure

The key cycling improvements along Section 2 of the Proposed Scheme can be summarised as follows:

- Provision of dedicated bus lane in the southbound direction from Saint Francis Street, via Eglinton Street to Williamsgate Street. This is considered a positive for cyclists, with safer road space available due to less general motorised vehicles.

The contents of Table 6.30 outline the cycling qualitative assessment along Section 2 of the Proposed Scheme, with reference to the accompanying sensitivity for each section and the resultant Significance of Impact.

Table 6.30: Section 2 – Cycling Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
St Francis St from Courthouse Square to Dalys Place	D	B	Medium	High	Positive, Very Significant and Long-term
Eglinton / Williamsgate St from Mary St to Eyre Square	D	B	Medium	High	Positive, Very Significant and Long-term
Section Summary	**D**	**B**	**Medium**	**High**	Positive, Very Significant and Long-term

The contents of Table 6.30 demonstrate that the scheme will have a Positive, Very Significant and Long-term effect on the cycling environment along the R866 Saint Francis Street to Williamsgate Street.

The Do Minimum Los has been determined using the previously referenced assessment criteria set out in Table 6.22. The LoS rating of the cycling facilities will improve from D in the Do Minimum to B in the Do Something along the entirety of Section 2 of the Proposed Scheme. This is a result of a reduction in traffic and therefore improved safety for cyclists associated with the Proposed Scheme.

The findings of the cycling assessment fully align with the objective of the Proposed Scheme, applicable to the Traffic and Transport assessment of the Proposed Scheme, to 'Enhance the potential for cycling by providing a safe network for cycling'. Section 1.7.3 in the National Cycle Manual states, that in relation to cyclist hierarchy of provision, traffic reduction is a priority, before the provision of segregated cycle lanes to create an attractive environment for cyclists. The Proposed Scheme is designed to reduce traffic significantly and therefore aligns with this hierarchy.

Bus Infrastructure

The proposed changes to the bus stop infrastructure along Section 2 of the Proposed Scheme are outlined in Table 6 below.

Table 6.31: Section 2 – Changes in Bus Infrastructure

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Inbound (Eastbound)	Franciscan Friary No. 522591	Osteria Italia Restaurant St. Francis Street	Retained	Bus Stop Pole Paper timetable	Bus shelter with seating & facilities to incorporate RTPI	N/A
Outbound (Westbound)	Francis Street No. 523021	Franciscan Abbey St. Francis Street	Retained	RTPI Bus Stop Pole	Bus shelter with seating & facilities to incorporate RTPI	N/A

The number and location of stops along Section 2 will remain the same, however, there will be improvements to the bus stop facilities with the provision of shelters, seating, the facilities to accommodate real-time information and accessible kerbs throughout. This is assessed as providing an overall Positive, Slight and Long-term effect for bus passengers.

Parking & Loading

The proposals will impact on existing parking and loading along Section 2 of the Proposed Scheme. The contents of Table 6.32 present a summary of the proposed changes along Section 2 of the Proposed Scheme.

Table 6.32: Section 2 – Overall Changes in Parking / Loading Spaces

Location	Parking Type	Do Minimum	Do Something	Change
Eglinton Street	Loading Bay / Commercial	1 bay (6 spaces)	1 bay (4 spaces)	-2
	Informal Parking/	1 bay (9 spaces)	0	-9

Location	Parking Type	Do Minimum	Do Something	Change
	Commercial			
Williamsgate Street	Loading Bay / Commercial	1 bay (3 spaces)	1 bay (3 spaces)	0
Total		**18**	**7**	**-11**

Overall, there are approximately 18 current parking spaces affected along Section 2 of the Proposed Scheme.

Under the proposals, 11 parking spaces will be lost, however this is informal, unmarked parking. It is noted that there are other on-street parking locations and off-street parking locations surrounding the corridor, which provide ample parking opportunities.

There are over 500 parking spaces on local side roads within 200m of this section. Bowling Green Car Park and Market Square Car Park are also situated in proximity to this section.

The changes are considered to have a Not Significant and Long-term effect overall, due to the low number of spaces lost and the informal nature of these spaces. This effect is considered acceptable in the context of the aim of the Proposed Scheme, to provide enhanced walking, cycling and bus infrastructure on this key access corridor.

In addition to this, reducing parking within the city centre links with national and regional policy requirements to shift away from private car use as a form of traffic demand management, and help meet Ireland's climate action target.

6.5.7.4 Section 3 – Eyre Square to Forster Street

Pedestrian Infrastructure Changes

The key infrastructure changes to pedestrian links along Section 3 of the Proposed Scheme are summarised as follows:

- Improved pedestrian crossing at the Williamsgate Street / Rosemary Street / Eyre Square intersection;
- Kerb realignment to provide wider footpaths and improved pedestrian facilities at the existing Eyre Square / Prospect Hill signalised junction; eastern arm on Prospect Hill to be disconnected;
- Raised entry treatment at Prospect Hill / Bóthar Na mBan uncontrolled junction;
- Existing partially signalised junction at Eyre Square / Forster Road / Station Road junction to be fully signalised with kerb realignment and improved pedestrian facilities; and
- Footpaths to be widened along Forster Street.

The assessment of the qualitative impacts on the pedestrian infrastructure for Section 3 of the Proposed Scheme is summarised in Table 6.33 along with the

accompanying sensitivity for each junction and the resultant significance of impact.

Table 6.33: Section 3 – Significance of Effects for Pedestrian Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Eyre Square / Prospect Hill	B	A	Low	High	Positive, Moderate and Long-term
Eyre Square / Forster Street / Station Road / Frenchville Lane	D	A	High	High	Positive, Profound and Long-term
Section Summary	**C**	**A**	**Medium**	**High**	**Positive, Very Significant and Long-term**

The contents of Table 6.33 demonstrate that the Proposed Scheme will have a Positive, Very Significant and Long-term impact on the quality of the pedestrian infrastructure at junctions between Eyre Square and Forster Street.

The LoS during the Do Minimum scenario ranges from B to D, with one of the two impacted junctions along this section given the low D rating. These ratings have been determined using the previously referenced assessment criteria set out in Table 6.20. The LoS will improve to an A rating at both of the impacted junctions, in the Do Something scenario. This is a result of the proposed improvements to the existing pedestrian facilities in the form of additional crossing locations, increased pedestrian directness, provision of traffic calming measures to reduce vehicle speeds, improved accessibility and increased footpath and crossing widths. All proposed facilities have been designed in accordance with the principles of DMURS and Building for Everyone: A Universal Design Approach (NDA 2020) with regards to catering for all users, including those with disabilities.

Overall, it is anticipated that there will be Positive, Very Significant and Long-term effect to the quality of the pedestrian infrastructure along Section 3 of the Proposed Scheme, during the Operational Phase, which aligns with the overarching aim to provide enhanced walking infrastructure on the corridor.

A detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Cycling Infrastructure

The key cycling improvements along Section 3 of the Proposed Scheme can be summarised as follows:

- Provision of dedicated bus lanes around Eyre Square, from Rosemary Avenue junction, along Eyre Square East to Forster Street and Fairgreen Road junction.

This is considered a positive for cyclists, with safer road space available due to less general motorised vehicles.

The contents of Table 6.34 outline the cycling qualitative assessment along Section 3 of the Proposed Scheme, with reference to the accompanying sensitivity for each section and the resultant Significance of Impact.

Table 6.34: Section 3 – Cycling Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
An Fhaiche Mhor from Rosemary Ave to Eyre Street	D	B	Medium	High	Positive, Very Significant and Long-term
Eyre Square / Forster St from Victoria Place to Fairgreen Road	D	B	Medium	High	Positive, Very Significant and Long-term
Section Summary	**D**	**B**	**Medium**	**High**	**Positive, Very Significant and Long-term**

The contents of Table 6.34 demonstrate that the scheme will have a Positive, Very Signiant and Long-term effect on the cycling environment along Section 3 of the Proposed Scheme.

The Do Minimum Los has been determined using the previously referenced assessment criteria set out in Table 6.22. The LoS rating of the cycling facilities will improve from D in the Do Minimum to B in the Do Something along the entirety of Section 3 of the Proposed Scheme. This is a result of a reduction in traffic and therefore improved safety for cyclists associated with the Proposed Scheme.

The findings of the cycling assessment fully align with the objective of the Proposed Scheme, applicable to the Traffic and Transport assessment of the Proposed Scheme, to 'Enhance the potential for cycling by providing a safe network for cycling'. Section 1.7.3 in the National Cycle Manual states, that in relation to cyclist hierarchy of provision, traffic reduction is a priority, before the provision of segregated cycle lanes to create an attractive environment for cyclists. The Proposed Scheme is designed to reduce traffic significantly and therefore aligns with this hierarchy.

Bus Infrastructure

The proposed changes to the bus stop infrastructure along Section 3 of the Proposed Scheme are outlined in Table 6.35 below.

Table 6.35: Section 3 – Changes in Bus Infrastructure

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Eastbound	Eyre Square Stop 1	North of Eyre Square parallel to the plaza.	Removed	RTPI Bus Shelter with Seating	Bus shelter with seating & facilities to incorporate RTPI	Removed due to amendments to road layout from Eyre Street
Eastbound	Eyre Square Stop 2	North of Eyre Square parallel to the plaza.	Retained	RTPI Bus Shelter with Seating	Bus shelter with seating & facilities to incorporate RTPI	N/A
Eastbound	Eyre Square Stop 3	North of Eyre Square parallel to the plaza.	Retained	RTPI Bus Shelter with Seating	Bus shelter with seating & facilities to incorporate RTPI	N/A
Eastbound	Eyre Square Stop 4	North of Eyre Square parallel to the plaza.	Retained	RTPI Bus Shelter with Seating	Bus shelter with seating & facilities to incorporate RTPI	N/A
N/A (Westbound)	Eyre Square Stop 5	East of Eyre Square Parallel to playground	Retained	RTPI Bus Shelter with Seating	Bus shelter with seating & facilities to incorporate RTPI	N/A
N/A (Westbound)	Eyre Square Stop 6	East of Eyre Square Parallel to playground	Retained	RTPI Bus Shelter with Seating	Bus shelter with seating & facilities to incorporate RTPI	N/A
N/A (Westbound)	Eyre Square Stop 7	East of Eyre Square Parallel to playground	Retained	RTPI Bus Shelter with Seating	Bus shelter with seating & facilities to incorporate RTPI	N/A
N/A (Westbound)	Eyre Square Stop 8	East of Eyre Square Parallel to playground	Retained	RTPI Bus Shelter with Seating	Bus shelter with seating & facilities to incorporate RTPI	N/A
N/A (Westbound)	Eyre Square Stop 9	South of Eyre Square Beside AIB Building	Removed	RTPI Bus Shelter with Seating	N/A	Removed as bus stop is now obsolete

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Inbound (Westbound)	Forster Street No. 524361	Outside Forster Court	Removed	Bus Stop Pole Paper Timetable	Bus shelter with seating & facilities to incorporate RTPI	Removed due to Proximity to Eyre Square

The number of stops along Section 3 will reduce by three stops, which is considered to better serve the existing and future catchment. There will be improvements to the bus stop facilities with the provision of accessible kerbs throughout. This is assessed as providing an overall Positive, Slight and Long-term effect for bus passengers.

Parking & Loading

The proposals will impact on existing parking and loading along Section 3 of the Proposed Scheme. The contents of Table 6.36 present a summary of the proposed changes along Section 3 of the Proposed Scheme.

Table 6.36: Section 3 – Overall Changes in Parking / Loading Spaces

Location	Parking Type	Do Minimum	Do Something	Change
Eyre Square East	Loading Bay/ Taxi Rank / Commercial	2 bays (6 spaces)	2 bays (12 spaces)	+6
	Taxi Rank / Commercial	2 bays (8 spaces)	0	-8
	Bus Set Down	1 bay (5 spaces)	1 bay (5 spaces)	0
Eyre Square North	Bus Set Down	2 bays (6 spaces)	1 bay (4 spaces)	-2
	Loading Bay / Commercial	1 bay (2 spaces)	1 bay (4 spaces)	+2
	Taxi Rank/ Commercial	1 bay (14 spaces)	0	-14
	Designated Disabled Parking	2	0	-2
Prospect Hill	Disabled Bays / Commercial	4	4	0
	Loading Bay / Commercial	2 bays (8 spaces)	2 bays (9 spaces)	+1
	Taxi Rank/ Commercial	2 bays (11 spaces)	2 bays (7 spaces)	-4
Forster Street	Paid Parking/ Commercial	8	0	-8
	Disabled Bays / Commercial	2	0	-2

Location	Parking Type	Do Minimum	Do Something	Change
	Loading Bay/ Commercial	1 bay (6 spaces)	1 bay (6 spaces)	0
Bothar Irwin	Paid Parking / Commercial	3	0	-3
	Disabled Bays / Commercial	1	3	+2
Total		**86**	**54**	**-32**

Overall, there are approximately 86 current parking spaces affected along Section 3 of the Proposed Scheme. Under the proposals, 32 parking spaces will be lost. It is noted that there are other on-street parking locations and off-street parking locations surrounding the corridor, which provide ample parking opportunities.

There are approximately over 1000 parking spaces within a 200m distance of Section 3. In addition, Galway (Ceannt) Train Station is located within a close proximity and contains 90 parking spaces.

The changes are considered to have a Not Significant and Long-term effect overall, due to the low number of spaces lost, compared to spaces available in surrounding areas. This effect is considered acceptable in the context of the aim of the Proposed Scheme, to provide enhanced walking, cycling and bus infrastructure on this key access corridor.

In addition to this, reducing parking within the city centre links with national and regional policy requirements to shift away from private car use as a form of traffic demand management, and help meet Ireland's climate action target.

More information in relation to detailed parking proposals can be found in Appendix 6.3 (Preliminary Parking Survey Report) in Volume 4 of this EIAR.

6.5.7.5 Section 4 – College Road (Forster Street to Lough Atalia)

Pedestrian Infrastructure Changes

The key infrastructural changes to the pedestrian link along Section 4 of the Proposed Scheme are the following:

- Raised entry treatment on College Road, approximately 50m west to the College Road / The Elms junction;
- Raised entry treatment on The Elms at the College Road / The Elms uncontrolled junction;
- Signalised pedestrian crossing on College Road at approximately 40m to the south of the College Road / Glenmore uncontrolled junction;
- Raised entry treatment on Glenmore at the College Road / Glenmore uncontrolled junction;

- Raised entry treatment on The Green at the College Road / The Green uncontrolled junction;
- Raised entry treatment at the access to Galway Greyhound Stadium on College Road, approximately 160 to the north of the College Road / The Green uncontrolled junction; and
- Signalised pedestrian crossing on College Road at the southeast of Galway Greyhound Stadium.
- There are no existing junctions along Section 4 of the scheme, and therefore there is no significant impact on pedestrian infrastructure.

Cycling Infrastructure

The key cycling improvements along Section 4 of the Proposed Scheme can be summarised as follows:

- Carriageway designated as 'quiet cycle route' by provision of a bus gate on College Road which will reduce vehicle traffic and provides safer cycling facilities.

The contents of Table 6.37 outline the cycling qualitative assessment along Section 4 of the Proposed Scheme, which sets out the overall Do Minimum LoS and the Do Something LoS and the description of impact. Please refer to Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR which outlines in further detail the methodology behind each LoS rating given to the Do Minimum and Do Something scenarios.

Table 6.37: Section 4 – Cycling Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Forster Street/ College Road from Fairgreen Road to / Lough Atalia Road	D	B	Medium	Medium	Positive, Significant and Long-term

The contents of Table 6.37 demonstrate that the scheme will have a Positive Significant and Long-term effect on the cycling environment along the R339 Forster Road / College Road between Fairgreen Road and the Lough Atalia Road junction.

The Do Minimum LoS has been determined using the previously referenced assessment criteria set out in Table 6.22. The LoS rating of the cycling facilities will improve from D in the Do Minimum to B in the Do Something along Section 4 of the Proposed Scheme. This is a result of removing through traffic in this section of the Proposed Scheme, and prioritising cyclist movement.

The findings of the cycling assessment fully align with the objective of the Proposed Scheme, applicable to the Traffic and Transport assessment of the Proposed Scheme, to 'Enhance the potential for cycling by providing a safe network for cycling'.

Section 1.7.3 in the National Cycle Manual states, that in relation to cyclist hierarchy of provision, traffic reduction is a priority, before the provision of segregated cycle lanes to create an attractive environment for cyclists. The Proposed Scheme is designed to reduce traffic significantly and therefore aligns with this hierarchy.

Bus Infrastructure

The proposed changes to the bus stop infrastructure along Section 4 of the Proposed Scheme are outlined in Table 6.38 below.

Table 6.38: Section 4 – Changes in Bus Infrastructure

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Inbound (Westbound)	College Road Galway (Opposite City Hall) No. 523691	Opposite Galway City Council Entrance	Relocated	Bus Stop Pole Paper Timetable	Bus shelter with seating & facilities to incorporate RTPI	Relocated due to installing of new pedestrian crossing
Outbound (Eastbound)	College Road Stop ID 523231	Yeats College Gate	Retained	Pole Paper Timetable	Bus shelter with seating & facilities to incorporate RTPI	N/A
Inbound (Westbound)	Connacht Rugby No. 523681	Opposite Connacht Rugby Main Entrance	Relocated	Pole Paper Timetable	Bus shelter with seating & facilities to incorporate RTPI	Relocated due to reconfiguration of loading bay
Outbound (Eastbound)	Connacht Rugby No. 523241	Connacht Rugby 50m North East of Main Entrance	Retained	Pole Paper Timetable	Bus shelter with seating & facilities to incorporate RTPI	N/A
Inbound (Eastbound)	Loyola Park No. 523671	40m South West from Lough Atalia Road Junction	Removed	Bus Shelter Paper Timetable	N/A	Removed due to proximity to Connaught Rugby Stop
Outbound (Eastbound)	Loyola Park No. 523251	60m South West from Lough Atalia Road Junction	Removed	Bus Stop Pole Paper Timetable	N/A	Removed due to proximity to Connaught Rugby Stop

Table 6.38 indicates that there are considerable improvements to the bus stop facilities along Section 4 of the Proposed Scheme with the provision of shelters, seating, the facilities to incorporate real-time information and accessible kerbs throughout.

Two bus stops are being removed, due to the proximity of other bus stops within Section 4. The layout of the relocated and new bus stops is considered to better serve the existing and future catchment and be closer to existing pedestrian crossing facility for improved convenience. This is assessed as providing an overall Positive, Moderate and Long-term effect for bus passengers.

Parking & Loading

The proposals will impact on existing parking and loading along Section 4 of the Proposed Scheme. The contents of Table 6.49 present a summary of the proposed changes along Section 4 of the Proposed Scheme.

Table 6.39:Section 4 – Overall Changes in Parking / Loading Spaces

Location	Parking Type	Do Minimum	Do Something	Change
College Road	Paid / Residential	65	46	-19
	Disabled Bay / Commercial	3	4	+1
	Loading Bay / Commercial	2 bays (4 spaces)	2 bays (4 spaces)	0
Total		**72**	**55**	**-18**

Overall, there are approximately 72 current parking spaces affected along Section 4 of the Proposed Scheme. Under the proposals, 18 parking spaces will be lost, all of which are on-street pay and display spaces. One additional commercial parking space will be added along this section. It is noted that there are other on-street parking locations and off-street parking locations surrounding the corridor, which provide ample parking opportunities.

There are approximately 45 parking spaces on local side roads within a 200m distance of Section 4. There are also a number of off-street parking locations within the vicinity of Section 4 including Galway Sportsground car park, comprising 100 pay and display spaces.

The changes are considered to have a Not Significant and Long-term effect overall, due to the low number of spaces lost, compared to spaces available in surrounding areas. This effect is considered acceptable in the context of the aim of the Proposed Scheme, to provide enhanced walking, cycling and bus infrastructure on this key access corridor.

In addition to this, reducing parking within the city centre links with national and regional policy requirements to shift away from private car use as a form of traffic demand management, and help meet Ireland’s climate action target.

More information in relation to detailed parking proposals can be found in Appendix 6.3 (Preliminary Parking Survey Report) in Volume 4 of this EIAR.

6.5.7.6 Section 5 – College Road (Lough Atalia to Moneenageisha)

Pedestrian Infrastructure Changes

The key infrastructural changes to the pedestrian link along Section 5 of the Proposed Scheme are the following:

- Reprovision of signalised junction with pedestrian crossing at the College Road / Lough Atalia Road junction, approximately 50m to the south of the existing College Road / Loyola Park / Lough Atalia Road signalised junction;
- Raised entry treatment on Loyola Park at the Loyola Park / College Road uncontrolled junction;
- Raised entry treatment at the Gleann Noinin access on College Road, approximately 70m to the north of the Loyola Park / College Road junction; and
- Raised entry treatment at the Huntsman Inn access on College Road, approximately 60m to the south of the College Road / Moneenageisha Road / Wellpark Road / Dublin Road junction.

The assessment of the qualitative impacts on the Pedestrian Infrastructure for Section 5 of the Proposed Scheme are summarised in Table 6.40 along with the accompanying sensitivity for each junction and the resultant significance of effect. A detailed breakdown of the assessment at each junction can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Table 6.40: Section 5 – Significance of Effects for Pedestrian Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
College Road / Loyola Park / Lough Atalia Road	C	A	Medium	Low	Positive, Moderate and Long-term

The contents of Table 6.40 demonstrate that the Proposed Scheme will have a Positive, Moderate and Long-term impact on the quality of the pedestrian infrastructure along College Road between Lough Atalia and Moneenageisha Road.

The LoS during the Do Minimum scenario is noted as C. This rating has been determined using the previously referenced assessment criteria set out in Table 6.20. The LoS will improve to an A rating at the impacted junction in the Do Something scenario.

This is as a result of the proposed improvements to the existing pedestrian facilities in the form of additional crossing locations, increased pedestrian

directness, provision of traffic calming measures to reduce vehicle speeds, improved accessibility and increased footpath and crossing widths. All proposed facilities have been designed in accordance with the principles of DMURS and the National Disability Authority (NDA) 'Building for Everyone: A Universal Design Approach' (NDA 2020) with regards to catering for all users, including those with disabilities.

Overall, it is anticipated that there will be Positive, Moderate and Long-term effect to the quality of the pedestrian infrastructure along Section 5 of the Proposed Scheme, during the Operational Phase, which aligns with the overarching aim to provide enhanced walking infrastructure on the corridor. A detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Cycling Infrastructure

The key cycling improvements along Section 5 of the Proposed Scheme can be summarised as follows:

- Provision of continuous cycle infrastructure in westbound direction between Moneenageisha Road and the College Road in the form of a 2.0m wide cycle tracks in one direction and a dedicated bus lane in the eastbound direction;
- Upgrade of the existing signalised crossing on L5048 Lough Atalia Road, at the College Road junction, from a pelican crossing to a toucan crossing, allowing cyclist priority.

Along Section 5, the Proposed Scheme will provide a 60mm set down kerb segregation between the footpath and the cycle track.

The kerbs separating the cycle tracks will be raised 120mm from the carriageway to provide segregation from vehicles.

The contents of Table 6.52 outline the cycling qualitative assessment along Section 5 of the Proposed Scheme, which sets out the overall Do Minimum LoS and the Do Something LoS and the description of impact. Please refer to Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR which outlines in further detail the methodology behind each LoS rating given to the Do Minimum and Do Something scenarios.

Table 6.41: Section 5 – Cycling Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
College Road from Lough Atalia Road to Dublin Road	D	B	Medium	Low	Positive, Moderate and Long-term

The contents of Table 6.41 demonstrate that the scheme will have a Positive, Moderate and Long-term effect on the cycling environment along the R339 College Road between Lough Atalia Road and the R338 Moneenageisha Road.

The Do Minimum Los has been determined using the previously referenced assessment criteria set out in Table 6.22. The LoS rating of the cycling facilities will improve from D in the Do Minimum to B in the Do Something along Section 5 of the Proposed Scheme. This is a result of improved segregation for cyclists in the westbound direction and provision of dedicated bus lanes in the eastbound direction creating a more attractive cyclist environment A dedicated toucan crossing is also proposed, contributing to the improvement in LoS.

The findings of the cycling assessment fully align with the objective of the Proposed Scheme, applicable to the Traffic and Transport assessment of the Proposed Scheme, to 'Enhance the potential for cycling by providing a safe network for cycling'. Section 1.7.3 in the National Cycle Manual states, that in relation to cyclist hierarchy of provision, traffic reduction is a priority, before the provision of segregated cycle lanes to create an attractive environment for cyclists.

This section of the Proposed Scheme is designed to reduce traffic significantly and provides segregated cycling infrastructure, and therefore aligns with this hierarchy.

Bus Infrastructure

There is no bus infrastructure along Section 5 of the Proposed Scheme, therefore, the proposals will have no impact.

Parking & Loading

The proposals will impact on existing parking and loading along Section 5 of the Proposed Scheme. The contents of Table 6.42 present a summary of the proposed changes along Section 5 of the Proposed Scheme.

Table 6.42: Section 5 – Overall Changes in Parking / Loading Spaces

Location	Parking Type	Do Minimum	Do Something	Change
Gleann Noinin	Private / Residential	58	52	-6
Circle K	Private/ Commercial	11	7	-4
Moneenageisha Court	Private / Residential	24	24	0
Bayview B&B	Private / Commercial	12	7	-5
Total		**105**	**90**	**-15**

Overall, there are approximately 105 current parking spaces affected along Section 5 of the Proposed Scheme.

Under the proposals, 15 parking spaces will be lost. It is noted that there are other on-street parking locations and off-street parking locations surrounding the corridor, which provide ample parking opportunities.

There are approximately 45 parking spaces on local side roads, within a 200m distance of Section 5.

The changes are considered to have a Not Significant and Long-term effect overall, due to the low number of spaces lost. This effect is considered acceptable in the context of the aim of the Proposed Scheme, to provide enhanced walking, cycling and bus infrastructure on this key access corridor.

In addition to this, reducing parking within the city centre links with national and regional policy requirements to shift away from private car use as a form of traffic demand management, and help meet Ireland's climate action target.

More information in relation to detailed parking proposals can be found in Appendix 6.3 (Preliminary Parking Survey Report) in Volume 4 of this EIAR.

6.5.7.7 Section 6 – Dublin Road

Pedestrian Infrastructure

The key infrastructural changes to the pedestrian link along Section 6 of the Proposed Scheme are the following:

- Junction upgrade at the existing College Road / Moneenageisha Road / Wellpark Road / Dublin Road signalised junction;
- Raised entry treatment at the Huntsman Inn access on Dublin Road, approximately 100m to the east of the College Road / Moneenageisha Road / Wellpark Road / Dublin Road junction; and
- Toucan crossing on Dublin Road and raised entry treatment on Wellpark Retail Park entrance at the Dublin Road / Sáilín uncontrolled junction.

The assessment of the qualitative impacts on the Pedestrian Infrastructure for Section 6 of the Proposed Scheme are summarised in Table 6.43 along with the accompanying sensitivity for each junction and the resultant significance of effect. A detailed breakdown of the assessment at each junction can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Table 6.43: Section 6 – Significance of Effects for Pedestrian Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Dublin Road / Sáilín	D	A	High	High	Positive, Profound and Long-term

The contents of Table 6.43 demonstrate that the Proposed Scheme will have a Positive, Profound and Long-term impact on the quality of the pedestrian infrastructure along Dublin Road.

The LoS during the Do Minimum scenario is noted as D. This rating has been determined using the previously referenced assessment criteria set out in Table 6.20. The LoS will improve to an A rating at the impacted junction in the Do Something scenario. This is as a result of the proposed improvements to the existing pedestrian facilities in the form of additional crossing locations, increased pedestrian directness, provision of traffic calming measures to reduce vehicle speeds, improved accessibility and increased footpath and crossing widths. All proposed facilities have been designed in accordance with the principles of DMURS and the National Disability Authority (NDA) 'Building for Everyone: A Universal Design Approach' (NDA 2020) with regards to catering for all users, including those with disabilities.

Overall, it is anticipated that there will be Positive, Profound and Long-term effect to the quality of the pedestrian infrastructure along Section 5 of the Proposed Scheme, during the Operational Phase, which aligns with the overarching aim to provide enhanced walking infrastructure on the corridor.

A detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Cycling Infrastructure

The key cycling improvements along Section 6 of the Proposed Scheme can be summarised as follows:

- Provision of continuous cycle infrastructure in both directions between Moneenageisha Road and the Brothers of Charity access road in the form of a 2.0m wide cycle tracks in both directions which bypass bus stop islands;
- Upgrade of the existing signalised crossings on R339 College Road / Wellpark Road/R338 Moneenageisha Road / Dublin Road, from pelican to Toucan crossings allowing cyclist priority.

Along Section 6, the Proposed Scheme will provide a 60mm set down kerb segregation between the footpath and the cycle track. The kerbs separating the cycle tracks from the adjoining lane will be raised 120mm from the carriageway to provide segregation from vehicles.

The contents of Table 6.44 outline the cycling qualitative assessment along Section 6 of the Proposed Scheme, which sets out the overall Do Minimum LoS and the Do Something LoS and the description of impact.

Please refer to Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR which outlines in further detail the methodology behind each LoS rating given to the Do Minimum and Do Something scenarios.

Table 6.44: Section 6 – Cycling Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Dublin Road from College Road to Sáilín	D	A+	High	Medium	Positive Very Significant

Table 6.44 demonstrates that the scheme will have a Positive, Very Significant and Long-term effect on the cycling environment along the R338 Dublin Road between R339 Wellpark Road and the Sáilín.

The Do Minimum LoS has been determined using the previously referenced assessment criteria set out in Table 6.22. The LoS rating of the cycling facilities will improve from D in the Do Minimum to A+ in the Do Something along Section 6 of the Proposed Scheme. This is a result of improved segregation for cyclists and toucan junction treatment as part of the Proposed Scheme.

The findings of the cycling assessment fully align with the objective of the Proposed Scheme, applicable to the Traffic and Transport assessment of the Proposed Scheme, to 'Enhance the potential for cycling by providing a safe network for cycling'.

Bus Infrastructure

The proposed changes to the bus stop infrastructure along Section 6 of the Proposed Scheme are outlined in Table 6.45 .

Table 6.45 : Section 6 – Changes in Bus Infrastructure

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Inbound (Westbound)	Dublin Road (Opp G Hotel) No. 522971	30m North West of Huntsman Inn Entrance	Retained	Bus Shelter Paper Timetable	Bus shelter with seating & facilities to incorporate RTPI	N/A
Outbound (Eastbound)	Dublin Road (G Hotel) No. 522691	60m North West of G Hotel Entrance	Relocated	Pole Paper Timetable	Bus shelter with seating & facilities to incorporate RTPI	Relocated to improve interchange opportunity
Outbound (Eastbound)	Dublin Road (Eye	80m West of Wellpark Shopping Centre Entrance on	New	N/A	Bus shelter with seating & facilities to incorporate	N/A

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
	Cinema)	Dublin Road			RTPI	

Table 6.45 indicates that there are improvements to the existing bus stop facilities along Section 6 of the Proposed Scheme with the provision of shelters, seating, the facilities to incorporate real-time information and accessible kerbs throughout.

Overall, there will be one additional bus stop along this section. The layout of the relocated and new bus stops is considered to better serve the existing and future catchment and be closer to the bus interchange opportunity for improved convenience. This is assessed as providing an overall Positive, Moderate and Long-term effect for bus passengers.

Parking & Loading

There are no existing parking and loading facilities within Section 6 of the Proposed Scheme. Therefore, no significance of effect can be determined.

6.5.7.8 Section 7 – Fairgreen Road

Pedestrian Infrastructure

The key infrastructural changes to the pedestrian link along Section 7 of the Proposed Scheme are the following:

- Raised entry treatment on Station Road at the Fairgreen Road / Station Road uncontrolled junction;
- Signalised pedestrian crossing on Fairgreen Road approximately 10m to the north of the Fairgreen Road / Station Road uncontrolled junction;
- Raised entry treatment at the entrance / exit of the City Centre Carpark on Fairgreen Road, approximately 50m south to the Bóthar Bhreandain Uí Eithir / Forster Street / Fairgreen Road junction;
- Raised entry treatment at the entrance / exit to the Galmont Hotel access road junction.

There are no key junctions along Section 7 of the scheme, and therefore there is no significant impact on pedestrian infrastructure.

Cycling Infrastructure

There are no cycling improvements planned along Section 7 of the Proposed Scheme and therefore there is no significant impact on cycling infrastructure

Bus Infrastructure

There is no bus infrastructure along Section 7 of the Proposed Scheme, therefore, the proposals will have no impact.

Parking & Loading

The proposals will impact on existing parking and loading along Section 7 of the Proposed Scheme. The contents of Table 6.46 present a summary of the proposed changes along Section 7 of the Proposed Scheme.

Table 6.46: Section 7 – Overall Changes in Parking / Loading Spaces

Location	Parking Type	Do Minimum	Do Something	Change
Fairgreen Road	Set Down Area	2 bays (6 spaces)	2 bays (6 spaces)	0
	Taxi Rank	1 bay (10 spaces)	1 bay (10 spaces)	0
	Loading Bay/ Commercial	1 bay (5 spaces)	1 bay (5 spaces)	0
	Informal Parking	7	0	-7
Total		**28**	**21**	**-7**

Overall, there are approximately 28 current parking spaces affected along Section 7 of the Proposed Scheme. Under the proposals, seven informal, unmarked parking spaces will be lost. It is noted that there are other on-street parking locations and off-street parking locations surrounding the corridor, which provide ample parking opportunities.

There are approximately over 25 parking spaces on local side roads within a 200m distance of Section 7. In addition, Galway Coach Station and the City Car Park provide over 500 paid for parking spaces.

The changes are considered to have a Not Significant and Long-term effect overall, due to the low number of spaces lost and the informal nature of the parking spaces. This effect is considered acceptable in the context of the aim of the Proposed Scheme, to provide enhanced walking, cycling and bus infrastructure on this section.

In addition to this, reducing parking within the city centre links with national and regional policy requirements to shift away from private car use as a form of traffic demand management, and help meet Ireland's climate action target.

More information in relation to detailed parking proposals can be found in Appendix 6.3 (Preliminary Parking Survey Report) in Volume 4 of this EIAR.

6.5.7.9 Section 8 – Bóthar Uí Eithir and Prospect Hill

Pedestrian Infrastructure

The key infrastructural changes to the pedestrian link along Section 10 of the Proposed Scheme are the following:

- Existing Prospect Hill / Bóthar Bhreandain Uí Eithir uncontrolled junction to be converted into signal control with pedestrian crossings.
- Kerb realignment to provide wider footpaths and improved pedestrian facilities at the Bóthar Bhreandain Uí Eithir / Forster Street / Fairgreen Road junction.
- The assessment of the qualitative impacts on the Pedestrian Infrastructure for Section 8 of the Proposed Scheme are summarised in Table 6.47 along with the accompanying sensitivity for each junction and the resultant significance of effect. A detailed breakdown of the assessment at each junction can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Table 6.47: Section 8 – Significance of Effects for Pedestrian Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Prospect Hill / Bóthar Bhreandain Uí Eithir	B	A	Low	Medium	Positive, Moderate and Long-term
Bóthar Bhreandain Uí Eithir / Forster Street / Fairgreen Road	B	A	Low	Medium	Positive Moderate and Long-term
Section Summary	B	A	Low	Medium	Positive Moderate and Long-term

The contents of Table 6.47 demonstrate that the Proposed Scheme will have a Positive, Moderate and Long-term impact on the quality of the pedestrian infrastructure along the Prospect Hill and Bóthar Uí Eithir.

The LoS during the Do Minimum scenario is B at both junctions. This rating has been determined using the previously referenced assessment criteria set out in Table 6.20. The LoS will improve to an A rating at both of the impacted junctions, in the Do Something scenario.

This is as a result of the proposed improvements to the existing pedestrian facilities in the form of additional crossing locations, increased pedestrian directness, provision of traffic calming measures to reduce vehicle speeds, improved accessibility and increased footpath and crossing widths. All proposed facilities have been designed in accordance with the principles of DMURS and the National Disability Authority (NDA) 'Building for Everyone: A Universal Design Approach' (NDA 2020) with regards to catering for all users, including those with disabilities.

Overall, it is anticipated that there will be Positive, Moderate and Long-term effect to the quality of the pedestrian infrastructure along Section 8 of the Proposed Scheme, during the Operational Phase, which aligns with the overarching aim to provide enhanced walking infrastructure on the corridor. A

detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Cycling Infrastructure

There are no cycling improvements planned along Section 8 of the Proposed Scheme and therefore there is no significant impact on cycling infrastructure

Bus Infrastructure

The proposed changes to the bus stop infrastructure along Section 8 of the Proposed Scheme are outlined in Table 6.48.

Table 6.48: Section 8 – Changes in Bus Infrastructure

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Inbound Eastbound	Bóthar Uí Eithir	Outside Salon de Beauté	Removed	Bus Stop Pole Paper Timetable	n/a	Removed as bus stop is now obsolete

Table 6.48 indicates that the bus stop along Section 8 will be removed as part of the proposals. Section 8 is in proximity to Eyre Square, which has a number of bus stops serving a range of routes. Therefore, the removal of this bus stop is assessed as providing an overall Not Significant and Long-term effect for bus passengers.

Parking & Loading

There are no existing parking and loading facilities within Section 8 of the Proposed Scheme. Therefore, no significance of effect can be determined.

6.5.7.10 Section 9 – Bothar na mBan / St. Brendan's Avenue / Dyke Road/ Headford Road

Pedestrian Infrastructure

The key infrastructural changes to the pedestrian link along Section 9 of the Proposed Scheme are the following:

- Raised entry treatment at the Bóthar Na mBan / St Brendan's Avenue uncontrolled junction;
- Raised entry treatment at the Bóthar Na mBan / Bóthar Irwin uncontrolled junction; and
- Provision of new footpath on St. Brendan's Avenue and widened footpath on opposite side of the road.

- Realigned and improved pedestrian facilities at the Headford Road / St Brendan's Avenue / Dyke Road signalised junction;
- Existing uncontrolled junction on Dyke Road to be converted into signal control with pedestrian crossings; and
- Existing Dyke Road / Headford Road / St Bridget's Place uncontrolled junction to be converted into signal control with pedestrian crossings.

The assessment of the qualitative impacts on the Pedestrian Infrastructure for Section 9 of the Proposed Scheme are summarised in Table 6.49 along with the accompanying sensitivity for each junction and the resultant significance of effect. A detailed breakdown of the assessment at each junction can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Table 6.49: Section 9 – Significance of Effects for Pedestrian Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Bóthar Na mBan / Prospect Hill / Bohemore Road	C	A	Medium	Medium	Positive, Significant and Long-term
Headford Road / Street Brendan's Avenue / Dyke Road	B	A	Low	High	Positive Moderate and Long-term
Dyke Road	E	A	High	Low	Positive Moderate and Long-term
Section Summary	**D**	**A**	**High**	**Medium**	Positive, Very Significant and Long-term

Positive, Very Significant and Long-term impact on the quality of the pedestrian infrastructure along Bothar Na mBan, St Brendan's Avenue, Dyke Road and Headford Road.

The LoS during the Do Minimum scenario ranges from B to E. This rating has been determined using the previously referenced assessment criteria set out in Table 6.20. The LoS will improve to an A rating at all junctions in this section, in the Do Something scenario. This is as a result of the proposed improvements to the existing pedestrian facilities in the form of additional crossing locations, increased pedestrian directness, provision of traffic calming measures to reduce vehicle speeds, improved accessibility and increased footpath and crossing widths. All proposed facilities have been designed in accordance with the principles of DMURS and the National Disability Authority (NDA) 'Building for Everyone: A Universal Design Approach' (NDA 2020) with regards to catering for all users, including those with disabilities.

Overall, it is anticipated that there will be Positive, Very Significant and Long-term effect to the quality of the pedestrian infrastructure along Section 9 of the

Proposed Scheme, during the Operational Phase, which aligns with the overarching aim to provide enhanced walking infrastructure on the corridor. A detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Cycling Infrastructure

The key cycling improvements along Section 9 of the Proposed Scheme can be summarised as follows:

- Provision of cycle infrastructure between The Plots Road and the Dyke Road Car Park in the form of a 3.0m wide two-way cycle track, with two protected right-turn movements on the Dyke Road Car Park crossing.

The contents of Table 6.50 outline the cycling qualitative assessment along Section 7 of the Proposed Scheme, which sets out the overall Do Minimum LoS and the Do Something LoS and the description of impact. Please refer to Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR which outlines in further detail the methodology behind each LoS rating given to the Do Minimum and Do Something scenarios.

Table 6.50: Section 9 – Cycling Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Headford Road from St Brendan's Ave to St Bridget's Place	D	B	Medium	High	Positive Very Significant and Long - Term
Dyke Road from St Brendan's Avenue to Dyke Road	D	B	Medium	Medium	Positive Significant Long - Term
Section Summary	**D**	**B**	**Medium**	**Medium**	**Positive Significant and Long - Term**

The contents of Table 6.50 demonstrate that the scheme will have a Positive, Significant and Long-term effect on the cycling environment along Section 9 of the Proposed Scheme.

The Do Minimum Los has been determined using the previously referenced assessment criteria set out in Table 6.22. The LoS rating of the cycling facilities will improve from D in the Do Minimum to B in the Do Something along the entirety of Section 9 of the Proposed Scheme. This is as a result of improved segregation for cyclists in the form of cycling infrastructure on Dyke Road.

The findings of the cycling assessment fully align with the objective of the Proposed Scheme, applicable to the Traffic and Transport assessment of the Proposed Scheme, to 'Enhance the potential for cycling by providing a safe network for cycling'. Section 1.7.3 in the National Cycle Manual states, that in relation to cyclist hierarchy of provision, traffic reduction is a priority, before the provision of segregated cycle lanes to create an attractive environment for

cyclists. This section of the Proposed Scheme is designed to reduce traffic significantly and provides segregated cycling infrastructure, and therefore aligns with this hierarchy.

Bus Infrastructure

There are no bus facilities along Section 9 of the Proposed Scheme to assess and therefore there is no significant impact on bus infrastructure.

Parking & Loading

The proposals will impact on existing parking and loading along Section 8 of the Proposed Scheme. The contents of Table 6.51 present a summary of the proposed changes along Section 9 of the Proposed Scheme.

Table 6.51: Section 9–Overall Changes in Parking / Loading Spaces

Location	Parking Type	Do Minimum	Do Something	Change
St Brendan's Avenue	Paid/ Residential	48	46	-2
Bóthar Na mBan	Bus Set Down/ Commercial	1 bay (2 spaces)	1 bay (2 spaces)	0
	Loading Bay	1 bay (3 spaces)	1 bay (3 spaces)	0
Headford Road	Informal Parking	2	0	-2
Dyke Road Car Park*	Paid/ Commercial	510	500	-10
Total		**565**	**551**	**-14**

Overall, there are approximately 565 current parking spaces affected along Section 9 of the Proposed Scheme. Under the proposals, two designated paid residential parking spaces , two informal parking spaces will be lost and 10 car parking spaces will be lost. It is noted that there is still significant capacity within the Dyke Road Car Park and there are other on-street parking locations and off-street parking locations surrounding the corridor, which provide ample parking opportunities.

There are approximately over 75 parking spaces on local side roads within a 200m distance of Section 9. In addition, the Corrib Shopping Centre is located off Bóthar Na mBan and provides 576 pay by foot spaces.

The changes are considered to have a Not Significant and Long-term effect overall, due to the low number of spaces lost. This effect is considered acceptable in the context of the aim of the Proposed Scheme, to provide enhanced walking, cycling and bus infrastructure on this key access corridor.

In addition to this, reducing parking within the city centre links with national and regional policy requirements to shift away from private car use as a form of traffic demand management, and help meet Ireland's climate action target.

More information in relation to detailed parking proposals can be found in Appendix 6.3 (Preliminary Parking Survey Report) in Volume 4 of this EIAR.

6.5.7.11 Section 10 – Woodquay / Walsh's Terrace / Daly's Place / Mary Street

Pedestrian Infrastructure

The key infrastructural changes to the pedestrian link along Section 10 of the Proposed Scheme are the following:

- Raised entry treatment at the Headford Road / Riverside / Woodquay junction, existing signalised pedestrian crossing on Headford Road to be retained;
- Raised entry treatment at the Woodquay / St Anthony's Place junction; and
- Raised entry treatment at the Woodquay / Daly's Place junction.

The assessment of the qualitative impacts on the Pedestrian Infrastructure for Section 10 of the Proposed Scheme are summarised in Table 6.52 along with the accompanying sensitivity for each junction and the resultant significance of effect. A detailed breakdown of the assessment at each junction can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Table 6.52: Section 10 – Significance of Effects for Pedestrian Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Headford Road at Headford Road / Riverside	C	A	Medium	High	Positive Very Significant and Long-Term

The contents of Table 6.52 demonstrate that the Proposed Scheme will have a Positive, Very Significant and Long-Term impact on the quality of the pedestrian infrastructure along Woodquay, Mary Street and Daly's Place

The LoS during the Do Minimum scenario is noted as C. This rating has been determined using the previously referenced assessment criteria set out in Table 6.20. The LoS will improve to an A rating in the Do Something scenario. This is a result of the proposed improvements to the existing pedestrian facilities in the form of additional crossing locations, increased pedestrian directness, provision of traffic calming measures to reduce vehicle speeds, improved accessibility and increased footpath and crossing widths. All proposed facilities have been designed in accordance with the principles of DMURS and the National Disability Authority (NDA) 'Building for Everyone: A Universal Design Approach' (NDA 2020) with regards to catering for all users, including those with disabilities.

Overall, it is anticipated that there will be Positive, Very Significant and Long-term effect to the quality of the pedestrian infrastructure along Section 10 of the Proposed Scheme, during the Operational Phase, which aligns with the overarching aim to provide enhanced walking infrastructure on the corridor. A

detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Cycling Infrastructure

The key cycling improvements along Section 10 of the Proposed Scheme can be summarised as follows:

- Provision of dedicated bus lane in a westbound direction on R866 Corrib Terrace to R866 St. Francis Street. This is considered a positive for cyclists, with safer road space available due to less general motorised vehicles.
- Provision of cycle infrastructure on Woodquay between Daly's Place and Riverside in the form of a 2.0m wide counterflow cycle track, for the northbound direction.
- Provision of dedicated bus lane in an eastbound direction on R866 O'Donoghue's Terrace. This is considered a positive for cyclists, with safer road space available due to less general motorised vehicles.

Along Section 10, the Proposed Scheme will provide a 60mm set down kerb segregation between the footpath and the cycle track. The kerb separating the cycle tracks will be raised 120mm from the adjacent carriageway to provide segregation from vehicles.

The contents of Table 6.53 outline the cycling qualitative assessment along Section 10 of the Proposed Scheme, which sets out the overall Do Minimum LoS and the Do Something LoS and the description of impact. Please refer to Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR which outlines in further detail the methodology behind each LoS rating given to the Do Minimum and Do Something scenarios.

Table 6.53: Section 10 – Cycling Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
St Vincent's Avenue / Headford Road from St Francis Street to Dyke Road	D	B	Medium	High	Positive Very Significant and Long-Term
Mary Street / Woodquay Street from Newtownsmith to Headford Road	D	B	Medium	Low	Positive Moderate Long-Term
Section Summary	**D**	**B**	**Medium**	**Medium**	**Positive Significant and Long - Term**

The contents of Table 6.53 demonstrate that the scheme will have a Positive, Significant and Long-term effect on the cycling environment along Section 10 of the Proposed Scheme.

The Do Minimum LoS has been determined using the previously referenced assessment criteria set out in Table 6.22. The LoS rating of the cycling facilities

will improve from D in the Do Minimum to B in the Do Something along the entirety of Section 10 of the Proposed Scheme. This is as a result of improved segregation for cyclists in the form of cycle lane traversing Woodquay Street and a reduction in vehicular traffic creating a safer space for cyclists.

The findings of the cycling assessment fully align with the objective of the Proposed Scheme, applicable to the Traffic and Transport assessment of the Proposed Scheme, to 'Enhance the potential for cycling by providing a safe network for cycling'. Section 1.7.3 in the National Cycle Manual states, that in relation to cyclist hierarchy of provision, traffic reduction is a priority, before the provision of segregated cycle lanes to create an attractive environment for cyclists. This section of the Proposed Scheme is designed to reduce traffic significantly and provides segregated cycling infrastructure, and therefore aligns with this hierarchy.

Bus Infrastructure

The proposed changes to the bus stop infrastructure along Section 10 of the Proposed Scheme are outlined in Table 6.54 below.

Table 6.54: Section 10 – Changes in Bus Infrastructure

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Inbound (Eastbound)	Headford Road No. 523711	AXA Insurance Building parallel to Walsh's Terrace	Relocated	Bus Stop Pole Paper timetable	Bus shelter with seating & facilities to incorporate RTPI	Relocated due to amendments to on street parking
Outbound (Westbound)	Woodquay Court No. 525411	Opposite AXA Insurance parallel to Walsh's Terrace	Retained	Bus Shelter Paper timetable	Bus shelter with seating & facilities to incorporate RTPI	N/A

Table 6.54 indicates that there are improvements to the bus stop facilities along Section 10 of the Proposed Scheme with the provision shelters, seating, the facilities to incorporate real-time information and accessible kerbs throughout. The number of bus stops along this section will remain unchanged.

This is assessed as providing an overall Positive, Slight and Long-term effect for bus passengers.

Parking & Loading

The proposals will impact on existing parking and loading along Section 10 of the Proposed Scheme. The contents of Table 6.55 present a summary of the proposed changes along Section 10 of the Proposed Scheme.

Table 6.55: Section 10 – Overall Changes in Parking / Loading Spaces

Location	Parking Type	Do Minimum	Do Something	Change
Woodquay Street	Paid / Commercial	64	22	-42
	Disabled Bay	2	0	-2
	Loading Bay / Taxi Ran	1 bay (2 spaces)	1 bay (5 spaces)	+3
	Taxi Rank / Paid / Commercial	1 bay (2 spaces)	0	-2
Walsh's Terrace	Paid / Commercial	5	10	+5
Total		**75**	**37**	**38**

Overall, there are approximately 75 current parking spaces affected along Section 10 of the Proposed Scheme. Under the proposals, 38 parking spaces will be lost, the majority being designated paid parking on Woodquay. It is noted that there are other on-street parking locations and off-street parking locations surrounding the corridor, which provide ample parking opportunities.

There are approximately over 60 parking spaces on local side roads within a 200m distance of Section 10.

The changes are considered to have a Negative, Slight and Long-term effect overall, due to the low number of spaces lost, compared to the number of spaces available in the surrounding area. This effect is considered acceptable in the context of the aim of the Proposed Scheme, to provide enhanced walking, cycling and bus infrastructure on this key access corridor.

In addition to this, reducing parking within the city centre links with national and regional policy requirements to shift away from private car use as a form of traffic demand management, and help meet Ireland's climate action target.

More information in relation to detailed parking proposals can be found in Appendix 6.3 (Preliminary Parking Survey Report) in Volume 4 of this EIAR.

6.5.7.12 Section 11 – Forthill / Merchants Road / Queen Street

Pedestrian Infrastructure

The key infrastructural changes to the pedestrian link along Section 11 of the Proposed Scheme are the following:

- Raised uncontrolled crossing on Merchants Road at the Merchants Road / Victoria Place uncontrolled junction;
- Raised uncontrolled crossing on Merchants Road and signalised crossing on Forthill Street at the Merchants Road / Forthill Street uncontrolled junction;
- Raised entry treatment on Queen Street and signalised crossing on Forthill Street at the Forthill Street / Queen Street uncontrolled junction; and

The assessment of the qualitative impacts on the Pedestrian Infrastructure for Section 11 of the Proposed Scheme are summarised in Table 6.56 along with the accompanying sensitivity for each junction and the resultant significance of effect. A detailed breakdown of the assessment at each junction can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Table 6.56: Section 11 – Significance of Effects for Pedestrian Impact during Operational Phase

Junctions	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Merchants Road / Forthill Street	C	A	Medium	Medium	Positive Significant and Long-term
Forthill Street / Queen Street	E	A	High	Low	Positive, Moderate and Long-term
Section Summary	**D**	**A**	**High**	**Medium**	**Positive, Very Significant and Long-term**

The contents of Table 6.56 demonstrate that the Proposed Scheme will have a Positive, Very Significant and Long-term impact on the quality of the pedestrian infrastructure along Forthill Street, Merchants Road Queen Street.

The LoS during the Do Minimum scenario is C and E at each impacted junction respectively. These ratings have been determined using the previously referenced assessment criteria set out in Table 6.20. The LoS will improve to an A rating for both junctions, in the Do Something scenario. This is as a result of the proposed improvements to the existing pedestrian facilities in the form of additional crossing locations, increased pedestrian directness, provision of traffic calming measures to reduce vehicle speeds, improved accessibility and increased footpath and crossing widths. All proposed facilities have been designed in accordance with the principles of DMURS and the National Disability Authority (NDA) 'Building for Everyone: A Universal Design Approach' (NDA 2020) with regards to catering for all users, including those with disabilities.

Overall, it is anticipated that there will be Positive, Very Significant and Long-term effect to the quality of the pedestrian infrastructure along Section 11 of the Proposed Scheme, during the Operational Phase, which aligns with the overarching aim to provide enhanced walking infrastructure on the corridor. A detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

Cycling Infrastructure

There are no cycling improvements planned along Section 11 of the Proposed Scheme and therefore there is no significant impact on cycling infrastructure

Bus Infrastructure

The proposed changes to the bus stop infrastructure along Section 11 of the Proposed Scheme are outlined in Table 6.57 below.

Table 6.57: Section 11 – Changes in Bus Infrastructure

Inbound/ Outbound	Bus Stop Name/No.	Location	Retained/ Relocated/ Removed/ New	Existing Facilities	Proposed Facilities	Reason for moving / locating stop
Inbound (Eastbound)	Merchants Road No. 524501	Opposite Ross House	Retained	Bus Stop Pole Paper Timetable	Bus shelter with seating & facilities to incorporate RTPI	N/A

The location of the stop along Section 11 will remain unchanged, however, there will be improvements to the bus stop facilities with the provision of shelters, seating, the facilities to incorporate real-time information and accessible kerbs throughout. This is assessed as providing an overall Positive, Slight and Long-term effect for bus passengers.

Parking & Loading

The proposals will impact on existing parking and loading along Section 11 of the Proposed Scheme. The contents of Table 6.58 present a summary of the proposed changes along Section 11 of the Proposed Scheme.

Table 6.58: Section 11 – Overall Changes in Parking / Loading Spaces

Location	Parking Type	Do Minimum	Do Something	Change
Merchants Road	Disabled Bay	2	2	0
	Bus Set Down	1 bay (2 spaces)	2 bays (3 spaces)	+1
	Paid / Taxi Rank	2 bays (6 spaces)	2 bays (5 spaces)	-1
Forthill Street	Paid/ Commercial	19	6	-13
	Bus Set Down	1 bay (1 space)	1 bay (1 space)	0
Total		**30**	**17**	**-13**

Overall, there are approximately 30 current parking spaces affected along Section 11 of the Proposed Scheme. Under the proposals, 13 designated paid parking spaces will be lost. It is noted that there are other on-street parking locations and off-street parking locations surrounding the corridor, which provide ample parking opportunities.

There are approximately over 900 parking spaces on local side roads within a 200m distance of Section 11. In addition, there are two off-street car parks within the vicinity of this section offering charged parking.

The changes are considered to have a Not Significant and Long-term effect overall, due to the low number of spaces lost. This effect is considered acceptable in the context of the aim of the Proposed Scheme, to provide enhanced walking, cycling and bus infrastructure on this key access corridor.

In addition to this, reducing parking within the city centre links with national and regional policy requirements to shift away from private car use as a form of traffic demand management, and help meet Ireland's climate action target.

More information in relation to detailed parking proposals can be found in Appendix 6.3 (Preliminary Parking Survey Report) in Volume 4 of this EIAR.

6.5.8 Quantitative Analysis

This quantitative assessment has been prepared with reference to the modelling outputs obtained from the three-tiered modelling approach outlined in Section 6.3.2 The following assessment topics have been considered:

- People Movement:
- Peak Hour People Movement along the Proposed Scheme;
- People Movement by Bus; and
- Bus Boarding.
- Bus Network Performance Indicators:
- Bus Journey Times; and
- Bus Journey Time Reliability.
- General Traffic Network Performance Indicators:
- Junction Capacity Outputs on the Direct Study Area; and
- Redistributed flows and Junction Capacity Outputs on the Indirect Study Area.

6.5.8.1 People Movement Assessment

Overview

In order to understand the benefit of the Proposed Scheme with regards to the Movement of People following the implementation of the proposed infrastructure measures, a quantitative People Movement assessment has been undertaken using outputs from the NTA ERM and LAM and comparing the Do Minimum and Do Something peak hour scenarios for each forecast year (2023, 2038).

The assessment of People Movement includes the following metrics:

- The average number of people moved by each transport mode (i.e., Car, Bus, Walking and Cycling) along the corridor in the eastbound and westbound direction. This metric is compared for the Do Minimum and Do Something scenarios in the AM and PM peak hours for each forecast year (2023, 2038). This metric provides an estimate of the modal share changes along the route as a result of the Proposed Scheme measures; and
- People Movement by Bus:
- AM and PM peak hour Bus Passenger Loadings along the Proposed Scheme for each forecast year (2023, 2038); and
- Total Passengers Boarding Buses on bus routes that use any part of the Proposed Scheme for each forecast year (2023, 2038).

Peak Hour People Movement along the Proposed Scheme

To determine the impact that the Proposed Scheme has on modal share in the study area as a result of its implementation, the weighted average number of people moved by each mode (Car, Bus, Active Modes) has been extracted from the WRM / LAM. The analysis compares the Do Minimum and Do Something scenarios both in the eastbound and westbound direction in the AM and PM peak hours (8-9am, 5-6pm) for each forecast year (2023, 2038).

As outlined previously, the same demographic assumptions (population, employment levels) are included in both the Do Minimum and Do Something scenarios. The bus network and frequency assumptions are also the same in both scenarios and are in line with the network proposals. It is acknowledged, therefore, that the assessment is conservative in terms of the relative increase in the level of people movement that is predicted in the Do Something scenario. The Do Something scenario will facilitate opportunities to increase bus network capacity operating along the corridor due to the extensive priority provided.

In addition to this, the significant segregation and safety improvements to walking and cycling infrastructure that is a key feature of the Proposed Scheme will further maximise the movement of people travelling sustainably along the corridor and will therefore cater for higher levels of future population and employment growth. In the absence of the delivery of the Proposed Scheme, growth along this key corridor would continue to contribute to increased congestion and operational issues on the road network. The Proposed scheme delivers a reliable alternative to car-based travel that can support future sustainable growth and provide a positive contribution towards reducing carbon emissions.

For the purposes of this assessment, the Proposed Scheme has been split into two sub-corridors, as highlighted in Diagram 6.19.

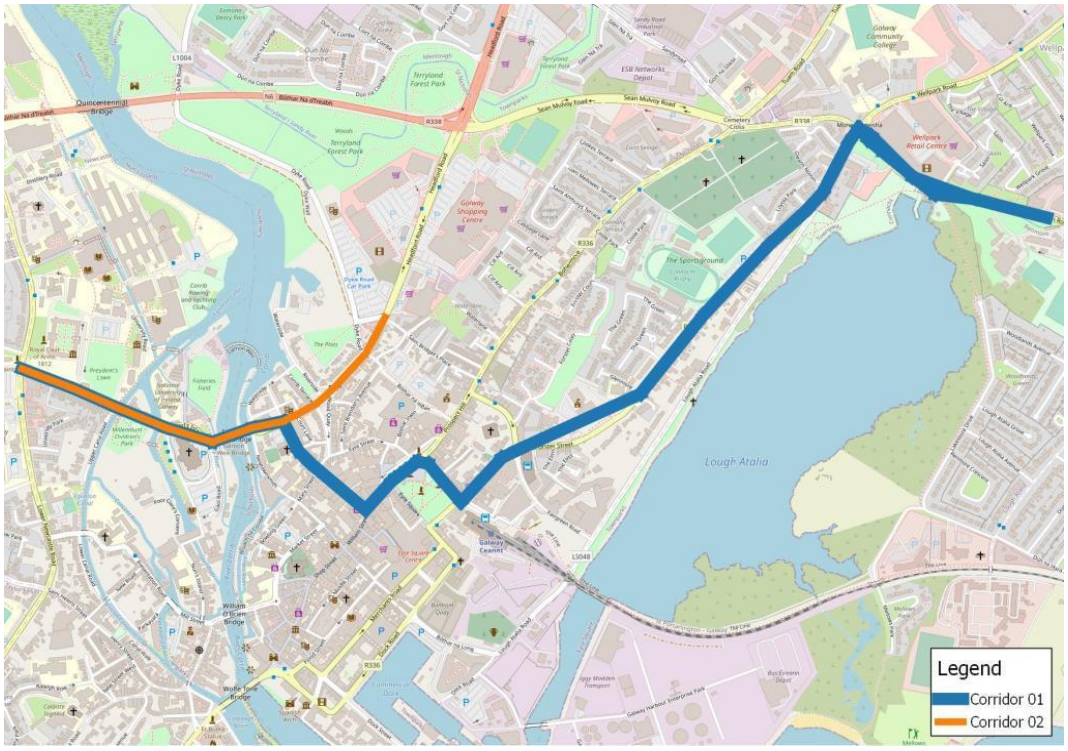

Diagram 6.19: Sub Corridors – People Movement Assessment

2023 AM Peak Hour People Movement Westbound

The contents of Table 6.59 and Table 6.60 outline the difference in modal split between the Do Minimum and Do Something scenarios for each mode of transport in a westbound direction during the AM Peak Hour. The results indicate a 12% and 13% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.59: Mode Shift of 2023 AM Peak Hour: Corridor 1 Westbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Westbound Corridor 1	AM Peak Period	General Traffic	550	34%	350	22%	-200	-36%
		Public Transport	810	50%	910	58%	100	12%
		Walking	220	13%	250	16%	30	14%
		Cycling	50	3%	50	3%	0	0%
		Sustainable Modes Total	**1,080**	**66%**	**1,210**	**78%**	**130**	**12%**

Table 6.60: Mode Shift of 2023 AM Peak Hour: Corridor 2 Westbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Westbound Corridor 2	AM Peak Period	General Traffic	590	38%	80	7%	-510	-86%
		Public Transport	460	29%	510	43%	50	11%
		Walking	460	29%	530	45%	70	15%
		Cycling	60	4%	70	6%	10	17%
		Sustainable Modes Total	**980**	**62%**	**1,110**	**93%**	**130**	**13%**

2023 AM Peak Hour People Movement Eastbound

The contents of Table 6.61 and Table 6.62 outline the difference in modal split between the Do Minimum and Do Something scenarios for each mode of transport in an eastbound direction during the AM Peak Hour. The results indicate a 10% and 8% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.61: Mode Shift of 2023 AM Peak Hour: Corridor 1 Eastbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Eastbound Corridor 1	AM Peak Period	General Traffic	410	34%	240	22%	-170	-41%
		Public Transport	650	54%	710	64%	60	9%
		Walking	120	10%	130	12%	10	8%
		Cycling	20	2%	30	3%	10	50%
		Sustainable Modes Total	**790**	**66%**	**870**	**78%**	**80**	**10%**

Table 6.62: Mode Shift of 2023 AM Peak Hour: Corridor 2 Eastbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Eastbound Corridor 2	AM Peak Period	General Traffic	400	38%	180	20%	-220	-55%
		Public Transport	440	42%	470	53%	30	7%

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
		Walking	180	17%	200	22%	20	11%
		Cycling	40	4%	40	4%	0	0%
		Sustainable Modes Total	**660**	**62%**	**710**	**80%**	**50**	**8%**

2023 PM Peak Hour People Movement Westbound

The contents of Table 6.63 and Table 6.64 outline the difference in modal split between the Do Minimum and Do Something scenarios for each mode of transport in a westbound direction during the PM Peak Hour. The results indicate a 15% and 17% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.63: Mode Shift of 2023 PM Peak Hour: Corridor 1 Westbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Westbound Corridor 1	PM Peak Period	General Traffic	490	45%	330	32%	-160	-33%
		Public Transport	460	42%	530	51%	70	15%
		Walking	120	11%	140	14%	20	17%
		Cycling	30	3%	30	3%	0	0%
		Sustainable Modes Total	**610**	**55%**	**700**	**68%**	**90**	**15%**

Table 6.64: Mode Shift of 2023 PM Peak Hour: Corridor 2 Westbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Westbound Corridor 2	PM Peak Period	General Traffic	530	50%	70	10%	-460	-87%
		Public Transport	300	28%	350	51%	50	17%
		Walking	190	18%	230	33%	40	21%
		Cycling	40	4%	40	6%	0	0%
		Sustainable Modes Total	**530**	**50%**	**620**	**90%**	**90**	**17%**

2023 PM Peak Hour People Movement Eastbound

The contents of Table 6.65 and Table 6.66 outline the difference in modal split between the Do Minimum and Do Something scenarios for each mode of transport in an eastbound direction during the PM Peak Hour. The results indicate a 15% and 8% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.65: Mode Shift of 2023 PM Peak Hour: Corridor 1 Eastbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Eastbound Corridor 1	PM Peak Period	General Traffic	460	35%	230	19%	-230	-50%
		Public Transport	640	48%	750	61%	110	17%
		Walking	190	14%	200	16%	10	5%
		Cycling	30	2%	40	3%	10	33%
		Sustainable Modes Total	**860**	**65%**	**990**	**81%**	**130**	**15%**

Table 6.66: Mode Shift of 2023 PM Peak Hour: Corridor 2 Eastbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Eastbound Corridor 2	PM Peak Period	General Traffic	630	43%	230	20%	-400	-63%
		Public Transport	380	26%	430	37%	50	13%
		Walking	410	28%	430	37%	20	5%
		Cycling	60	4%	60	5%	0	0%
		Sustainable Modes Total	**850**	**57%**	**920**	**80%**	**70**	**8%**

2038 AM Peak Hour People Movement Westbound

The contents of Table 6.67 and Table 6.68 outline the difference in modal split between the Do Minimum and Do Something scenarios for each mode of transport in a westbound direction during the AM Peak Hour. The results indicate a 18% and 12% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.67: Mode Shift of 2038 AM Peak Hour: Corridor 1 Westbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Westbound Corridor 1	AM Peak Period	General Traffic	530	24%	360	15%	-170	-32%
		Public Transport	1,240	56%	1,520	65%	280	23%
		Walking	290	13%	320	14%	30	10%
		Cycling	150	7%	140	6%	-10	-7%
		Sustainable Modes Total	**1,680**	**76%**	**1,980**	**85%**	**300**	**18%**

Table 6.68: Mode Shift of 2038 AM Peak Hour: Corridor 2 Westbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Westbound Corridor 2	AM Peak Period	General Traffic	560	30%	90	6%	-470	-84%
		Public Transport	600	32%	650	42%	50	8%
		Walking	570	31%	660	43%	90	16%
		Cycling	130	7%	150	10%	20	15%
		Sustainable Modes Total	**1,300**	**70%**	**1,460**	**94%**	**160**	**12%**

2038 AM Peak Hour People Movement Eastbound

The contents of Table 6.69 and Table 6.70 outline the difference in modal split between the Do Minimum and Do Something scenarios for each mode of transport in an eastbound direction during the AM Peak Hour. The results indicate an 8% and 7% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.69: Mode Shift of 2038 AM Peak Hour: Corridor 1 Eastbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Eastbound Corridor 1	AM Peak Period	General Traffic	390	28%	250	19%	-140	-36%
		Public Transport	790	56%	860	64%	70	9%

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
		Walking	150	11%	150	11%	0	0%
		Cycling	80	6%	90	7%	10	13%
		Sustainable Modes Total	**1,020**	**72%**	**1,100**	**81%**	**80**	**8%**

Table 6.70: Mode Shift of 20 AM Peak Hour: Corridor 2 Eastbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Eastbound Corridor 2	AM Peak Period	General Traffic	430	31%	210	17%	-220	-51%
		Public Transport	630	46%	670	54%	40	6%
		Walking	220	16%	240	20%	20	9%
		Cycling	100	7%	110	9%	10	10%
		Sustainable Modes Total	**950**	**69%**	**1,020**	**83%**	**70**	**7%**

2038 PM Peak Hour People Movement Westbound

The contents of Table 6.71 and Table 6.72 outline the difference in modal split between the Do Minimum and Do Something scenarios for each mode of transport in a westbound direction during the PM Peak Hour. The results indicate a 14% and 10% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.71: Mode Shift of 2038 PM Peak Hour: Corridor 1 Westbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Westbound Corridor 1	PM Peak Period	General Traffic	420	33%	310	24%	-110	-26%
		Public Transport	600	47%	710	55%	110	18%
		Walking	160	13%	180	14%	20	13%
		Cycling	90	7%	80	6%	-10	-11%
		Sustainable Modes Total	**850**	**67%**	**970**	**76%**	**120**	**14%**

Table 6.72: Mode Shift of 2038 PM Peak Hour: Corridor 2 Westbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Westbound Corridor 2	PM Peak Period	General Traffic	350	31%	90	9%	-260	-74%
		Public Transport	450	40%	500	53%	50	11%
		Walking	260	23%	290	31%	30	12%
		Cycling	70	6%	70	7%	0	0%
		Sustainable Modes Total	**780**	**69%**	**860**	**91%**	**80**	**10%**

2038 PM Peak Hour People Movement Eastbound

The contents of Table 6.73 and Table 6.74 outline the difference in modal split between the Do Minimum and Do Something scenarios for each mode of transport in an eastbound direction during the PM Peak Hour. The results indicate a 12% and 7% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.73: Mode Shift of 2038 PM Peak Hour: Corridor 1 Eastbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Eastbound Corridor 1	PM Peak Period	General Traffic	440	26%	240	14%	-200	-45%
		Public Transport	910	53%	1,050	63%	140	15%
		Walking	260	15%	260	16%	0	0%
		Cycling	110	6%	120	7%	10	9%
		Sustainable Modes Total	**1,280**	**74%**	**1,430**	**86%**	**150**	**12%**

Table 6.74: Mode Shift of 2038 PM Peak Hour: Corridor 2 Eastbound

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Eastbound Corridor 2	PM Peak Period	General Traffic	540	33%	230	16%	-310	-57%
		Public Transport	470	29%	510	36%	40	9%

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
		Walking	520	32%	540	38%	20	4%
		Cycling	110	7%	130	9%	20	18%
		Sustainable Modes Total	**1,100**	**67%**	**1,180**	**84%**	**80**	**7%**

People Movement – Conclusions

In summary, the People Movement Assessment above has shown increases in sustainable modes in both 2023 and 2038 as a result of the Proposed Scheme. Despite the general growth in traffic levels between 2023 and 2038, general traffic along the corridor is either reducing or increasing at marginal levels. Sustainable modes on the other hand see a significant increase between 2023 and 2038. This shows that car trips – unlike public transport, walking and cycling - do not grow in line with population. Therefore, the Proposed Scheme is providing a substantial opportunity for growth of sustainable modes whilst it discourages car usage along the corridor.

People Movement – Significance of Impact

The significance of impact for the movement of People Movement by sustainable modes with the Proposed Scheme in place has been appraised qualitatively, taking into account the changes in mode share, demand changes by mode along the Proposed Scheme as well as bus usage presented above.

The Proposed Scheme has been adjudged to deliver a Positive, Very Significant and Long-term impact in terms of People Movement by sustainable modes. The Proposed Scheme can be shown to deliver significant improvements in people movement by sustainable modes along the Proposed Scheme corridor, particularly by bus, with reductions in car mode share due to the enhanced sustainable mode provision.

People Movement by Bus

The following section presents the WRM demand outputs for People Movement by Bus in terms of passenger loadings along the corridor. The results indicate that the improvements in bus priority infrastructure with the Proposed Scheme in place show a substantial increase in Bus patronage during the peak hours.

Diagram 6.20 presents the passenger loading profile comparing the Do Minimum and Do Something scenarios in the AM Peak Hour in the westbound direction in 2023.

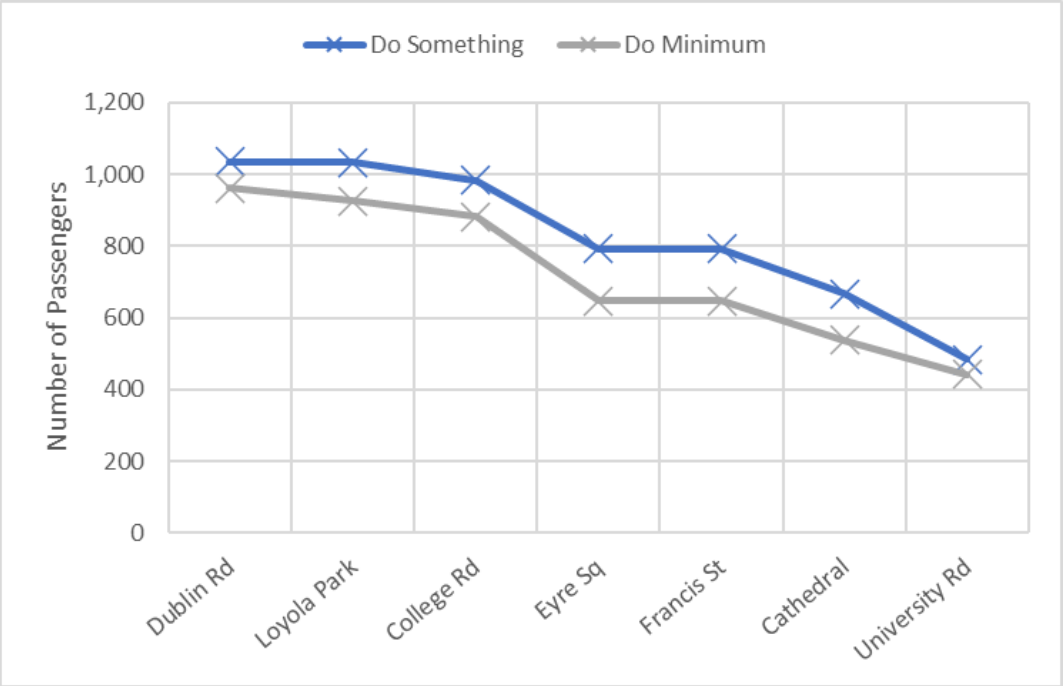

Diagram 6.20: 2023 AM Peak Hour Passenger Volume along Proposed Scheme (westbound direction)

Diagram 6.20 shows higher levels of bus passenger loadings along the Proposed Scheme. The volume of passengers reaches its peak at Loyola Park and Dublin Road with a volume of 1,035 passengers in the AM Peak hour, compared to approximately 925 in the Do Minimum scenario.

The increase in bus passengers remains at a high level along the Proposed Scheme with approximately 145 additional users at Eyre Square, compared to the Do Minimum scenario.

Diagram 6.21 presents the passenger loading profile comparing the Do Minimum and Do Something scenarios in the AM Peak Hour in the westbound direction in 2038.

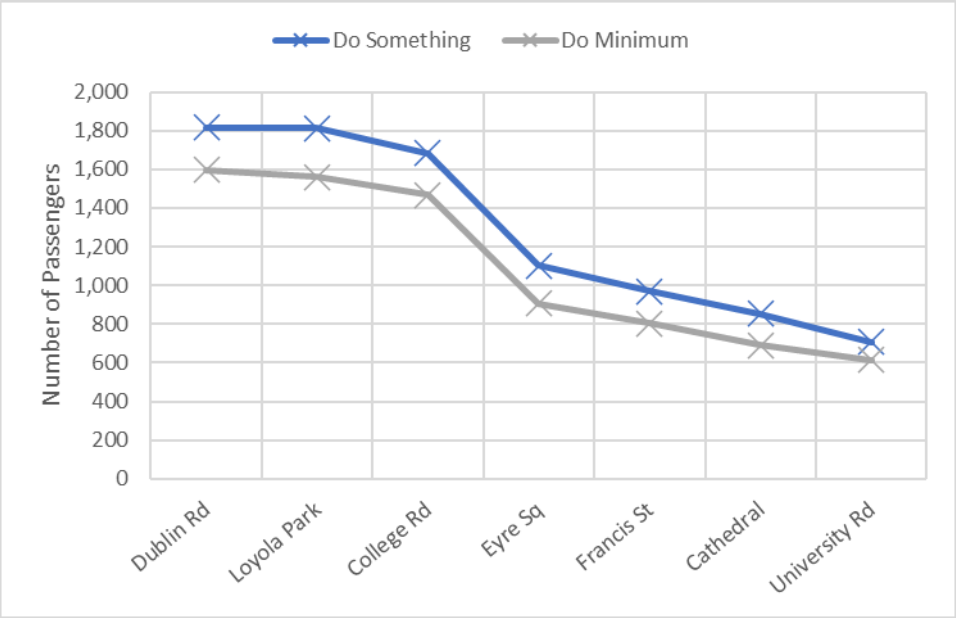

Diagram 6.21: 2038 AM Peak Hour Passenger Volume along Proposed Scheme (westbound direction)

Diagram 6.21 shows higher levels of bus passenger loadings along the Proposed Scheme. The volume of passengers reaches its peak at Loyola Park and Dublin Road with a volume of 1,815 passengers in the AM Peak hour, compared to approximately 1,560 in the Do Minimum scenario.

The increase in bus passengers remains at a high level along the Proposed Scheme, at Loyola Park and Dublin Road with approximately 250 additional users on most of the corridor, compared to the Do Minimum scenario.

Diagram 6.22 presents the passenger loading profile comparing the Do Minimum and Do Something scenarios in the PM Peak Hour in the eastbound direction in 2023.

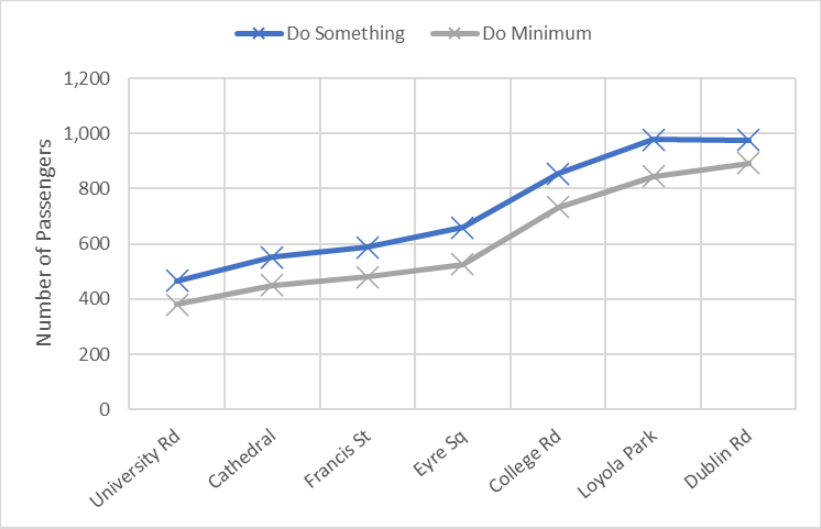

Diagram 6.22: 2023 PM Peak Hour Passenger Volume along Proposed Scheme (eastbound direction)

Diagram 6.22 shows a higher level of bus passenger along the Proposed Scheme. Loadings reach a peak at Loyola Park and Dublin Road at approximately 975 passengers in the Do Something scenario, compared to 845 passengers in the Do Minimum.

The increase in bus patronage is high all along the Proposed Scheme, specifically at Eyre Square where the additional passengers loading is approximately 135, compared to the Do Minimum scenario.

Diagram 6.23 presents the passenger loading profile comparing the Do Minimum and Do Something scenarios in the PM Peak Hour in the eastbound direction in 2038.

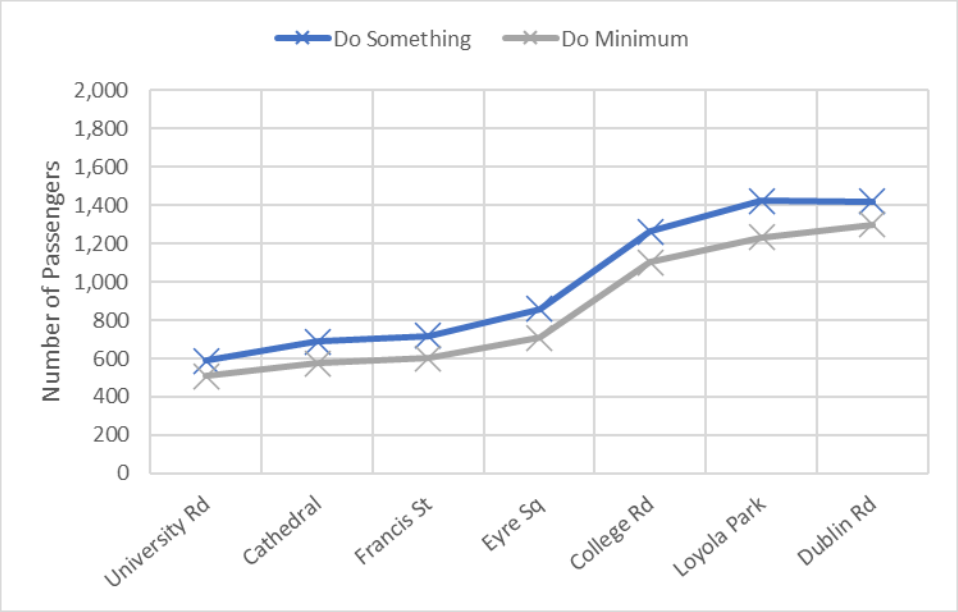

Diagram 6.23: 2038 PM Peak Hour Passenger Volume along Proposed Scheme (eastbound direction)

Diagram 6.23 shows a higher level of bus passenger along the scheme. Loadings reach a peak at Loyola Park at approximately 1,425 passengers in the Do Something scenario, compared to 1,230 passengers in the Do Minimum.

The increase in bus patronage is high all along the Proposed Scheme, specifically at Loyola Park where the additional passenger load is approximately 190, compared to the Do Minimum scenario.

Bus Boardings

An additional assessment has been undertaken to compare the Do Minimum and Do Something total passengers boarding on bus routes that use any part of the Proposed Scheme in both 2023 and 2038 forecast years. The results for the 2023 Opening Year scenario are indicated in Table 6.75.

Table 6.75: 2023 Peak Hour Bus Boardings on Routes using the Proposed Scheme

Time Period	Do Minimum (no. of boardings)	Do Something (no. of boardings)	Difference in No. of Boardings	Difference (%)
AM Peak Hour	4,277	4,516	239	5.6%
PM Peak Hour	2,937	3,264	327	11.1%

The contents of Table 6.75 show that there will be a 5.6% increase in people boarding bus routes which use the Proposed Scheme during the AM Peak Hour. This represents an addition of 239 passengers in the AM Peak hour.

In the PM Peak hour, there will be a 11.1% increase in people boarding bus routes which use the Proposed Scheme, representing an additional 327 passengers.

The comparison results for the 2038 Design Year scenario are indicated in Table 6.76.

Table 6.76: 2038 Peak Hour Bus Boardings on Routes using the Proposed Scheme

Time Period	Do Minimum (no. of boardings)	Do Something (no. of boardings)	Difference in No. of Boardings	Difference (%)
AM Peak Hour	6,355	6,862	507	8.0%
PM Peak Hour	4,265	4,797	531	12.5%

The contents of Table 6.76 show that there will be an 8% increase in people boarding bus routes which use the Proposed Scheme during the AM Peak Hour. This represents an addition of 507 passengers in the AM Peak hour.

In the PM Peak hour, there will be a 12.5% increase in people boarding bus routes which use the Proposed Scheme, representing an additional 531 passengers.

6.5.8.2 Operational Impacts for Bus Users

Overview

The impacts of the Proposed Scheme for Bus Users have been assessed based on journey times and reliability metrics extracted from the micro-simulation model of the Proposed Scheme corridor.

Due to the stochastic nature of the micro-simulation software, model outputs based on the average of 5 simulation seed runs (minimum of 5 recommended as per Transport for London (2010) Traffic Modelling Guidelines) have been calculated between the point of Proposed Scheme entry and exit and compared against the corresponding Do Minimum scenarios.

Bus Journey Time and Reliability changes as a result of the Proposed Scheme

To give an overview of how the Proposed Scheme will impact on bus journey times along the Scheme, outputs for all services combined, for the entire length of the Proposed Scheme only, have been extracted from the model. As outlined in Section 6.3.3.3, the Opening Year assessment is based on the same network as the base year plus other committed schemes while the Design Year assessment is based in the context of the full implementation of the GTS network re-design (including the Galway City Ring Road) in both the Do Minimum and Do Something scenarios, with the Proposed Scheme servicing the new GTS services.

Eastbound Direction

Average journey times for all eastbound services in the 2023 Opening Year can be seen in Table 6.77.

Table 6.77: Bus Average Journey Times (All Eastbound Services)

Peak Hour	Do Minimum (minutes)	Do Something (minutes)	Difference (minutes)	% Difference
2023 AM	23.8	11.6	-12.1	-51%
2023 PM	24.3	13.1	-11.2	-46%

Additional information regarding the range of journey times (minimum, maximum, average and standard deviation) for all eastbound services combined in the Do Minimum and Do Something can be seen in Table 6.78, Diagram 6.24 and Diagram 6.25 below. The minimum, maximum, average and standard deviation journey times are represented as a dot in the graphs for buses in each scenario. A larger range of journey times are an indication of lower levels of reliability in a given scenario.

Table 6.78: Range of Journey Times (Eastbound Services)

Peak Hour	Do Minimum				Do Something			
	MIN	MAX	AVG	STDEV	MIN	MAX	AVG	STDEV
2023 AM	12.5	43.4	23.8	9.2	10.8	13.1	11.6	0.6
2023 PM	13.5	40.1	24.3	7.9	11.6	14.9	13.1	0.9

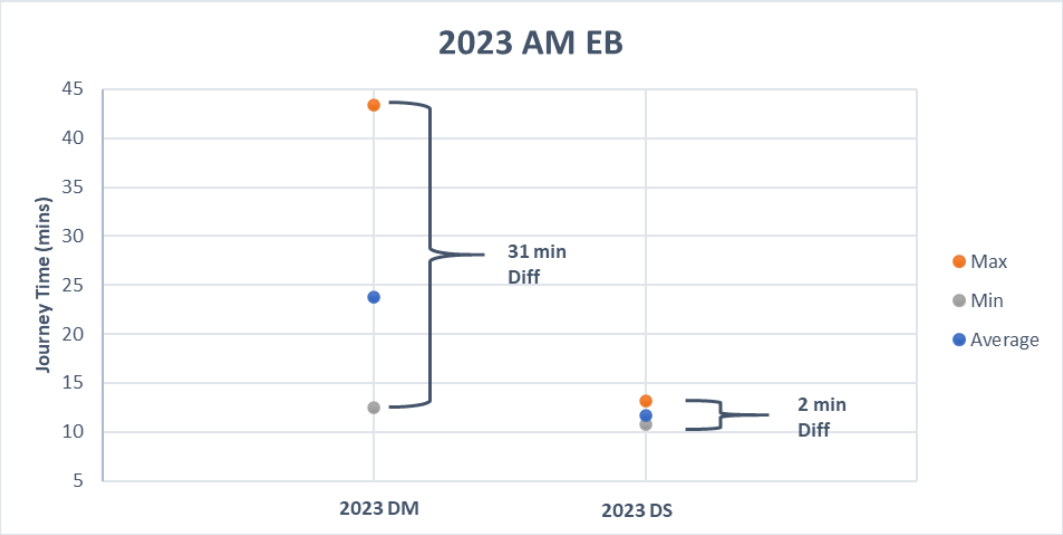

Diagram 6.24: AM Bus Journey Times (Eastbound Services)

Diagram 6.25: PM Bus Journey Times (Eastbound Services)

Based on the results presented above, the Proposed Scheme will deliver average journey time savings for eastbound bus passengers of up to 12.1 minutes (51%) in 2023 during the AM peak hour and 11.2 minutes (46%) in the PM peak hour. Furthermore, results presented in Diagram 6.2426 and Diagram 6.2527 suggest an improvement in bus journey time reliability across both morning and evening peak hour scenarios as indicated by the reduced ranges of journey times achieved with the max and min journey times focused much closer to the average journey times in the Do Something scenario with the Proposed Scheme in place compared to the more dispersed range in the Do Minimum scenario.

Note that the variation in journey times shown above are based on one set of predicted flows for the Do Minimum and Do Something scenario. Traffic flows fluctuate daily which would mean that the variation in journey times would be much greater in the Do Minimum with any increases in traffic flows compared to the protection of journey time reliability provided by the bus priority measures that comprise the Proposed Scheme.

Westbound Direction

Average journey times for all westbound services in the 2023 Opening Year can be seen in Table 6.79.

Table 6.79: Bus Average Journey Times (All Westbound Services)

Peak Hour	Do Minimum (minutes)	Do Something (minutes)	Difference (minutes)	% Difference
2023 AM	19.6	12.3	-7.3	-37%
2023 PM	19.4	11.3	-8.1	-42%

Additional information regarding the range of journey times (minimum, maximum, average and standard deviation) for all westbound services combined in the Do Minimum and Do Something can be seen in Table 6.80, Diagram 6.26 and Diagram 6.27.

The minimum, maximum, average and standard deviation journey times are represented as a dot in the graphs for buses in each scenario. A larger range of journey times are an indication of lower levels of reliability.

Table 6.80: Range of Journey Times (Westbound Services)

Peak Hour	Do Minimum				Do Something			
	MIN	MAX	AVG	STDEV	MIN	MAX	AVG	STDEV
2023 AM	11.3	32.3	19.7	6.8	11.3	13.1	12.3	0.4
2023 PM	12.1	26.0	19.4	4.5	10.2	12.4	11.3	0.9

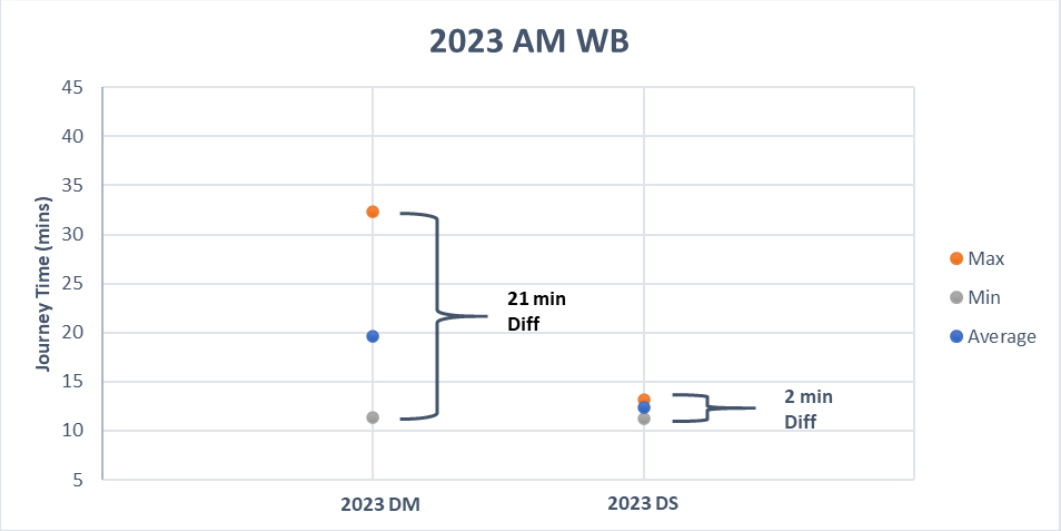

Diagram 6.26: AM Bus Journey Times (Westbound Services)

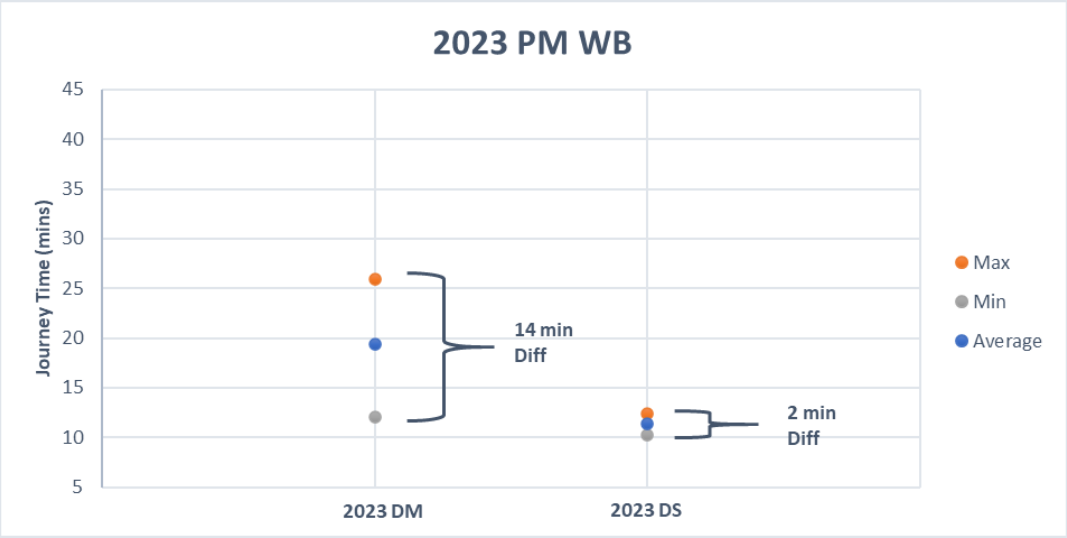

Diagram 6.27: PM Bus Journey Times (Westbound Services)

Based on the results presented in above, the Proposed Scheme will deliver average journey time savings for westbound bus passengers of 7.3 minutes (37%) in 2023 during the AM peak hour and 8.1 minutes (42%) in the PM peak hour. Furthermore, results presented in Diagram 6.2628 and Diagram 6.2729 suggest an improvement in bus journey time reliability across both morning and evening peak hour scenarios as indicated by the reduced ranges of variability of journey times achieved. The maximum and minimum journey times are closer to the average journey times in the Do Something scenario with the Proposed Scheme in place compared to the more variable (hence unreliable) journey times in Do Minimum scenario.

Note that the variation in journey times shown above are based on one set of predicted flows for the Do Minimum and Do Something scenario. Traffic flows fluctuate daily which would mean that the variation in journey times would be much greater in the Do Minimum with any increases in traffic flows compared to the protection of journey time reliability provided by the bus priority measures that comprise the Proposed Scheme.

6.5.8.3 General Traffic Assessment

Overview

The Proposed Scheme aims to provide an attractive alternative to the private car and promote a modal shift to public transport, walking and cycling. It is, however, recognised that there will be an overall reduction in operational capacity for general traffic along the direct study area given the proposed changes to the road layout and the rebalancing of priority to walking, cycling and bus. This reduction in operational capacity for general traffic along the Proposed Scheme will likely create some level of trip redistribution onto the surrounding road network.

It should be noted that the Do Minimum and Do Something scenarios are based on the assumption that travel behaviour will remain broadly consistent over time and that car demand, used for this assessment, represents a reasonable worst-case

scenario. It is possible that societal trends in the medium to long term may reduce car demand further due to the ongoing changes to travel behaviours and further shifts towards sustainable travel, flexibility in working arrangements brought on following COVID-19, and delayed car ownership trends that are emerging.

The assessment also assumes that goods vehicles (HGVs and LGVs) continue to grow in line with forecasted population growth and economic activity with patterns of travel remaining the same. For example, the assessment assumes a 45% and 77% increase in goods traffic versus the base year in 2023 and 2038 respectively. This is considered a very conservative or worst-case assumption, i.e., it will result in higher levels of associated impact estimates in the modelling. It should be noted that the 2021 Climate Action Plan (CAP) (DCCAE 2021) includes reference to a freight strategy for the region which will seek to further integrate smart technologies in logistics management and may include the regulation of delivery times as far as practicable to off-peak periods to limit traffic congestion in urban areas.

CAP outlines plans to manage the increase in delivery and servicing requirements as the population grows, which may include the development of consolidation centres to limit the number of 'last-mile' trips made by larger goods vehicles with plans for higher use of smaller electric vans or cargo bikes for 'last-mile' deliveries in urban areas. As proposals for the above are at a pre-planning stage, it was not possible to account for them in the assessments and a worst-case assessment has been undertaken based on continued growth in goods traffic.

The purpose of this section is to assess the overall impact that any redistributed general traffic will have on both the direct and indirect study areas. It should be noted that the impacts presented in this chapter are based on the final Preliminary Design for the Proposed Scheme which includes embedded mitigation to limit environmental and traffic and transport impacts to a minimal level as part of the iterative design development work described previously above.

Significance of the General Traffic Impact

To determine the impact that the Proposed Scheme has in terms of general traffic redistribution on the direct and indirect study areas, the LAM Opening Year 2023 model results have been used to identify the difference in general traffic flows between the Do Minimum and Do Something scenarios and the associated level of traffic flow difference as a result of the Proposed Scheme. The assessment has been considered with reference to both the reductions and increases in general traffic flows along road links.

Significance of a Reduction in General Traffic

For this assessment, the reductions in general traffic flows have been described as a positive impact to the environment. The significance of this positive impact is outlined by the contents of Table 6.81.

Table 6.81: Significance of the Reduction in General Traffic Flows

Significance of Positive Impact	Description of Impact / Proposed Changes in Two-way Hourly Traffic Flows
Profound	< -1,000
Very Significant	-1,000 to -800
Significant	-800 to -400
Moderate	-400 to -300
Slight	-300 to -100
Not Significant	> -100

The majority of instances where a reduction in general traffic flow occurs are located along or adjacent to the Proposed Scheme (i.e. the direct study area), where there are proposed measures to improve priority for bus, cycle and walking facilities.

Significance of an Increase in General Traffic

To determine the impact that the Proposed Scheme has in terms of an increase in general traffic flows on the direct and indirect study areas, a robust assessment has been undertaken, with reference to TII's Traffic and Transport Assessment Guidelines (May 2014).

This document is considered best practice guidance for the assessment of transport impacts related to changes in traffic flows due to proposed developments and is an appropriate means of assessing the impact of general traffic trip redistribution on the surrounding road network.

Diagram 6.28 is a snapshot from the guidance which outlines "Advisory Thresholds for Traffic and Transport Assessment Where National Roads are Affected".

Where applications affect national roads a Transport Assessment should be requested if the thresholds in Table 2.2, below, are exceeded.

Table 2.2 Advisory Thresholds for Traffic and Transport Assessment Where National Roads are Affected

Vehicle Movements	*100 trips in / out combined in the peak hours for the proposed development*
	Development traffic exceeds 10% of turning movements at junctions with and on National Roads.
	Development traffic exceeds 5% of turning movements at junctions with National Roads if location has potential to become congested or sensitive.

Traffic and Transport Assessment Guidelines PE-PDV-02045 May 2014, TII Publications

Diagram 6.28: Extract from the Traffic and Transport Assessment Guidelines (PE-PDV-02045, May 2014)

The basis of the guidance is to assess the impacts of additional trips that have been generated as part of a new development (for example, a new housing estate etc.). Noting that the guidance relates to National Roads only, for the purpose of this assessment, the principles of the guidance have been adapted for the

assessment of the Proposed Scheme. This has been achieved by extending the threshold to cover all road types in the vicinity of the Proposed Scheme, not only National Roads. This ensures a robust and rigorous assessment is undertaken and that potential impacts on more localised or residential streets have been captured as part of the assessment.

The impact assessment of increases to the general traffic flows has used the following thresholds based on the above guidelines:

- Local / Regional Roads: Traffic redistribution results in an increase above 100 combined flows (i.e. in a two-way direction) along residential, local and regional roads in the vicinity of the Proposed Scheme in the AM and PM peak hours;
    - The threshold aligns with an approximate 1 vehicle per minute increase per direction on any given road. This is a very low level of traffic increase on any road type and ensures that a robust assessment of the impacts of redistributed traffic has been undertaken.
- National Roads: Traffic exceeds 5% of the combined turning flows at major junctions with/ on/or with national roads in the AM and PM peak hours as a result of traffic redistribution comparing the Do Minimum to the Do Something scenario with the Proposed Scheme in place;
    - The guidelines indicate that a 10% threshold may be used, however, to ensure a rigorous assessment in this instance the lower 5% threshold for turning movements has been utilised.

Where road links have been identified as experiencing additional general traffic flow increases which exceed the above thresholds, a further assessment has been undertaken by way of a traffic capacity analysis on the associated junctions along the affected links.

General Traffic Flow Difference - AM Peak Hour

Diagram 6.29 illustrates the difference in traffic flows on the road links in the AM Peak Hour for the 2023 Opening Year. Please see Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR for the full LAM outputs.

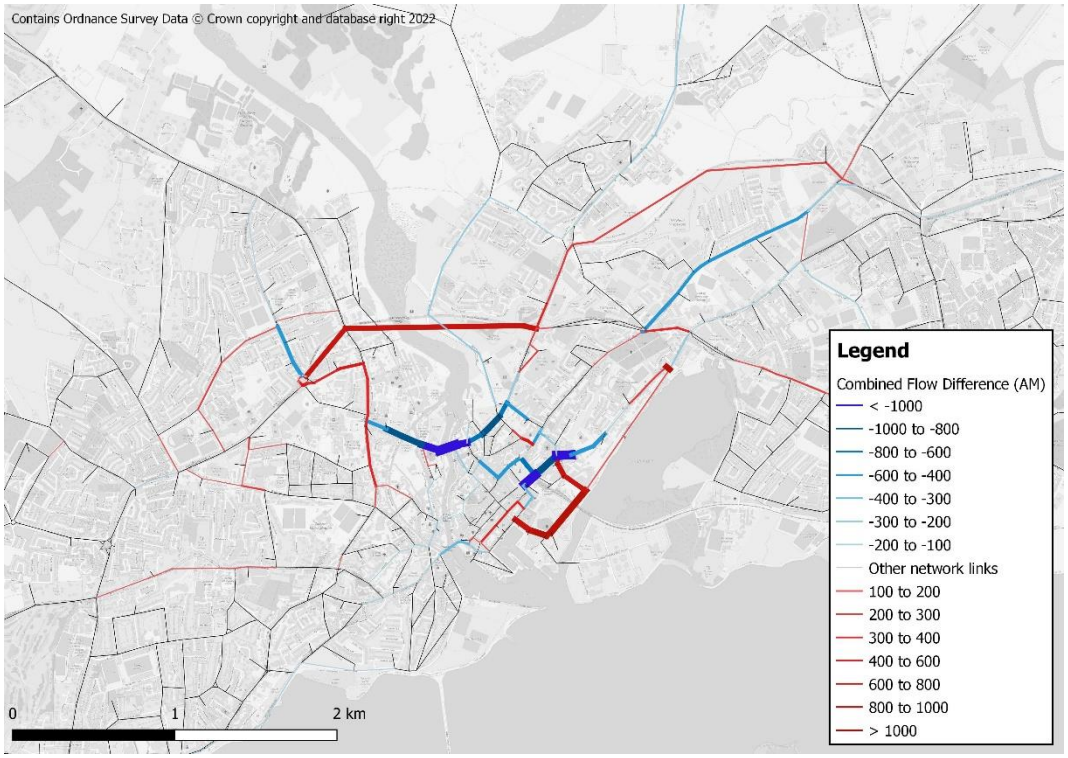

Diagram 6.29: Flow Difference on Road Links (Do Minimum vs. Do Something), AM Peak Hour, 2023 Opening Year

Reductions in General Traffic

The LAM indicates that, during the 2023 Opening Year scenario, there are reductions in general traffic noted along the Proposed Scheme during the AM Peak Hour, as illustrated by the blue lines in 31, which indicates where a reduction of at least -100 combined traffic flows occurs.

The key reductions in traffic flows during the AM Peak Hour are outlined in Table 6.82.

Table 6.82: Road Links that Experience a Reduction of ≥100 Combined Flows (AM Peak Hour, 2023)

Road Name	Do Minimum Flows (PCU)	Do Something Flows (PCU)	Flow Difference (PCU)
Bishop O'Donnell Road	850	743	-107
Thomas Hynes Road	664	563	-101
Coolough Road	487	381	-106
R339 Monivea Road	1,581	1,432	-149
Tuam Road	1,736	1,476	-260
Wellpark Road	1,253	1,133	-120
Connolly Avenue	440	249	-191
Michael Collins Road	340	236	-105
O'Donoghue's Terrace	999	367	-631
St Bridgets Place	587	132	-455
College Road (North of Foster St)	643	530	-113
Forster Street	739	173	-566

Road Name	Do Minimum Flows (PCU)	Do Something Flows (PCU)	Flow Difference (PCU)
College Road (Lough Atalia Road - Dublin Road)	2,085	1,866	-219
Bothar Bhreandan Ui Eithir	1,223	1,029	-194
Queen Street (Forthill St - Victoria Pl)	521	205	-317
Victoria Place	521	205	-317
Eyre Square	272	139	-134
Eyre Square East	272	139	-134
Williamsgate Street	630	139	-492
Eglinton Street	630	144	-486
Daly's Place	147	0	-147
Walsh's Terrace	1,056	222	-833
St Vincent’s Avenue	926	293	-633
Newtownsmith	191	0	-191
Waterside	191	0	-191
Mary Street	428	266	-162
Upper Abbeygate Street	498	333	-165
Market Street	498	333	-165
Lombard Street	542	385	-157
O'Brien's Bridge	630	525	-106
Salmon Weir Bridge	1,525	175	-1,350
Spanish Parade	1,115	912	-203
Salthill Promenade	1,006	874	-133
Upper Salthill Road	349	199	-149
Seapoint Promenade	651	507	-143
Grattan Road	335	231	-104
University Road	1,363	844	-519
Earl's Island	1,190	169	-1,021
Nun's Island	263	96	-167
Gaol Road (South of Cathedral Parking)	263	145	-118
Sea Road	341	220	-121
William Street West	336	209	-127
Dominick Street Upper	731	539	-192
Dominick Street Lower	544	374	-169

The contents of Table 6.82 demonstrate that there is a reduction of between -107 and -1,350 general traffic flows along the direct study area during the AM Peak Hour, which is attributed to the Proposed Scheme and the associated modal shift as a result of its implementation. This reduction in general traffic flow averages at -283 across all road links, which is determined as an overall Positive, Slight and Long-term effect on the direct study area, in accordance with Table 6.814. The most significant effect occurs on Salmon-Weir-Bridge and Earl's Island, which is the main corridor of the Proposed Scheme.

Increases in General Traffic

The road links which experience additional traffic volumes of over 100 combined flows are illustrated by the orange / red lines in 31. These road links have been identified as experiencing traffic volumes above the additional traffic threshold and therefore require further analysis. The road links and associated flow difference between the Do Minimum and Do Something scenarios during the AM Peak Hour are outlined in Table 6.83.

Table 6.83: Road Links where the 100 Flow Additional Threshold is Exceed (2023, AM Peak Hour)

Road Name	Do Minimum Flows (PCU)	Do Something Flows (PCU)	Flow Difference (PCU)
Headford Road	2,452	2,759	306
Quincentenary Bridge	3,656	4,385	729
Quincentenary Bridge Approach Road	3,656	4,385	729
Circular Road	468	613	145
Bushypark	539	649	110
Western Distributor Road	296	398	102
Bothar Le Cheile	429	605	175
Siobhan Mckenna Road	748	976	228
Moyola Park	203	312	109
N83 Tuam Road	1,595	1,759	164
Wellpark	365	487	123
Ballybane Road	926	1,153	228
Dublin Road	1,656	1,892	235
Sean Mulvoy Road	1,439	1,616	176
Moneenageisha Road	1,403	1,704	301
Headford Road (South of Sean Mulvoy Road)	1,119	1,324	206
Bohermore	1,334	1,470	136
College Road (South of Lough Atalia Road)	606	843	237
Lough Atalia Road	1,384	2,328	944
Bothar Na Long	1,174	2,043	869
Fairgreen Road	292	1,011	719
Bothar Na Mban	320	754	434
Forthill Street	534	847	313
Merchants Road (Saint Nicholas Street - Forthill Street)	845	1,150	305
New Dock Street	0	175	175
Flood Street	1,113	1,332	219
Taylors Hill Road	1,041	1,187	146
Rahoon Road	751	873	122
Old Seamus Quirke Road	554	803	249
Ashe Road	86	205	120
Shantalla Road	1,174	1,423	250
Seamus Quirke Road (Lower	447	858	411

Road Name	Do Minimum Flows (PCU)	Do Something Flows (PCU)	Flow Difference (PCU)
Newcastle Road - Browne Roundabout)			
Lower Newcastle Road (University Road - Seamus Quirke Road)	1,270	1,643	373
Newcastle Road	998	1,371	372
St Mary's Road	737	841	104
Gaol Road (South of University Road)	15	187	172
Presentation Road	106	254	148
Bothar na dTreabh (N83-N84)	1,838	2,111	273

Table 6.83 outline that the additional traffic on the key road links varies between 102 and 944 combined flows during the AM Peak Hour. Further junction capacity assessment has been undertaken along these road links to determine whether the above road links have the capacity to cater for the additional traffic volumes as a result of the Proposed Scheme.

Operational capacity outputs have been extracted from the LAM at the associated junctions along the subject road links to determine whether there is reserve capacity to facilitate the uplift in traffic. The results are presented in terms of the significance of the impact to the V / C ratio for each junction based on its sensitivity and magnitude of impact.

It should be noted that the worst performing arm of the junction has been used for the purpose of the assessment to ensure a conservative impact assessment is undertaken.

National Roads – 5% Threshold Impact Assessment (AM Peak Hour)

On the basis of the assessment methodology specifically for national roads, whereby traffic exceeding 5% of the combined turning flows at junctions on or with national roads as a result of traffic redistribution associated with the Proposed Scheme, the junctions and associated flow difference between the Do Minimum and Do Something scenarios during the AM Peak Hour are outlined in Table 6.84 .

Table 6.84: National Road Links where the 5% Additional Traffic Threshold is Exceeded (AM Peak Hour)

Junction	Total Do Minimum Turning Flows (PCU)	Total Do Something Turning Flows (PCU)	Turning Flow Difference (PCU)	Percentage Difference
N6 Quincentenary Bridge/ Upper Newcastle / Lower Newcastle	4,279	4,858	579	13.5%
N6 Quincentenary Bridge/ Headford Road/ Sean Mulvoy Road	4,330	4,869	539	12.4%
Browne Roundabout	3,577	3,740	163	4.6%
Headford Road / Bothar na dTreabh (Kirwan	3,233	3,481	248	7.7%

Junction	Total Do Minimum Turning Flows (PCU)	Total Do Something Turning Flows (PCU)	Turning Flow Difference (PCU)	Percentage Difference
Junction)				
Bothar na dTreabh / Tuam Road	3,915	3,996	81	2.1%
Bothar na dTreabh/ Ballybana Road	4,216	4,119	-97	-2.3%
Bothar na dTreabh/ Monivea Road	4,481	4,286	-195	-4.4%
Coolagh Roundabout	3,299	3,176	-123	-3.7%
Martin Jct	2,088	2,091	3	0.1%

The contents of Table 6.86 demonstrate that redistributed traffic from the Proposed Scheme will have a less than 5% impact on turning flows at Browne Roundabout and Bothar na dTreabh/Tuam Road Junction. Turning flows see a decrease at three national road junctions (Bothar na dTreabh / Ballybana Road and Bothar na dTreabh / Monivea Road Junctions as well as Coolagh Roundabout.

Turning flows at Headford Road / Bothar na dTreabh (Kirwan Junction) will increase by 7.7%. However, this junction has been addressed as part of the General Traffic Impact Assessment shown in Table 6.90 and operates above 100% during both the Do Minimum and Do Something scenarios. Therefore, the impact is considered to be negligible.

Traffic flows at the signalised junction at either end of Quincentenary Bridge (N6 Quincentenary Bridge / Upper Newcastle / Lower Newcastle and N6 Quincentenary Bridge/Headford Road / Sean Mulvoy Road) will increase by 13.5% and 12.4% respectively. Similar to Kirwan Junction, both junctions have been analysed as part of the General Traffic Impact Assessment as shown in Table 6.90 which confirms that both junctions operate above 100% during both the Do Minimum and Do Something scenarios. Therefore, the impact is considered to be negligible.

General Traffic Flow Difference - PM Peak Hour

Diagram 6.30 illustrates the difference in traffic flows on the road links in the PM Peak Hour for the 2023 Opening Year. Please see Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR for the full LAM outputs.

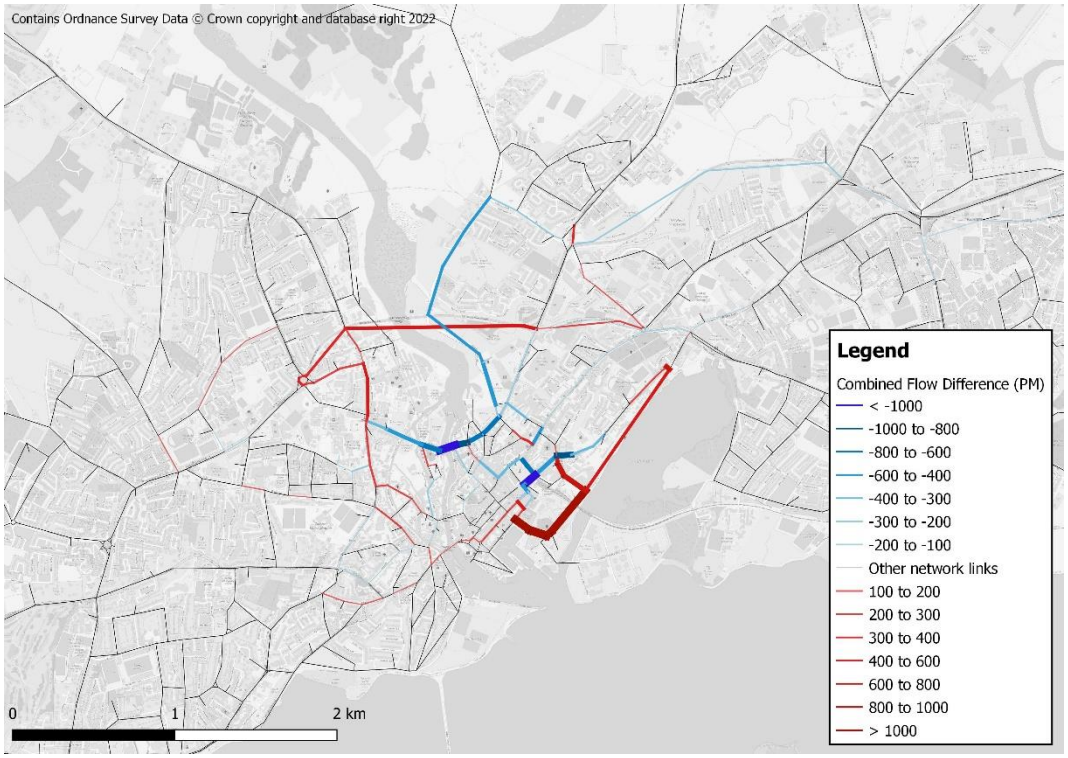

Diagram 6.30: Flow Difference on Road Links (Do Minimum vs. Do Something), PM Peak Hour, 2023 Opening Year

Reductions in General Traffic

The LAM indicates that, during the 2023 Opening Year scenario, there are reductions in general traffic noted along the Proposed Scheme during the PM Peak Hour, as illustrated by the blue lines in 32, which indicates where a reduction of at least -100 combined traffic flows occurs. The key reductions in traffic flows during the PM Peak Hour are outlined in Table 6.85.

Table 6.85: Road Links that Experience a Reduction of ≥100 Combined Flows (PM Peak Hour, 2023)

Road Name	Do Minimum Flows (PCU)	Do Something Flows (PCU)	Flow Difference (PCU)
Seamus Quirke Road (Bothar Le Cheile - Old Seamus Quirke Road)	1,475	1,333	-143
Dyke Road	406	248	-159
N67/M6 Roundabout	786	685	-101
Monivea Road	458	352	-106
Moneenageisha Road	1,397	1,205	-191
Headford Road (South of Sean Mulvoy Road)	1,071	917	-154
Headford Road (North of Dyke Road)	559	357	-202
O'Donoghue's Terrace	541	256	-285
St Bridgets Place	353	39	-314
Bohermore	1,207	1,085	-122
Prospect Hill	1,105	979	-126
Forster Street	522	175	-347

Road Name	Do Minimum Flows (PCU)	Do Something Flows (PCU)	Flow Difference (PCU)
Queen Street (Forthill Street - Victoria Place)	543	287	-256
Victoria Place	543	287	-256
Merchants Road (Forthill Street - Victoria Place)	393	107	-285
Williamsgate Street	512	139	-374
Eglinton Street	512	145	-368
Daly's Place	184	0	-184
Walsh's Terrace	944	323	-622
St Vincent's Avenue	934	294	-641
Mary Street	387	276	-111
Upper Abbeygate Street	377	222	-155
Market Street	377	222	-155
Lombard Street	392	249	-143
Salmon Weir Bridge	1,274	173	-1,101
Costello Road	731	626	-105
St Enda's Road	657	556	-101
St Mary's Road	690	571	-119
University Road	1,002	639	-363
Earl's Island	900	168	-732
Nun's Island	384	151	-233
Gaol Road (South of Cathedral Parking)	384	216	-168
The Crescent	361	238	-123
Sea Road	265	150	-116
William Street West	290	174	-116
Dominick Street Lower	586	451	-135

The contents of Table 6.85 demonstrate that there is a reduction of between -101 and -1,101 general traffic flows along the direct study area during the PM Peak Hour, which is attributed to the Proposed Scheme and the associated modal shift as a result of its implementation. This reduction in general traffic flow averages at -256 across all road links, which is determined as an overall Positive, Slight and Long-term effect on the direct study area, in accordance with Table 6.814. The most significant effect occurs on Salmon-Weir-Bridge and Earl's Island, which is the main corridor of the Proposed Scheme.

Increases in General Traffic

The road links which experience additional traffic volumes of over 100 combined flows are illustrated by the orange / red lines in 32.

These road links have been identified as experiencing traffic volumes above the additional traffic threshold and therefore require further analysis.

The road links and associated flow difference between the Do Minimum and Do Something scenarios during the PM Peak Hour are outlined in Table 6.86.

Table 6.86: Road Links where the 100 Flow Additional Threshold is Exceed (2023, PM Peak Hour)

Road Name	Do Minimum Flows (PCU)	Do Something Flows (PCU)	Flow Difference (PCU)
Quincentenary Bridge	3,000	3,486	486
Quincentenary Bridge Approach Road	3,000	3,486	486
Circular Road	486	619	132
Siobhan Mckenna Road	699	819	119
N84 Headford Road	1,442	1,749	307
Doughiska Road	427	540	113
Sandy Road	472	654	182
Sean Mulvoy Road	1,393	1,513	120
College Road (South of Lough Atalia Road)	549	764	215
Lough Atalia Road	922	2,034	1,111
College Road (Lough Atalia Road - Dublin Road)	1,487	1,587	100
Bothar Na Long	763	1,942	1,179
Fairgreen Road	184	944	760
Bothar Bhreandan Ui Eithir	796	954	158
Bothar Na Mban	270	605	335
Queen Street (Bothar Na Long - Forthill St)	806	1,052	246
Forthill Street	260	762	502
Merchants Road (Saint Nicholas St - Forthill St)	461	692	230
St Francis Street	286	405	119
New Dock Street	461	634	173
Wolfe Tone Bridge	527	698	171
Flood Street	809	1,034	225
Shantalla Road	778	944	165
Seamus Quirke Road (Lower Newcastle Road - Browne Roundabout)	233	528	295
Upper Newcastle Road	896	1,099	203
Lower Newcastle Road (Seamus Quirke Road - Snipe Av)	896	1,099	203
Lower Newcastle Road (University Road - Seamus Quirke Road)	1,121	1,527	406
Newcastle Road	953	1,241	287
Gaol Road (South of University Road)	42	262	220
Father Griffin Road	264	427	163
Presentation Road	117	348	232
Mill Street	261	415	153
St Helen's Street	436	653	217
Henry Street	322	579	257
Lower Road Fairhill	666	847	181

The contents of Table 6.86 outline that the additional traffic on the key road links varies between 100 and 1,111 combined flows during the PM Peak Hour. As described earlier, these road links have been identified as experiencing additional traffic volumes over the threshold for further assessment.

National Roads – 5% Threshold Impact Assessment (PM Peak Hour)

On the basis of the assessment methodology specifically for national roads, whereby traffic exceeding 5% of the combined turning flows at junctions on or with national roads as a result of traffic redistribution associated with the Proposed Scheme, the junctions and associated flow difference between the Do Minimum and Do Something scenarios during the PM Peak Hour are outlined in Table 6.87.

Table 6.87: National Road Links where the 5% Additional Traffic Threshold is Exceeded (PM Peak Hour)

Junction	Total Do Minimum Turning Flows (PCU)	Total Do Something Turning Flows (PCU)	Turning Flow Difference (PCU)	Percentage Difference
N6 Quincentenary Bridge/ Upper Newcastle/ Lower Newcastle	3,665	4,177	511	13.9%
N6 Quincentenary Bridge/ Headford Road/ Sean Mulvoy Road	3,632	3,706	74	2.0%
Browne Roundabout	3,055	3,361	306	10.0%
Headford Road / Bothar na dTreabh (Kirwan Junction)	2,509	2,598	89	3.5%
Bothar na dTreabh/ Tuam Road	3,424	3,281	-143	-4.2%
Bothar na dTreabh/ Ballybana Road	4,196	4,073	-123	-2.9%
Bothar na dTreabh/ Monivea Road	4,301	4,250	-51	-1.2%
Coolagh Roundabout	3,399	3,359	-40	-1.2%
Martin Junction	2,244	2,247	3	0.1%

The contents of Table 6.87 demonstrate that redistributed traffic from the Proposed Scheme will have a less than 5% impact on turning flows at junctions with national roads at N6 Quincentenary Bridge/Headford Road/ Sean Mulvoy Road, Headford Road / Bothar na dTreabh (Kirwan Junction) and Martin Junction. Bothar na dTreabh / Tuam Road, Bothar na dTreabh / Ballybana Road and Bothar na dTreabh / Monivea Road Junctions see a decrease in turning flows.

Traffic flows at N6 Quincentenary Bridge / Upper Newcastle / Lower Newcastle will increase by 13.9%.

This junction has been analysed as part of the General Traffic Impact Assessment as shown in Table 6.87 which confirms that this junction operates between 85% and 100% during the Do Minimum and above 100% during the Do Something scenario. Therefore, the impact is considered to be negligible.

Traffic flows at Browne Roundabout will increase by 10%. As shown in Table **6.91** as part of the General Traffic Impact Assessment, this junction operates below 85% during the Do Minimum and between 85% and 100% in the Do Something scenario. Therefore, the impact is considered to have a Negative, Slight and Long-term effect.

Traffic flows at N6 Quincentenary Bridge / Headford Road / Sean Mulvoy Road Junction will increase by 15%. However, this junction has been analysed as part of the General Traffic Impact Assessment as shown in Table 6.91 which confirms that this junction operates above 100% during both the Do Minimum and Do Something scenarios. Therefore, the impact is considered to have a Negative, Slight and Long-term effect.

General Traffic Impact Assessment Methodology

Following the above threshold assessment, the following three-step approach has been undertaken to determine the impact and Significance of Effect as a result of the redistributed general traffic associated with the Proposed Scheme:

Step 1 - Determination of Junction Sensitivity: Where road links experience additional traffic volumes of above the proposed thresholds, a review has been undertaken of its associated junctions using the following categories:

- **High Sensitivity (Category 5)** – Roads that cater for a lower volume of traffic than Category 4 with a lower speed limit (30km/h);
- **Medium Sensitivity (Category 4)** – Roads that can cater for a high volume of traffic with a moderate speed limit (30km/h – 50km/h), connecting neighbourhoods;
- **Low Sensitivity (Category 3)** – Roads that interconnect Category 2 type roads with a lower level of mobility than national roads; and
- **Negligible Sensitivity (Category 1 and Category 2)** – Roads that can cater for a high volume of traffic with a high speed limit (100km/h - 120km/h), between major metropolitan cities, i.e. national primary and secondary roads.

The above sensitivities / categories establish the characteristics of the surrounding road network impacted by the Proposed Scheme. The road link characteristics of the major arm of a junction has been used to determine the junction sensitivity. This has allowed for the identification of where more sensitive locations, in particular Category 5 roads / junctions, are impacted.

Step 2 – Determination of the Magnitude of Impact using Junction Analysis: To understand the magnitude impact of the redistributed traffic, operational capacities have been extracted from the LAM.

The capacity of junctions within the LAM are expressed in terms of Volume to Capacity ratios (V / C ratios). The V / C ratios represent the operational efficiency for each arm of a junction. For the purpose of this EIAR, operational capacity outputs of a junction have been identified with reference to the busiest arm which experiences the maximum V/C ratio.

A V / C ratio of below 85% indicates that a junction is operating well, with spare capacity, with traffic not experiencing queuing or delays throughout the hour. A

value of 85% to 100% indicates that the junction is approaching its theoretical capacity with traffic possibly experiencing occasional queues and delays within the hour. A value of over 100% indicates that a junction is operating above its theoretical capacity and traffic experiences queues and delays regularly within the hour. The junctions have been described in the ranges outlined in Table 6.88.

Table 6.88: Junction Volume / Capacity Ranges

V / C Ratio	Traffic Condition
≤85%	A junction is operating well within theoretical capacity.
85% - 100%	A junction is approaching theoretical capacity and may experience occasional queues and delays within the hour.
≥100%	A junction is operating above its theoretical capacity and experiences queues and delays quite regularly within the hour.

When comparing the V / C ratios during the Do Minimum and Do Something scenarios for the key junctions, the terms outlined in Table 6.89 have been used to describe the impact.

Table 6.89: Magnitude of Impact for Redistributed Traffic

		Do Something		
		≤85%	85% - 100%	>100%
Do Minimum	≤85%	Negligible	Low Negative	High Negative
	85% - 100%	Low Positive	Negligible	Medium Negative
	>100%	Medium Positive	Low Positive	Negligible

As indicated in Table 6.89, the changes in V / C ratios between the Do Minimum and Do Something scenarios result in either a positive, negative, or neutral magnitude of impact.

Step 3 – Determination of Significance of Effects: The magnitude of impact has been combined with the sensitivity of the road link to determine the Significance of Effect using the matrix shown in Table 6.4 which is based upon the EPA Guidelines on EIAR. The significance of effect has been assigned as positive or negative in instances where the effect is Slight or higher.

Potential mitigation measures have been considered at junctions where the Significance of Effect is predicted to be Significant or higher. At junctions where a moderate effect or lower is predicted, further consideration has not been undertaken as moderate effects represent that which effects the 'character of the environment in a manner that is consistent with existing and emerging baseline trends' (as per Table 6.5).

The above analysis was carried out on the following scenarios:

- 2023 Opening Year – Do Minimum vs Do Something – AM Peak Hour;
- 2038 Design Year (Opening Year + 15 Years) – Do Minimum vs Do Something – AM Peak Hour;
- 2023 Opening Year – Do Minimum vs Do Something – PM Peak Hour; and
- 2038 Design Year (Opening Year + 15 Years) – Do Minimum vs Do Something – PM Peak Hour.

The AM and PM Peak Hour flows are modelled as occurring between 08:00 to 09:00 and 17:00 to 18:00 respectively. The interpeak periods have not been analysed for this impact assessment as the AM and PM Peak Hour flows present an overall worst-case scenario. The full analysis tables for each scenario, demonstrating the Do Minimum and Do Something Peak Hour traffic flows and maximum V / C ratio for each junction assessed is detailed in Table 6.3.1 to Table 6.3.4 of Appendix 6.2 (Impact Assessments) in Volume 4 of this EIAR.

General Traffic Impact Assessment (2023, AM Peak Period)

The contents of Table 6.90 outline the V / C ratios at the key local / regional road junctions in the AM Peak Hour for the 2023 Opening Year and the resultant magnitude of impact and significance of effect at each junction.

Table 6.90: Volume over Capacity at Key Junctions (Do Minimum vs Do Something), AM Peak, 2023

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
Headford Road	Headford Road / Bothar na dTreabh	Negligible			✓			✓	Negligible	Imperceptible
Headford Road	Headford Road / Dun Na Coiribe	Low	✓			✓			Negligible	Not Significant
Quincentenary Bridge	Quincentenary Bridge Approach Road / Headford Road	Low			✓			✓	Negligible	Not Significant
Quincentenary Bridge	Quincentenary Bridge Approach Road / Upper Newcastle Road	Low			✓			✓	Negligible	Not Significant
Quincentenary Bridge	Thomas Hynes Road / Seamus Quirke Road	Low		✓				✓	Medium	Negative Moderate
Circular Road	Circular Road / Siabhan Mckenna Road	Medium	✓			✓			Negligible	Not Significant
Circular Road	Rahoon Road / Circular Road	Low			✓			✓	Negligible	Not Significant
Bushypark	Bushypark / Corcullen Road	High	✓			✓			Negligible	Not Significant
Bushypark	Upper Clybaun Road / Corcullen Road	High	✓				✓		Low	Negative Moderate
Western Distributor Road	Rahoon Road / Unnamed	Medium	✓			✓			Negligible	Not Significant
Western Distributor Road	Unnamed / Galway West Business Park	High	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivit	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Bothar Le Cheile	Bothar Le Cheile / Seamus Quirke Road	Low			✓			✓	Negligible	Not Significant
Siobhan Mckenna Road	Bothar Le Cheile / Siabhan Mckenna Road	High	✓			✓			Negligible	Not Significant
Siobhan Mckenna Road	Siobhan Mckenna Road / Thomas Hynes Road	Low		✓		✓			Low Positive	Positive Slight
Moyola Park	Moyola Park / Upper Newcastle Road	Low	✓					✓	High	Negative Moderate
Moyola Park	Thomas Hynes Road / Moyola Park	Low	✓			✓			Negligible	Not Significant
N83 Tuam Road	N83 Tuam Road / Bothar Na Mine	Negligible	✓			✓			Negligible	Imperceptible
N83 Tuam Road	N83 Tuam Road / Parkmore Road	Negligible		✓			✓		Negligible	Imperceptible
Wellpark	Tuam Road / Wellpark	Low			✓			✓	Negligible	Not Significant
Wellpark	Wellpark Road / Connolly Avenue	Medium		✓		✓			Low Positive	Positive Moderate
Ballybane Road	Ballybane Road / Beechwood Park	Low	✓			✓			Negligible	Not Significant
Ballybane Road	Ballybane Road / Castlepark Road	Low	✓			✓			Negligible	Not Significant
Ballybane Road	Ballybane Road / Glasan	Low	✓			✓			Negligible	Not Significant
Ballybane Road	Ballybane Road / Monivea Road	Low	✓			✓			Negligible	Not Significant
Ballybane Road	Ballybane Road / Rahylin Glebe	Low	✓			✓			Negligible	Not Significant
Dublin Road	Dublin Road / Ballybane Road	Low	✓			✓			Negligible	Not Significant
Dublin Road	Dublin Road / Ballyloughane Road	Low	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivit	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Dublin Road	Dublin Road / Michael Collins Road	Low		✓		✓			Low Positive	Positive Slight
Dublin Road	Dublin Road / Renmore Park	Low	✓				✓		Low	Negative Slight
Dublin Road	Dublin Road / Renmore Road	Low		✓			✓		Negligible	Not Significant
Moneenageisha Road	Moneenageisha Road / Wellpark Road	Low			✓		✓		Low Positive	Positive Slight
Bohermore	Bohermore / Cookes Terrace	Low	✓			✓			Negligible	Not Significant
Bohermore	Bohermore / Saint Anthonys Terrace	High	✓			✓			Negligible	Not Significant
Lough Atalia Road	Fairgreen Road / Lough Atalia Road	Low	✓					✓	High	Negative Moderate
Lough Atalia Road	Lough Atalia Road / Bothar Na Long	Low	✓					✓	High	Negative Moderate
Lough Atalia Road	Lough Atalia Road / College Road	Low	✓					✓	High	Negative Moderate
Bothar Na Long	Bothar Na Long / Dock Road	Low	✓					✓	High	Negative Moderate
Bothar Na Long	Bothar Na Long / Queen Street	Low	✓					✓	High	Negative Moderate
Fairgreen Road	Fairgreen Road / Station Road	High	✓			✓			Negligible	Not Significant
Fairgreen Road	Forster Street / Bothar Bhreandan Ui Eithir	Low	✓				✓		Low	Negative Slight
Bothar Na Mban	Bothar Na Mban / Bothar Irwin	High	✓			✓			Negligible	Not Significant
Forthill Street	Forthill Street / Queen Street	Low			✓	✓			Medium Positive	Positive Moderate
Forthill Street	Merchants Road /	Low	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivit	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
	Forthill Street									
Merchants Road (Saint Nicholas St - Forthill St)	Merchants Road / Lower Abbeygate Street	Low	✓			✓			Negligible	Not Significant
Merchants Road (Saint Nicholas St - Forthill St)	New Dock Street / Merchants Road	Low	✓				✓		Low	Negative Slight
New Dock Street	New Dock Street / Dock Road	Low	✓			✓			Negligible	Not Significant
Flood Street	Flood Street / New Dock Street	Low	✓			✓			Negligible	Not Significant
Flood Street	Wolfe Tone Bridge / Spanish Parade	Low		✓			✓		Negligible	Not Significant
Taylors Hill Road	Taylors Hill Road / Ardmore	Low	✓			✓			Negligible	Not Significant
Taylors Hill Road	Taylors Hill Road / Bishop O'Donnell Road	Low			✓			✓	Negligible	Not Significant
Taylors Hill Road	Taylors Hill Road / Maunsell'S Road	Low	✓			✓			Negligible	Not Significant
Taylors Hill Road	Taylors Hill Road / Rosary Lane	Low		✓			✓		Negligible	Not Significant
Rahoon Road	Rahoon Road / Highfield Park	Medium	✓			✓			Negligible	Not Significant
Rahoon Road	Rahoon Road / Seamus Quirke Road	Low	✓			✓			Negligible	Not Significant
Old Seamus Quirke Road	Old Seamus Quirke Road / Ashe Road	High	✓			✓			Negligible	Not Significant
Old Seamus Quirke Road	Old Seamus Quirke Road / Weatherly Lodge	High	✓			✓			Negligible	Not Significant
Old Seamus Quirke Road	Seamus Quirke Road / Old Seamus Quirke	Low		✓			✓		Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivit	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
	Road									
Ashe Road	Ashe Road / Costello Road	High	✓			✓			Negligible	Not Significant
Shantalla Road	Rahoon Road / Old Seamus Quirke Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Colmcille Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Mc Dara Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Rahoon Road	Medium		✓			✓		Negligible	Not Significant
Seamus Quirke Road (Lower Newcastle Road - Browne Roundabout)	Seamus Quirke Road / Lower Newcastle Road	Medium	✓			✓			Negligible	Not Significant
Seamus Quirke Road (Lower Newcastle Road - Browne Roundabout)	Seamus Quirke Road / Snipe Lawn	High	✓			✓			Negligible	Not Significant
Lower Newcastle Road (University Road - Seamus Quirke Road)	Lower Newcastle Road / Newcastle Avenue	Medium	✓			✓			Negligible	Not Significant
Lower Newcastle Road (University Road - Seamus Quirke Road)	Newcastle Road / University Road	Medium		✓			✓		Negligible	Not Significant
Newcastle Road	Costello Road / Newcastle Road	Medium	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivit	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Newcastle Road	Newcastle Road / Presentation Road	Medium	✓			✓			Negligible	Not Significant
Newcastle Road	St Mary's Road / Shantalla Road	Medium	✓			✓			Negligible	Not Significant
St Mary's Road	St Mary's Road / Palmyra Avenue	Medium	✓			✓			Negligible	Not Significant
St Mary's Road	The Crescent / Lower Salthill Road	Low		✓			✓		Negligible	Not Significant
Gaol Road (South of University Road)	Gaol Road / Gaol Road	High	✓			✓			Negligible	Not Significant
Gaol Road (South of University Road)	University Road / Gaol Road	Medium	✓			✓			Negligible	Not Significant
Presentation Road	Presentation Road / New Road	High	✓			✓			Negligible	Not Significant
Presentation Road	Presentation Road / Parkavara	High	✓			✓			Negligible	Not Significant
Bothar na dTreabh (N83-N84)	Bothar na dTreabh / Glenburren Park	Negligible			✓			✓	Negligible	Imperceptible
Bothar na dTreabh (N83-N84)	Bothar na dTreabh / Tuam Road	Negligible			✓			✓	Negligible	Imperceptible

The results of the junction analysis illustrated in Table 6.90 demonstrate that the majority of junctions are operating with a maximum V / C ratio of below 85% during the AM Peak Hour in the 2023 Opening Year, and that the Proposed Scheme will have a negligible impact on the majority of assessed local / regional road links within the indirect study area.

At four junctions assessed a Positive, Slight to Moderate and Long-term effect is predicted as a result of the Proposed Scheme due to the redistribution of general traffic.

Capacity issues are noted at the following junctions:

- **Headford Road / Bothar na dTreabh** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Quincentenary Bridge Approach Road / Headford Road** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Quincentenary Bridge Approach Road / Upper Newcastle Road** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Rahoon Road / Circular Road** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Bothar Le Cheile / Seamus Quirke Road** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Tuam Road / Wellpark** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Taylors Hill Road / Bishop O'Donnell Road** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Bothar na dTreabh / Glenburren Park** – operates above 100% during both the Do Minimum and Do Something scenarios; and
- **Bothar na dTreabh / Tuam Road** – operates above 100% during both the Do Minimum and Do Something scenarios.

The junctions listed above operate with a maximum V / C ratio of above 100% in both the Do Minimum and Do Something scenarios, therefore, the impact is considered to be negligible with a Not Significant and Long-term effect.

Capacity issues are also noted at the following junctions:

- **Thomas Hynes Road / Seamus Quirke Road** – operates between 85% and 100% in the Do Minimum and above 100% during the Do Something scenario;
- **Moyola Park / Upper Newcastle Road** – operates below 85% in the Do Minimum and above 100% during the Do Something scenario;
- **Fairgreen Road / Lough Atalia Road** – operates below 85% in the Do Minimum and above 100% during the Do Something scenario;
- **Lough Atalia Road / Bothar Na Long** – operates below 85% in the Do Minimum and above 100% during the Do Something scenario;
- **Lough Atalia Road / College Road** – operates below 85% in the Do Minimum and above 100% during the Do Something scenario;
- **Bothar Na Long / Dock Road** – operates below 85% in the Do Minimum and above 100% during the Do Something scenario;

- **Bothar Na Long / Queen Street** – operates below 85% in the Do Minimum and above 100% during the Do Something scenario.

Combining the road sensitivity with the magnitude of impact determines that the significance of effects of the redistributed traffic as a result of the Proposed Scheme at the remaining junctions results in a Not Significant and Long-term effect at 61 junctions and Negative, Imperceptible and Long-term at five junctions. At three junctions, a Negative, Slight and Long-term effect is predicted. At eight junction a Negative, Moderate and Long-term effect is predicted. Further assessment into mitigation measures is therefore not considered necessary for any junctions in the AM Peak Hour of the 2023 Opening Year.

General Traffic Impact Assessment (2023, PM Peak Period)

The contents of Table 6.91 outline the V / C ratios at the key local / regional road junctions in the PM Peak Hour for the 2023 Opening Year and the resultant magnitude of impact and significance of effect at each junction.

Table 6.91: Volume over Capacity at Key Junctions (Do Minimum vs Do Something), PM Peak, 2023

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
Quincentenary Bridge	Quincentenary Bridge Approach Road / Headford Road	Low			✓			✓	Negligible	Not Significant
Quincentenary Bridge	Quincentenary Bridge Approach Road / Upper Newcastle Road	Low		✓			✓		Negligible	Not Significant
Quincentenary Bridge	Thomas Hynes Road / Seamus Quirke Road	Low	✓				✓		Low	Negative Slight
Circular Road	Circular Road / Siabhan Mckenna Road	Medium		✓			✓		Negligible	Not Significant
Circular Road	Rahoon Road / Circular Road	Low			✓		✓		Low Positive	Positive Slight
Siobhan Mckenna Road	Bothar Le Cheile / Siabhan Mckenna Road	High	✓			✓			Negligible	Not Significant
Siobhan Mckenna Road	Siobhan Mckenna Road / Thomas Hynes Road	Low	✓			✓			Negligible	Not Significant
N84 Headford Road	Headford Road / Bothar na dTreabh	Negligible			✓			✓	Negligible	Imperceptible
N84 Headford Road	N84 Headford Road / Ballinfoile Park	Negligible	✓			✓			Negligible	Imperceptible
N84 Headford Road	N84 Headford Road / Bothar An Choiste	Negligible	✓			✓			Negligible	Imperceptible
N84 Headford Road	N84 Headford Road / Brookdale	Negligible	✓			✓			Negligible	Imperceptible

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
N84 Headford Road	N84 Headford Road / Monument Road	Negligible	✓			✓			Negligible	Imperceptible
N84 Headford Road	N84 Headford Road / Tirellan Heights	Negligible	✓			✓			Negligible	Imperceptible
Doughiska Road	Doughiska Road / An Fiodan	High	✓			✓			Negligible	Not Significant
Doughiska Road	Doughiska Road / Dublin Road	Low			✓			✓	Negligible	Not Significant
Doughiska Road	Doughiska Road / Fearann Ri	High	✓			✓			Negligible	Not Significant
Doughiska Road	Doughiska Road / Merlin Park Lane	High	✓			✓			Negligible	Not Significant
Sandy Road	Sandy Road / Glen Na Tra	High	✓			✓			Negligible	Not Significant
Sandy Road	Sandy Road / Gort Na Glaise	High	✓			✓			Negligible	Not Significant
Sandy Road	Sandy Road / Maldron Hotel	High	✓			✓			Negligible	Not Significant
Lough Atalia Road	Fairgreen Road / Lough Atalia Road	Low	✓				✓		Low	Negative Slight
Lough Atalia Road	Lough Atalia Road / College Road	Low	✓				✓		Low	Negative Slight
College Road (Lough Atalia Road - Dublin Road)	Moneenageisha Road / Wellpark Road	Low		✓				✓	Medium	Negative Moderate
Bothar Na Long	Bothar Na Long / Dock Road	Low	✓					✓	High	Negative Moderate
Bothar Na Long	Bothar Na Long / Queen Street	Low	✓					✓	High	Negative Moderate
Bothar Na Long	Lough Atalia Road /	Low	✓					✓	High	Negative Moderate

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
	Bothar Na Long									
Fairgreen Road	Fairgreen Road / Station Road	High	✓			✓			Negligible	Not Significant
Fairgreen Road	Forster Street / Bothar Bhreandan Ui Eithir	Low	✓			✓			Negligible	Not Significant
Bothar Bhreandan Ui Eithir	Bothar Bhreandan Ui Eithir / Foster Court	Low	✓			✓			Negligible	Not Significant
Bothar Bhreandan Ui Eithir	Prospect Hill / Bothar Bhreandan Ui Eithir	Low	✓				✓		Low	Negative Slight
Bothar Na Mban	Bothar Na Mban / Bothar Irwin	High	✓			✓			Negligible	Not Significant
Forthill Street	Forthill Street / Queen Street	Low		✓		✓			Low Positive	Positive Slight
Forthill Street	Merchants Road / Forthill Street	Low	✓			✓			Negligible	Not Significant
Merchants Road (St Nicholas Street - Forthill Street)	Merchants Road / Lower Abbeygate Street	Low	✓			✓			Negligible	Not Significant
Merchants Road (St Nicholas Street - Forthill Street)	New Dock Street / Merchants Road	Low	✓			✓			Negligible	Not Significant
St Francis Street	St Francis Street / Mary Street	Medium	✓			✓			Negligible	Not Significant
St Francis Street	St Vincents Avenue / Saint Francis Street	Medium	✓			✓			Negligible	Not Significant
New Dock Street	New Dock Street / Dock Road	Low	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Wolfe Tone Bridge	Father Griffin Road / Claddagh Quay	Low	✓			✓			Negligible	Not Significant
Flood Street	Flood Street / New Dock Street	Low	✓			✓			Negligible	Not Significant
Flood Street	Wolfe Tone Bridge / Spanish Parade	Low		✓			✓		Negligible	Not Significant
Shantalla Road	Rahoon Road / Old Seamus Quirke Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Colmcille Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Mc Dara Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Rahoon Road	Medium	✓			✓			Negligible	Not Significant
Seamus Quirke Road (Lower Newcastle Road - Browne Roundabout)	Seamus Quirke Road / Snipe Lawn	High	✓			✓			Negligible	Not Significant
Lower Newcastle Road (Seamus Quirke Road - Snipe Av)	Lower Newcastle Road / Distillery Road	Medium		✓			✓		Negligible	Not Significant
Lower Newcastle Road (University Road - Seamus Quirke Road)	Lower Newcastle Road / Newcastle Avenue	Medium	✓			✓			Negligible	Not Significant
Lower Newcastle Road	Newcastle Road / University Road	Medium		✓			✓		Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
(University Road - Seamus Quirke Road)										
Lower Newcastle Road (University Road - Seamus Quirke Road)	Seamus Quirke Road / Lower Newcastle Road	Medium	✓			✓			Negligible	Not Significant
Newcastle Road	Costello Road / Newcastle Road	Medium	✓			✓			Negligible	Not Significant
Newcastle Road	Newcastle Road / Presentation Road	Medium	✓			✓			Negligible	Not Significant
Newcastle Road	St Mary's Road / Shantalla Road	Medium	✓			✓			Negligible	Not Significant
Gaol Road (South of University Road)	Gaol Road / Gaol Road	High	✓			✓			Negligible	Not Significant
Gaol Road (South of University Road)	University Road / Gaol Road	Medium	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Father Burke Road	Low	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Father Griffin Avenue	Low	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Grattan Court	High	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Lower Salthill Road	Medium	✓			✓			Negligible	Not Significant
Father Griffin	Father Griffin Road /	Low	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Road	Munster Avenue									
Father Griffin Road	Father Griffin Road / Whitestrand Road	Medium	✓			✓			Negligible	Not Significant
Presentation Road	Presentation Road / New Road	High	✓			✓			Negligible	Not Significant
Presentation Road	Presentation Road / Parkavara	High	✓			✓			Negligible	Not Significant
Mill Street	Mill Street / Presentation Road	High	✓			✓			Negligible	Not Significant
Henry Street	Henry Street / William Street West	Medium	✓			✓			Negligible	Not Significant
Henry Street	St Helen's Street / New Road	Medium	✓			✓			Negligible	Not Significant
Lower Road Fairhill	Dominick Street Upper / Lower Fairhill Road	Medium	✓			✓			Negligible	Not Significant
Lower Road Fairhill	Father Griffin Road / Lower Fairhill Road	Low		✓		✓			Negligible	Not Significant

The results of the junction analysis illustrated in Table **6.91** demonstrate that the majority of junctions are operating with a maximum V / C ratio of below 85% during the PM Peak Hour in the 2023 Opening Year and that the Proposed Scheme will have a negligible impact on the majority of assessed local / regional road links within the indirect study area.

A Positive, Slight and Long-term effect is predicted at two junctions as a result of redistribution of general traffic associated with the Proposed Scheme.

Capacity issues are noted at the following junctions:

- **Quincentenary Bridge Approach Road / Headford Road** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Headford Road / Bothar na dTreabh** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Doughiska Road / Dublin Road** – operates above 100% during both the Do Minimum and Do Something scenarios;
- **Moneenageisha Road / Wellpark Road** – operates between 85% and 100% in the Do Minimum and above 100% during the Do Something scenario;
- **Bothar Na Long / Dock Road** – operates below 85% in the Do Minimum and above 100% during the Do Something scenario;
- **Bothar Na Long / Queen Street** – operates below 85% in the Do Minimum and above 100% during the Do Something scenario; and
- **Lough Atalia Road / Bothar Na Long** – operates below 85% in the Do Minimum and above 100% during the Do Something scenario.

At three of the junctions above, performance is similar with or without the Proposed Scheme in place, therefore, the impact is considered to be negligible and when combining with the sensitivity of the road link, the significance of effect is Not Significant and Long-term at both Quincentenary Bridge Approach Road / Headford Road and Doughiska Road / Dublin Road junctions and Imperceptible and Long-term at Headford Road / Bothar na dTreabh junction.

At the remaining junctions, the effect of redistributed traffic associated with the Proposed Scheme is deemed Not Significant and Long-term at 54 of the 68 junctions assessed. Six junctions are predicted to experience Imperceptible and Long-term effects, four junctions are predicted to experience Negative, Moderate and Long-terms effects and four junctions Negative, Slight and Long-term. Further assessment into mitigation measures is therefore not necessary for any junctions in the PM Peak Hour of the 2023 Opening Year.

General Traffic Impact Assessment (2038, AM Peak Period)

The contents of Table 6.92 outline the V / C ratios at the key local / regional road junctions in the AM Peak Hour for the 2038 Design Year and the resultant magnitude of impact and significance of effect at each junction.

Table 6.92: Volume over Capacity at Key Junctions (Do Minimum vs Do Something), AM Peak, 2038

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
Headford Road	Headford Road / Bothar na dTreabh	Negligible			✓			✓	Negligible	Imperceptible
Headford Road	Headford Road / Dun Na Coiribe	Low	✓			✓			Negligible	Not Significant
Quincentenary Bridge	Quincentenary Bridge Approach Road / Headford Road	Low		✓				✓	Medium	Negative Moderate
Quincentenary Bridge	Quincentenary Bridge Approach Road / Upper Newcastle Road	Low			✓			✓	Negligible	Not Significant
Quincentenary Bridge	Thomas Hynes Road / Seamus Quirke Road	Low			✓			✓	Negligible	Not Significant
Circular Road	Circular Road / Siabhan Mckenna Road	Medium	✓			✓			Negligible	Not Significant
Circular Road	Rahoon Road / Circular Road	Low			✓			✓	Negligible	Not Significant
Bushypark	Bushypark / Corcullen Road	High	✓			✓			Negligible	Not Significant
Bushypark	Upper Clybaun Road / Corcullen Road	High	✓			✓			Negligible	Not Significant
Western Distributor Road	Rahoon Road / Unnamed	Medium	✓			✓			Negligible	Not Significant
Western Distributor Road	Unnamed / Galway West Business Park	High	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Bothar Le Cheile	Bothar Le Cheile / Seamus Quirke Road	Low	✓				✓		Low	Negative Slight
Siobhan Mckenna Road	Bothar Le Cheile / Siabhan Mckenna Road	High	✓			✓			Negligible	Not Significant
Siobhan Mckenna Road	Siobhan Mckenna Road / Thomas Hynes Road	Low			✓			✓	Negligible	Not Significant
Moyola Park	Moyola Park / Upper Newcastle Road	Low	✓			✓			Negligible	Not Significant
Moyola Park	Thomas Hynes Road / Moyola Park	Low	✓			✓			Negligible	Not Significant
N83 Tuam Road	N83 Tuam Road / Bothar Na Mine	Negligible	✓			✓			Negligible	Imperceptible
N83 Tuam Road	N83 Tuam Road / Parkmore Road	Negligible		✓		✓			Low Positive	Not Significant
Wellpark	Tuam Road / Wellpark	Low	✓			✓			Negligible	Not Significant
Wellpark	Wellpark Road / Connolly Avenue	Medium	✓			✓			Negligible	Not Significant
Ballybane Road	Ballybane Road / Beechwood Park	Low	✓			✓			Negligible	Not Significant
Ballybane Road	Ballybane Road / Castlepark Road	Low	✓			✓			Negligible	Not Significant
Ballybane Road	Ballybane Road / Glasan	Low	✓			✓			Negligible	Not Significant
Ballybane Road	Ballybane Road / Monivea Road	Low	✓			✓			Negligible	Not Significant
Ballybane Road	Ballybane Road / Rahylin Glebe	Low	✓			✓			Negligible	Not Significant
Dublin Road	Dublin Road / Ballybane Road	Low	✓				✓		Low	Negative Slight
Dublin Road	Dublin Road / Ballyloughane Road	Low	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Dublin Road	Dublin Road / Michael Collins Road	Low		✓			✓		Negligible	Not Significant
Dublin Road	Dublin Road / Renmore Park	Low		✓			✓		Negligible	Not Significant
Dublin Road	Dublin Road / Renmore Road	Low		✓			✓		Negligible	Not Significant
Moneenageisha Road	Moneenageisha Road / Wellpark Road	Low		✓				✓	Medium	Negative Moderate
Bohermore	Bohermore / Cookes Terrace	Low	✓			✓			Negligible	Not Significant
Bohermore	Bohermore / Saint Anthonys Terrace	High	✓			✓			Negligible	Not Significant
Lough Atalia Road	Fairgreen Road / Lough Atalia Road	Low	✓					✓	High	Negative Moderate
Lough Atalia Road	Lough Atalia Road / Bothar Na Long	Low	✓					✓	High	Negative Moderate
Lough Atalia Road	Lough Atalia Road / College Road	Low	✓					✓	High	Negative Moderate
Bothar Na Long	Bothar Na Long / Dock Road	Low	✓					✓	High	Negative Moderate
Bothar Na Long	Bothar Na Long / Queen Street	Low	✓					✓	High	Negative Moderate
Fairgreen Road	Fairgreen Road / Station Road	High	✓			✓			Negligible	Not Significant
Fairgreen Road	Forster Street / Bothar Bhreandan Ui Eithir	Low	✓					✓	High	Negative Moderate
Bothar Na Mban	Bothar Na Mban / Bothar Irwin	High	✓			✓			Negligible	Not Significant
Forthill Street	Forthill Street / Queen Street	Low			✓		✓		Low Positive	Positive Slight
Forthill Street	Merchants Road / Forthill	Low	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
	Street									
Merchants Road (St Nicholas Street - Forthill Street)	Merchants Road / Lower Abbeygate Street	Low	✓			✓			Negligible	Not Significant
Merchants Road (St Nicholas Street - Forthill Street)	New Dock Street / Merchants Road	Low	✓				✓		Low	Negative Slight
New Dock Street	New Dock Street / Dock Road	Low	✓			✓			Negligible	Not Significant
Flood Street	Flood Street / New Dock Street	Low	✓			✓			Negligible	Not Significant
Flood Street	Wolfe Tone Bridge / Spanish Parade	Low	✓				✓		Low	Negative Slight
Taylors Hill Road	Taylors Hill Road / Ardmore	Low	✓			✓			Negligible	Not Significant
Taylors Hill Road	Taylors Hill Road / Bishop O'Donnell Road	Low			✓			✓	Negligible	Not Significant
Taylors Hill Road	Taylors Hill Road / Maunsell's Road	Low	✓			✓			Negligible	Not Significant
Taylors Hill Road	Taylors Hill Road / Rosary Lane	Low		✓			✓		Negligible	Not Significant
Rahoon Road	Rahoon Road / Highfield Park	Medium	✓			✓			Negligible	Not Significant
Rahoon Road	Rahoon Road / Seamus Quirke Road	Low		✓			✓		Negligible	Not Significant
Old Seamus Quirke Road	Old Seamus Quirke Road / Ashe Road	High	✓			✓			Negligible	Not Significant
Old Seamus Quirke Road	Old Seamus Quirke Road / Weatherly Lodge	High	✓			✓			Negligible	Not Significant
Old Seamus Quirke Road	Seamus Quirke Road / Old Seamus Quirke Road	Low		✓			✓		Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Ashe Road	Ashe Road / Costello Road	High	✓			✓			Negligible	Not Significant
Shantalla Road	Rahoon Road / Old Seamus Quirke Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Colmcille Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Mc Dara Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Rahoon Road	Medium		✓			✓		Negligible	Not Significant
Seamus Quirke Road (Lower Newcastle Road - Browne Roundabout)	Seamus Quirke Road / Lower Newcastle Road	Medium	✓				✓		Low	Negative Moderate
Seamus Quirke Road (Lower Newcastle Road - Browne Roundabout)	Seamus Quirke Road / Snipe Lawn	High	✓			✓			Negligible	Not Significant
Lower Newcastle Road (University Road - Seamus Quirke Road)	Lower Newcastle Road / Newcastle Avenue	Medium			✓			✓	Negligible	Not Significant
Lower Newcastle Road (University Road - Seamus Quirke Road)	Newcastle Road / University Road	Medium			✓		✓		Low Positive	Positive Moderate
Newcastle Road	Costello Road / Newcastle Road	Medium		✓			✓		Negligible	Not Significant
Newcastle Road	Newcastle Road / Presentation Road	Medium	✓			✓			Negligible	Not Significant
Newcastle Road	St Mary's Road / Shantalla Road	Medium		✓			✓		Negligible	Not Significant
St Mary's Road	St Mary's Road / Palmyra Avenue	Medium	✓			✓			Negligible	Not Significant
St Mary's Road	The Crescent / Lower	Low		✓			✓		Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
	Salthill Road									
Gaol Road (South of University Road)	Gaol Road / Gaol Road	High	✓			✓			Negligible	Not Significant
Gaol Road (South of University Road)	University Road / Gaol Road	Medium	✓			✓			Negligible	Not Significant
Presentation Road	Presentation Road / New Road	High	✓			✓			Negligible	Not Significant
Presentation Road	Presentation Road / Parkavara	High	✓			✓			Negligible	Not Significant
Bothar na dTreabh (N83-N84)	Bothar na dTreabh / Glenburren Park	Negligible	✓			✓			Negligible	Imperceptible
Bothar na dTreabh (N83-N84)	Bothar na dTreabh / Tuam Road	Negligible			✓			✓	Negligible	Imperceptible

The results of the junction analysis illustrated in Table 6.92 demonstrate that the majority of junctions continue to operate with a maximum V / C ratio of below 85% during the AM Peak Hour in the 2038 Design Year.

Positive, Slight to Moderate and Long-term effects are predicted at two junctions as a result of redistribution of general traffic associated with the Proposed Scheme.

Capacity issues arise at the following junctions during the AM Peak Hour:

- Headford Road / Bothar na dTreabh;
- Quincentenary Bridge Approach Road / Upper Newcastle Road;
- Thomas Hynes Road / Seamus Quirke Road;
- Rahoon Road / Circular Road;
- Siobhan Mckenna Road / Thomas Hynes Road;
- Taylors Hill Road / Bishop O'Donnell Road;
- Lower Newcastle Road / Newcastle Avenue; and
- Bothar na dTreabh / Tuam Road.

As each of the junctions above operate with a maximum V / C ratio of above 100% in both the Do Minimum and Do Something, the impact is considered to be negligible with a Not Significant and Long-term effect.

Capacity issues are also noted at the following junctions:

- **Quincentenary Bridge Approach Road / Headford Road** – operates between 85% and 100% during the Do Minimum and above 100% during the Do Something scenario;
- **Moneenageisha Road / Wellpark Road** – operates between 85% and 100% during the Do Minimum and above 100% during the Do Something scenario;
- **Fairgreen Road / Lough Atalia Road** – operates below 85% during the Do Minimum and above 100% during the Do Something scenario;
- **Lough Atalia Road / Bothar Na Long** – operates below 85% during the Do Minimum and above 100% during the Do Something scenario;
- **Lough Atalia Road / College Road** – operates below 85% during the Do Minimum and above 100% during the Do Something scenario;
- **Bothar Na Long / Dock Road** – operates below 85% during the Do Minimum and above 100% during the Do Something scenario;
- **Bothar Na Long / Queen Street** – operates below 85% during the Do Minimum and above 100% during the Do Something scenario; and
- **Forster Street / Bothar Bhreandan Ui Eithir** – operates below 85% during the Do Minimum and above 100% during the Do Something scenario.

Overall, redistributed traffic associated with the Proposed Scheme in is expected to result in a negligible impact at 59 out of 77 junctions assessed and the effect is deemed Not Significant and Long-term. Five junctions are predicted to experience Imperceptible and Long-term effects. A Negative, Slight and Long-term effect is predicted at four junctions, A Negative, Moderate and Long-term effect at nine junctions. Further assessment into mitigation measures is therefore not necessary for any junctions in the AM Peak Hour of the 2038 Design Year.

General Traffic Impact Assessment (2038, PM Peak Period)

The contents of Table 6.93 outline the V / C ratios at the key local / regional road junctions in the PM Peak Hour for the 2038 Design Year and the resultant magnitude of impact and significance of effect at each junction.

Table 6.93: Volume over Capacity at Key Junctions (Do Minimum vs Do Something), PM Peak, 2038

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
Quincentenary Bridge	Quincentenary Bridge Approach Road / Headford Road	Low			✓			✓	Negligible	Not Significant
Quincentenary Bridge	Quincentenary Bridge Approach Road / Upper Newcastle Road	Low		✓				✓	Medium	Negative Moderate
Quincentenary Bridge	Thomas Hynes Road / Seamus Quirke Road	Low	✓					✓	High	Negative Moderate
Circular Road	Circular Road / Siabhan Mckenna Road	Medium			✓			✓	Negligible	Not Significant
Circular Road	Rahoon Road / Circular Road	Low			✓			✓	Negligible	Not Significant
Siobhan Mckenna Road	Bothar Le Cheile / Siabhan Mckenna Road	High	✓			✓			Negligible	Not Significant
Siobhan Mckenna Road	Siobhan Mckenna Road / Thomas Hynes Road	Low	✓			✓			Negligible	Not Significant
N84 Headford Road	Headford Road / Bothar na dTreabh	Negligible		✓				✓	Medium	Not Significant
N84 Headford Road	N84 Headford Road / Ballinfoile Park	Negligible			✓			✓	Negligible	Imperceptible
N84 Headford Road	N84 Headford Road / Bothar An Choiste	Negligible	✓				✓		Low	Not Significant
N84 Headford Road	N84 Headford Road / Brookdale	Negligible	✓				✓		Low	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
N84 Headford Road	N84 Headford Road / Monument Road	Negligible		✓			✓		Negligible	Imperceptible
N84 Headford Road	N84 Headford Road / Tirellan Heights	Negligible	✓			✓			Negligible	Imperceptible
Doughiska Road	Doughiska Road / An Fiodan	High	✓			✓			Negligible	Not Significant
Doughiska Road	Doughiska Road / Dublin Road	Low			✓			✓	Negligible	Not Significant
Doughiska Road	Doughiska Road / Fearann Ri	High	✓			✓			Negligible	Not Significant
Doughiska Road	Doughiska Road / Merlin Park Lane	High	✓			✓			Negligible	Not Significant
Sandy Road	Sandy Road / Glen Na Tra	High	✓			✓			Negligible	Not Significant
Sandy Road	Sandy Road / Gort Na Glaise	High	✓			✓			Negligible	Not Significant
Sandy Road	Sandy Road / Maldron Hotel	High	✓			✓			Negligible	Not Significant
Lough Atalia Road	Fairgreen Road / Lough Atalia Road	Low	✓					✓	High	Negative Moderate
Lough Atalia Road	Lough Atalia Road / College Road	Low	✓					✓	High	Negative Moderate
College Road (Lough Atalia Road - Dublin Road)	Moneenageisha Road / Wellpark Road	Low			✓		✓		Low Positive	Positive Slight
Bothar Na Long	Bothar Na Long / Dock Road	Low	✓					✓	High	Negative Moderate
Bothar Na Long	Bothar Na Long / Queen Street	Low	✓				✓		Low	Negative Slight
Bothar Na Long	Lough Atalia Road / Bothar Na Long	Low	✓					✓	High	Negative Moderate

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Fairgreen Road	Fairgreen Road / Station Road	High	✓			✓			Negligible	Not Significant
Fairgreen Road	Forster Street / Bothar Bhreandan Ui Eithir	Low	✓				✓		Low	Negative Slight
Bothar Bhreandan Ui Eithir	Bothar Bhreandan Ui Eithir / Foster Court	Low	✓			✓			Negligible	Not Significant
Bothar Bhreandan Ui Eithir	Prospect Hill / Bothar Bhreandan Ui Eithir	Low	✓				✓		Low	Negative Slight
Bothar Na Mban	Bothar Na Mban / Bothar Irwin	High	✓			✓			Negligible	Not Significant
Forthill Street	Forthill Street / Queen Street	Low	✓			✓			Negligible	Not Significant
Forthill Street	Merchants Road / Forthill Street	Low	✓			✓			Negligible	Not Significant
Merchants Road (St Nicholas Street - Forthill Street)	Merchants Road / Lower Abbeygate Street	Low	✓			✓			Negligible	Not Significant
Merchants Road (St Nicholas Street - Forthill Street)	New Dock Street / Merchants Road	Low	✓			✓			Negligible	Not Significant
St Francis Street	St Francis Street / Mary Street	Medium		✓		✓			Low Positive	Positive Moderate
St Francis Street	St Vincents Avenue / Saint Francis Street	Medium	✓			✓			Negligible	Not Significant
New Dock Street	New Dock Street / Dock Road	Low	✓			✓			Negligible	Not Significant
Wolfe Tone Bridge	Father Griffin Road / Claddagh Quay	Low	✓			✓			Negligible	Not Significant
Flood Street	Flood Street / New Dock Street	Low	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Flood Street	Wolfe Tone Bridge / Spanish Parade	Low		✓			✓		Negligible	Not Significant
Shantalla Road	Rahoon Road / Old Seamus Quirke Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Colmcille Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Mc Dara Road	Medium	✓			✓			Negligible	Not Significant
Shantalla Road	Shantalla Road / Rahoon Road	Medium	✓			✓			Negligible	Not Significant
Seamus Quirke Road (Lower Newcastle Road - Browne Roundabout)	Seamus Quirke Road / Snipe Lawn	High	✓			✓			Negligible	Not Significant
Lower Newcastle Road (Seamus Quirke Road - Snipe Av)	Lower Newcastle Road / Distillery Road	Medium			✓			✓	Negligible	Not Significant
Lower Newcastle Road (University Road - Seamus Quirke Road)	Lower Newcastle Road / Newcastle Avenue	Medium	✓			✓			Negligible	Not Significant
Lower Newcastle Road (University Road - Seamus Quirke Road)	Newcastle Road / University Road	Medium		✓			✓		Negligible	Not Significant
Lower Newcastle Road (University Road - Seamus Quirke Road)	Seamus Quirke Road / Lower Newcastle Road	Medium	✓			✓			Negligible	Not Significant
Newcastle Road	Costello Road / Newcastle Road	Medium	✓			✓			Negligible	Not Significant
Newcastle Road	Newcastle Road / Presentation Road	Medium	✓			✓			Negligible	Not Significant
Newcastle Road	St Mary's Road / Shantalla Road	Medium	✓			✓			Negligible	Not Significant

Road Name	Junction Name	Junction Sensitivity	DM Max V/C Ratio			DS Max V/C Ratio			Magnitude of Impact	Significance of Effects
Gaol Road (South of University Road)	Gaol Road / Gaol Road	High	✓			✓			Negligible	Not Significant
Gaol Road (South of University Road)	University Road / Gaol Road	Medium	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Father Burke Road	Low	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Father Griffin Avenue	Low	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Grattan Court	High	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Lower Salthill Road	Medium	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Munster Avenue	Low	✓			✓			Negligible	Not Significant
Father Griffin Road	Father Griffin Road / Whitestrand Road	Medium	✓			✓			Negligible	Not Significant
Presentation Road	Presentation Road / New Road	High	✓			✓			Negligible	Not Significant
Presentation Road	Presentation Road / Parkavara	High	✓			✓			Negligible	Not Significant
Mill Street	Mill Street / Presentation Road	High	✓			✓			Negligible	Not Significant
Henry Street	Henry Street / William Street West	Medium	✓			✓			Negligible	Not Significant
Henry Street	St Helen's Street / New Road	Medium	✓			✓			Negligible	Not Significant
Lower Road Fairhill	Dominick Street Upper / Lower Fairhill Road	Medium	✓			✓			Negligible	Not Significant
Lower Road Fairhill	Father Griffin Road / Lower Fairhill Road	Low	✓				✓		Low	Negative Slight

The results of the junction analysis illustrated in Table 6.93 demonstrate that the majority of junctions continue to operate with a maximum V / C ratio of below 85% during the PM Peak Hour in the 2038 Design Year and the Proposed Scheme.

Positive, Slight to Moderate and Long-term effects are predicted at two junctions as a result of redistribution of general traffic associated with the Proposed Scheme.

It is noted that capacity issues arise at the following six junctions:

- Quincentenary Bridge Approach Road / Headford Road;
- Circular Road / Siabhan Mckenna Road;
- Rahoon Road / Circular Road;
- N84 Headford Road / Ballinfoile Park;
- Doughiska Road / Dublin Road; and
- Lower Newcastle Road / Distillery Road.

As each of the junctions above operate with a maximum V / C ratio of above 100% in both the Do Minimum and Do Something, the impact is considered to be negligible with a Not Significant and Long-term effect.

Capacity issues are also noted at the following junctions:

- Quincentenary Bridge Approach Road / Upper Newcastle Road – operates between 85% and 100% during the Do Minimum and above 100% in the Do Something scenario;
- Thomas Hynes Road / Seamus Quirke Road – operates below 85% and 100% during the Do Minimum and above 100% in the Do Something scenario;
- Headford Road / Bothar na dTreabh – operates between 85% and 100% during the Do Minimum and above 100% in the Do Something scenario;
- Fairgreen Road / Lough Atalia Road – operates below 85% and 100% during the Do Minimum and above 100% in the Do Something scenario;
- Lough Atalia Road / College Road – operates below 85% and 100% during the Do Minimum and above 100% in the Do Something scenario;
- Bothar Na Long / Dock Road – operates below 85% and 100% during the Do Minimum and above 100% in the Do Something scenario; and
- Lough Atalia Road / Bothar Na Long – operates below 85% and 100% during the Do Minimum and above 100% in the Do Something scenario.

Overall, redistributed traffic associated with the Proposed Scheme in is expected to result in a negligible impact at 55 out of 68 junctions assessed and the effect is deemed Not Significant and Long-term. Three junctions are predicted to experience Imperceptible and Long-term effects. A Negative, Moderate and Long-term effect is predicted at six junctions.

A Negative, Slight and Long-term effect is predicted at four junctions. Further assessment into mitigation measures is therefore not necessary for any junctions in the PM Peak Hour of the 2038 Design Year.

6.6 Mitigation and Monitoring Measures

Construction Phase

A Construction Environmental Management Plan (CEMP) has been prepared and is appended to Chapter 5 (Construction) of this report, which outlines a number of mitigation measures to minimise the impacts of the Construction Phase of the Proposed Scheme for walking, cycling, bus, parking and general traffic.

A detailed Construction Traffic Management Plan has been prepared and will subsequently be updated by the appointed contractor prior to construction, including Temporary Traffic Management arrangements prepared in accordance with Department of Transport's 'Traffic Signs Manual, Chapter 8 Temporary Traffic Measures and Signs for Roadworks'. The plan will be agreed with GCC and will include measures to minimise the impacts associated with the Construction Phase upon the peak periods of the day.

No further mitigation measures are therefore required to be considered as part of the Proposed Scheme.

Operational Phase

Given that the Proposed Scheme results in a positive impact for walking, cycling, bus and people movements, mitigation and monitoring measures have not been considered for these assessments.

The design development for general traffic and parking / loading, including the measures incorporated into the Proposed Scheme to minimise negative impacts, have been outlined in Chapter 4 (Proposed Scheme Description) of this EIAR. Therefore, no Negative, Significant and Temporary or Long-term effects are predicted as a result of the Proposed Scheme.

As such, no mitigation measures are required to be considered as part of the Proposed Scheme.

6.7 Residual Impacts

Residual impacts associated with the assessment topics remain the same as that outlined in Section 6.5 (Potential Impacts whilst meeting the scheme objectives set out in Chapter 1 (Introduction).

6.8 References

DoT (2002). Traffic Management Guidelines

DoT (2019). Traffic Signs Manual

DTTS (2019). Temporary Traffic Management Design Guidance

DTTS (2019). Design Manual for Urban Roads and Streets

DTTS (2019). Traffic Signs Manual – Chapter 8, Temporary Traffic Measures and Signs for Roadworks

EPA (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Draft. August 2017

NAVTEQ (2011). The NavStreets Reference Manual

NTA (2011). National Cycle Manual

NTA (2013). Greater Dublin Area Cycle Network Plan

NTA (2016). Transport Strategy for the Greater Dublin Area (2016 – 2035)

TRB (2000) Highway Capacity Manual

TRB (2013) Transit Capacity and Quality of Service Manual

Transport for London (2010) Traffic Modelling Guidelines

TII (2014) Traffic and Transport Assessment Guidelines

Chapter 07
Air Quality

Contents

7 Air Quality

7.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the potential air quality impacts associated with the Construction and Operational Phases of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) (hereafter referred to as the Proposed Scheme).

During the Construction Phase, the potential air quality impacts associated with the development of the Proposed Scheme have been assessed. This included construction activities such as utility diversions, road carriageway / cycleway / footway resurfacing and kerb road realignments. Construction traffic construction access routes are also assessed as part of the study area for this phase of the works.

During the Operational Phase, the potential air quality impacts associated with altered traffic flows along the Proposed Scheme, reallocated traffic lanes and displaced traffic flows have been assessed.

The assessment has been carried out according to best practice and guidelines relating to air quality.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure on the key access routes through the city of Galway, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the scheme. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction). The Proposed Scheme which is described Chapter 4 (Proposed Scheme Description) has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through the application of a comprehensive design iteration process with particular emphasis on minimising the potential for environmental impacts where practicable whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development programme have been incorporated where appropriate.

7.2 Methodology

The assessment has been undertaken with reference to the most applicable guidance documents relating to air quality which are set out in the following sections of this Chapter.

An overview of the methodology undertaken for the air quality impact assessment is outlined below:

- A detailed baseline air monitoring study has been undertaken in order to characterise the existing ambient environment in areas along the Proposed Scheme. This has been undertaken through a review of available published ambient air monitoring data and site-specific ambient air monitoring at sensitive locations along the Proposed Scheme;
- A review of the most applicable standards and guidelines has been reviewed in order to define the air quality significance criteria for the Construction and Operational Phases of the Proposed Scheme;
- Predictive calculations and impact assessments relating to the likely Construction Phase air quality impacts have been undertaken at the nearest sensitive locations to the construction work areas associated with the Proposed Scheme;
- Predictive calculations have been performed to assess the potential air quality impacts associated with traffic alterations associated with the operation of the Proposed Scheme at the most sensitive locations; and
- A schedule of mitigation measures has been incorporated where required, to reduce, where necessary, the identified potential air quality impacts associated with the Proposed Scheme.

7.2.1 General

Air quality assessments are concerned with the presence of airborne pollutants in the atmosphere. The likely significant effects of the proposed development on air quality have been assessed by considering the background concentration levels of pollutants in the atmosphere and the potential for construction, operational and decommissioning (where relevant) effects associated with the proposed development.

This assessment has been undertaken with regard to the National Roads Authority (NRA (now Transport Infrastructure Ireland (TII)) (2011)) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Roads Schemes (hereafter referred to as "TII Guidelines") and Institute of Air Quality Management (IAQM) (2014) Guidance on the assessment of dust from demolition and construction (hereafter referred to as "IAQM Guidance"). These guidelines provide a methodology for the assessment, management and mitigation of air quality which can be adapted accordingly depending on the nature of the works.

The potential impacts to air quality relate to alterations to traffic patterns, with a particular attention focused on those areas where the Proposed Scheme will be encroaching closer to air quality receptors, specifically where bus or traffic lanes are moving closer to air quality receptors.

7.2.2 Study Area

7.2.2.1 Extent of Study Area

The Proposed Scheme is located across Galway City centre, representing a west-east public transport corridor commencing at the junction of University Road/Newcastle Road, routing over Salmon Weir Bridge and onto St. Francis Street/Eglinton Street, continuing through Eyre Square and onto Forster Street and College Road, ultimately connecting with the existing outbound bus lane on the R338 Dublin Road to the east of the junction at Moneenageisha. Refer to Diagram 1.1 (Chapter 1- Introduction) of this EIAR for the extents of the proposed development.

The works will be at specific locations along the existing road network from University Road, west of the River Corrib to the R338 Dublin Road, adjacent to Lough Atalia, east of the city centre. The works will also extend to the Dyke Road/Headford Road junction.

The existing land use in Galway City is typical of an urban setting with a continuous range and mixture of facilities alongside residential and commercial uses. The existing land use across the proposed road development will stay largely the same with works designed to improve the existing road infrastructure to facilitate pedestrians, cyclists and buses moving across the city centre. Existing land use changes include where land used for traffic will be re-established as areas of public space including east of Galway Cathedral, Waterside adjacent to the Salmon Weir Bridge, Woodquay and at Forster Street/Bóthar Uí hEithir.

It is proposed to demolish two private residential properties, one on St. Brendan's Avenue and one on Headford Road to facilitate road widening and make junction improvements. In addition, road widening on College Road between Lough Atalia Road/College Road junction to the Moneenageisha junction, will result in boundary removal of a number of private properties to facilitate these proposed works and the partial acquisition of the existing petrol station on College Road.

The extent of the overall study area is typically up to a maximum of 350m from a specific area of construction work, as per the IAQM Guidance with the key impacted study areas focused up to a maximum of 100m depending on the types of air emission sources and the local area under consideration.

7.2.2.2 Sensitive Receptors

The TII Guidelines defines sensitive receptor locations as *"residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present."*

For the purposes of this assessment the focus is on air quality sensitive receptors which bound the Proposed Scheme and those along diverted traffic routes within the study area.

There is a range of air quality sensitive receptors within the study area mainly comprising residential dwellings, commercial developments, schools, leisure, and community facilities, as follows:

- There are schools and colleges located across the study area including Saint Patricks Primary School, Saint Nicholas Parochial School, Yeat's College, Our Lady's College Galway, Scoil Croi Iosa, Mercy Primary School and National University of Ireland Galway.
- There are religious premises and places of worship located throughout the study area including Galway Cathedral, Poor Clares Convent, St Francis the Abbey, United Methodist Presbyterian Church, St Patrick's Church, Saint Nicholas Collegiate Church and Saint Joseph's Church.
- There are several recreational and amenity facilities within the study area including Millennium Children's Park, Town Hall Theatre, Eyre Square, Connaught Rugby Pitches, Galway Greyhound Track and Lough Atalia Park.
- The University Hospital Galway (UHG) is located on the western side of the study area. The community facilities within the study area consist of Galway Court House, Bus Éireann bus depot and Irish Rail stations (Galway Ceannt train station), Galway Coach Station (Fairgreen Road), Galway General Post Office, County Hall and City Hall.
- The commercial developments are primarily located within the city-centre at Eyre Square, Corbett Court Shopping Centre and Corrib Shopping Centre.
- The majority of residential developments are located on the eastern boundary of the study area with clusters of housing estates and ribbon developments. In addition, there are a number of housing estates located along the western boundary of the study area.

The TII Guidelines consider ecologically designated sites (Irish and European designations) as highly sensitive air quality receptors. The closest designated sites to the Proposed Scheme include the following:

- Galway Bay Complex SAC and pNHA (Site Code 000268) and Lough Corrib SAC (000297) are located on the south-western boundary of the study area.
- Inner Galway Bay SPA (Site Code 004031) located approximately 0.01km south of the study area.
- Lough Corrib SPA (Site Code 004042) located approximately 2.8km from the study area.
- Moycullen Bogs NHA (Site Code: 002364) located 2.3km north-east of the study area.
- Cregganna Marsh SPA (Site Code 004142) located approximately 7.12km from the study area.
- Lough Fingall Complex SAC (Site Code 000606) located approximately 13.2km from the study area.
- Ross Lake and Woods SAC (Site Code 001312) located approximately 13.2km from the study area.

- East Burren Complex SAC (Site Code 001926) located approximately 13.6km from the study area.
- Connemara Bog Complex SAC (Site Code 002034) located approximately 12.1km from the study area.

The ecological sensitivities associated with these areas are assessed in Chapter 12 (Biodiversity).

7.2.3 Relevant Guidelines, Policy and Legislation

Guidelines, policy and legislation specifically relevant to the air quality assessment are outlined this section.

7.2.3.1 Overview

The following Environmental Protection Agency (EPA) guideline was considered and consulted in the preparation of this assessment:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022).

The statutory ambient air quality standards in Ireland are outlined in S.I. No. 180 of 2011 Air Quality Standards Regulations 2011 (hereafter referred to as the Air Quality Regulations), which incorporate the ambient air quality limits set out in Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (hereafter referred to as the CAFE Directive), for a range of air pollutants. The statutory ambient air quality guidelines are discussed in greater detail in Section 7.2.3.2.

In addition to the specific statutory air quality standards, the assessment has made reference to national guidelines, where available, in addition to international standards and guidelines relating to the assessment of ambient air quality impact from road schemes. These are summarised below:

- IAQM Guidance (IAQM 2014, 2020);
- The TII Air Quality Guidelines (TII 2011);
- Guidelines for Assessment of Ecological Impacts of National Roads Schemes (hereafter referred to as the TII Ecological Guidelines) (TII 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);
- United Kingdom (UK) Department of Environment Food and Rural Affairs (DEFRA) Part IV of the Environment Act 1995: Local Air Quality Management Policy Guidance (PG16) (hereafter referred to as LAQM (PG16)) (DEFRA 2016);

- Part IV of the Environment Act 1995: Local Air Quality Management Technical Guidance (TG16) (hereafter referred to as LAQM (TG16)) (DEFRA 2018);
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) – LA 105 Air Quality (hereafter referred to as LA 105 Air Quality Guidance) (UKHA 2019); and
- World Health Organization (WHO) Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide Global Update 2005 (hereafter referred to as the WHO Air Quality Guidelines) (WHO 2006).
- World Health Organization (WHO) Global Air Quality Guidelines (2021)

7.2.3.2 Ambient Air Quality Standards / Limit Values

The Air Quality Regulations came into force and transposed EU Directive 2008/50/EC on ambient air quality and cleaner air for Europe into Irish law. The purpose of the Air Quality Regulations is to:

- Establish limit values and alert thresholds for concentrations of certain pollutants;
- Provide for the assessment of certain pollutants using methods and criteria common to other European Member States;
- Ensure that adequate information on certain pollutant concentrations is obtained and made publicly available; and
- Provide for the maintenance and improvement of ambient air quality where necessary.

The limit values established under the Air Quality Regulations relevant to this assessment (pollutants of concern) are included in Table 7.1.

Table 7.1: Limit Values in the Air Quality Regulations

Pollutant	Limit value for the protection of:	Averaging period	Limit value (µg/m^3)	Basis of application of limit value
NO_2 (Nitrogen Dioxide)	Human Health	1-hour	200	≤ 18 exceedances p.a. (99.79%ile)
		Calendar year	40	Annual mean
NO_x (Oxides of Nitrogen)	Vegetation	Calendar year	30	Annual mean
PM_{10} (Particulate Matter)	Human Health	24-hours	50	≤ 35 exceedances p.a. (90%ile)
		Calendar year	40	Annual mean
$PM_{2.5}$	Human Health	Calendar year	25	Annual mean

Pollutant	Limit value for the protection of:	Averaging period	Limit value ($\mu g/m^3$)	Basis of application of limit value
(Particulate Matter)				
Carbon Monoxide	Human Health	8 hours	10,000	Maximum daily 8 hour mean
Benzene	Human Health	Calendar year	5	Annual mean

The WHO Global Air Quality Guidelines (WHO 2021) values relating to NO_2, PM_{10} and $PM_{2.5}$ are shown in Table 7.2. The WHO Global Air Quality Guidelines values are more stringent than the European Union (EU) statutory limit values.

Table 7.2: Global Air Quality Guidelines (WHO 2021)

Pollutant	Limit Type	Value
NO_2	24-hour limit for protection of human health	$25\mu g/m^3$
	Annual limit for protection of human health	$10\mu g/m^3$
PM (as PM_{10})	24-hour limit for protection of human health	$45\mu g/m^3$
	Annual limit for protection of human health	$15\mu g/m^3$
PM (as $PM_{2.5}$)	24-hour limit for protection of human health	$15\mu g/m^3$
	Annual limit for protection of human health	$5\mu g/m^3$

The WHO Guidelines were updated in 2021 to reflect the current increasing understanding and evidence that shows how air pollution affects many aspects of human health, even at low levels - as such, the WHO Guidelines are considerably lower than the EU statutory limit values. However, as the EU statutory limit values have not been updated since the release of the new WHO guidelines, the appropriate compliance limit values for the assessment of air quality impacts of the Proposed Scheme are those outlined in the Air Quality Regulations, which incorporate the CAFE Directive. Therefore, the assessment considers compliance with the EU statutory limits only.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines, at European or national level, regarding the maximum dust deposition levels, that may be generated during construction activities.

However, Verein Deutscher Ingenieure (VDI) German Technical Instructions on Air Quality Control - TA-Luft standard for dust deposition (VDI 2002) (non-hazardous dust) provides a guideline for the rate of dust deposition of 350 mg/m^2/day averaged over one year.

The EPA concurs that this guideline may be applied, although the EPA typically applies the guideline limit as a 30-day average. This guidance value can be implemented with regard to dust impacts from the construction of the Proposed Scheme.

7.2.3.3 National Air Emission Targets

Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (hereafter referred to as the National Emissions Reduction Directive) was published in December 2016. The National Emissions Reduction Directive applied the limits set out in Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (hereafter referred to as the National Emission Ceiling Directive) until 2020 and established new national emission reduction commitments which are applicable from 2020 and 2030 for SO_2, NO_X, non-methane volatile organic compounds (NMVOC), ammonia (NH_3), $PM_{2.5}$ and methane (CH_4). In relation to Ireland, the 2020 to 2029 emission targets are 25kt (kilotonnes) for SO_2 (65% on 2005 levels), 65kt for NO_X (49% reduction on 2005 levels), 43kt for NMVOCs (25% reduction on 2005 levels), 108kt for NH_3 (1% reduction on 2005 levels) and 10kt for $PM_{2.5}$ (18% reduction on 2005 levels) as shown in Table 7.3. In relation to 2030, Ireland's emission targets are 85% below 2005 levels for SO_2, 69% reduction for NO_x, 32% reduction for VOCs, 5% reduction for NH_3 and 41% reduction for $PM_{2.5}$, also shown in Table 7.3.

Table 7.3: National Air Emission Targets (Ireland's Air Pollutant Emissions 2020 to 2030)

Pollutant	2020 to 2029 Reduction Commitments (kilotonnes) (and % Reduction Compared to 2005 Levels)	2030 Reduction Commitments (kilotonnes) (and % Reduction Compared to 2005 Levels)
SO_2	25.6	11.0
	-65%	-85%
NO_X	66.8	40.6
	-49%	-69%
NMVOC	56.3	51.1
	-25%	-32%
NH_3	112.1	107.5
	-1%	-5%
$PM_{2.5}$	15.6	11.2
	-18%	-41%

7.2.3.4 Institute of Air Quality Management Guidance

The IAQM Guidance on the assessment of Dust from Demolition and Construction, 2014 gives guidance to air quality consultants and environmental health officers on how to assess air quality impacts from construction activities. The IAQM Guidance provides a method for classifying the significance of effect from construction activities based on the 'dust magnitude' (high, medium or low) and proximity of the site to the closest receptors. The guidance recommends that once the significance of effect from construction is identified, the appropriate mitigation measures are implemented. The guidance notes that once the appropriate mitigation measures are applied, in most cases the resulting dust impacts can be reduced to negligible levels.

7.2.4 Data Collection and Collation

The baseline data for this assessment has been collected through carrying out a desk study, availing of the most up-to-date available data including national ambient air quality monitoring data, at the time of writing, in addition to site-specific baseline ambient monitoring surveys.

7.2.4.1 Desk Study

A desk-based air quality assessment was carried out following guidelines described in the publication by TII (TII 2011). TII states that wherever possible use should be made of existing certified air quality data such as that undertaken by the EPA. Air quality monitoring programmes have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report, Air Quality in Ireland 2020 (EPA 2021), details the range and scope of monitoring undertaken throughout Ireland. The baseline air quality data collected through the desk study is detailed in Section 7.3.

7.2.4.2 Site Specific Baseline Surveys

A site-specific baseline monitoring study was undertaken at monthly intervals from September 2021 to December 2021 as part of the air quality assessment for NO_2 using diffusion tube monitoring at 15 locations as detailed in Section 7.3 and as shown in Figure 7.1 of Volume 3 of this EIAR. Passive sampling of NO_2 involves the molecular diffusion of NO_2 molecules through a polycarbonate tube and their subsequent adsorption onto a stainless-steel disc coated with triethanolamine. Following the sampling, the tubes were analysed using ultraviolet (UV) spectrophotometry, at an accredited laboratory in Switzerland.

The TII Air Quality Guidelines (TII 2011) note that NO_2 diffusion tube monitoring provides a simple, cost-effective means of monitoring at a number of locations across an area and can provide useful information on spatial distributions. Details of the baseline data collected is discussed in Section 7.3.

7.2.5 Appraisal Method for the Assessment of Impacts

This section sets out the air quality assessment has been undertaken and highlights where input from other environmental disciplines has been included within the assessment.

7.2.5.1 Overview

The air quality assessment has been carried out in accordance with the Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022). The EPA significance of impacts matrix has been used to determine the significance of impact (Table 7.4).

Table 7.4: EPA Significance Matrix

Significance		Sensitivity				
		Very Low	**Low**	**Medium**	**High**	**Very High**
Magnitude	**Very Low**	Imperceptible	Not significant	Slight	Slight	Slight
	Low	Not significant	Slight	Moderate	Moderate	Moderate
	Medium	Slight	Moderate	Moderate	Significant	Significant
	High	Slight	Moderate	Significant	Very significant	Profound
	Very High	Slight	Moderate	Significant	Profound	Profound

The methodology for this assessment topic is informed by existing best practice and experience on other infrastructure projects. The assessment methodologies have been applied to assess both the potential impacts during the construction phase and the potential impacts during the operational phase of the Proposed Scheme, unless otherwise stated.

7.2.5.2 Traffic Screening Criteria

The TII Guidelines state that increases in Annual Average Daily Traffic (AADT) flows of less than 5% and 10% during the operational and construction phases respectively are unlikely to result in significant air quality effects. Likely significant effects on air quality are therefore assessed when the AADT flows are projected to increase above these thresholds due to the construction and/or operation of the proposed development.

LA 105 Air Quality Guidance states that the following scoping criteria shall be used to determine whether the air quality impacts can be scoped out or require an assessment based on the changes between the Do Something traffic (with the Proposed Scheme) compared to the Do Minimum traffic (without the Proposed Scheme):

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV – includes goods vehicles, buses and other heavy vehicles) AADT changes by 200 or more;

- A change in speed band; and
- A change in carriageway alignment by 5m or greater.

The above scoping criteria have been used in the current assessment to determine if a modelling assessment is required for the operational phase. Based on the redistribution of traffic in the operational phase there are multiple road links resulting in an AADT increase above 1,000 or more. As such, it has been determined that a modelling assessment is required for the operational phase. Sensitive receptors within 200m of impacted road links were included within the modelling assessment as detailed in Section 7.2.2.2.

The LA 105 Air Quality Guidance states that a medium sensitivity environment includes areas that have annual mean NO_2 concentrations of 36µg/m^3 or above combined with sensitive receptors within 50m of the impacted roads. The NO_2 concentrations (Section 7.3) were found to be generally below 36µg/m^3 along the Proposed Scheme, however, given the number of sensitive receptors in close proximity to the road combined with the redistribution of traffic volumes, the scheme has been determined as medium sensitivity.

LA 105 Air Quality Guidance states that modelling should be conducted for NO_2 for the base, opening and design years for both the Do Minimum (without the Proposed Scheme) and Do Something (with Proposed Scheme) scenarios. The potential concentrations due to the operation of the Proposed Scheme are then compared to the relevant limit values described in Table 7.1 to determine likely significant effects.

Modelling of PM_{10} is only required for the base year to demonstrate that the air quality limit values in relation to PM_{10} are not breached. Where the air quality modelling indicates exceedances of the PM_{10} air quality limits in the base year then PM_{10} should be included in the air quality model in the Do-Minimum and Do-Something scenarios. The concentrations of PM_{10} are included in Section 7.3. LA 105 Air Quality guidance states that modelling of $PM_{2.5}$ is not required. The guidance suggests that modelling of PM_{10} can be used to show that the project does not impact on the $PM_{2.5}$ limit value on the basis that assuming compliance with the PM_{10} limit is achieved then compliance with the $PM_{2.5}$ limit will also be achieved.

Historically modelling of CO, lead and benzene was required by TII Guidance, however, guidance has now been updated by the LA 105 Air Quality Guidance as concentrations of these pollutants have been monitored to be significantly below their air quality limit values in recent years, even in urban centres[1] CO, lead and benzene have been scoped out of detailed assessment.

7.2.5.3 Construction Phase

For the construction phase assessment, the focus is on air quality sensitive receptors adjacent to the proposed works (e.g. utility diversions, road widening works, road excavation works (where required), road reconfiguration and resurfacing works) that are susceptible to dust impacts. As outlined in Section

[1] EPA (2020) Urban Environmental Indicators: Nitrogen dioxide levels in Dublin

7.2.5.2, the construction phase traffic has been scoped out of further assessment based on the screening criteria outlined in TII Guidelines and LA 105 Air Quality Guidance. As such, the greatest potential impact on air quality during the construction phase is from construction dust emissions, PM_{10} / $PM_{2.5}$ emissions and the potential for nuisance dust.

The construction effects have been assessed using the qualitative approach described in the latest IAQM Guidance, as detailed in Section 7.2.3.4. The guidance applies to the assessment of dust from construction and demolition activities.

An 'impact' is described as a change in pollutants concentrations or dust deposition, while an 'effect' is described as the consequence of an impact. The main impacts that may arise during construction of the proposed development are:

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes;
- Elevated PM_{10} concentrations as a result of dust generating activities on site; and
- Increase in NO_2 and PM_{10} concentrations due to exhaust emissions from non-road mobile machinery (NRMM) and vehicles accessing the site.

The IAQM Guidance considers the potential for dust emissions from dust-generating activities including:

- Demolition of existing structures;
- Earthworks;
- Construction of new structures; and
- Track-out.

Earthworks refer to the processes of soil stripping, ground levelling, excavation and land capping, while track-out is the transport of dust and dirt from the site onto the public road network where it may be deposited and then re-suspended by vehicles using the network.

This arises when vehicles leave the site with dusty materials, which may then spill onto the road, or when they travel over muddy ground on site and then transfer dust and dirt onto the road network.

For each of these dust-generating activities, the guidance considers three separate effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in PM_{10} exposure.

The receptors can be human or ecological and are chosen based on their sensitivity to dust soiling and PM_{10} exposure. The sensitive receptors are listed in Section 7.2.2.2.

The methodology takes into account the scale to which the above effects are likely to be generated (classed as small, medium or large), along with the levels of background PM_{10} concentrations and the distance to the closest receptor, in order to determine the sensitivity of the area. This is then taken into consideration when deriving the overall risk for the site. Suitable mitigation measures are also proposed to reduce the risk of the site. The steps to undertaking the dust assessment as per the IAQM Guidance are outlined below.

Step 1: Screen the need for detailed assessment

The first step is the initial screening to determine whether a detailed assessment is required. According to the IAQM Guidance, an assessment is required where there are sensitive receptors within 350m of the site boundary, for ecological receptors within 50m of the site boundary and/or within 50m of the route(s) used by the construction vehicles on the public highway and up to 500m from the site entrance(s).

There are sensitive receptors within 350m of the site boundary so therefore an assessment of the air quality effects is required.

The following ecological sensitive areas, as noted in Section 7.2.2.2, are in close proximity to the proposed development (as per above thresholds, within 50m), therefore, the potential air quality effects on such receptors are screened in for further assessment:

- Galway Bay Complex SAC and pNHA (Site Code 000268) located on the south-western boundary of the study area.
- Lough Corrib SAC (000297) are located on the south-western boundary of the study area.
- Inner Galway Bay SPA (Site Code 004031) located approximately 10m south of the study area.

Refer to Table 7.5 for the sensitivity of ecological impacts.

Table 7.5: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2: Assess the Risk of Dust Impacts Arising

This step is split into three sections as follows:

- Define the potential dust emission magnitude;
- Define the sensitivity of the area; and
- Define the risk of impacts.

Each of the dust-generating activities is given a dust emission magnitude depending on the scale and nature of the works (Step 2A) based on the criteria shown in Table 7.6**.**

Table 7.6: Categorisation of Dust Emission Magnitude

Dust Emission Magnitude		
Small	**Medium**	**Large**
Demolition		
• total building volume <20,000m^3 • construction material with low potential for dust release (e.g. metal cladding or timber) • demolition activities <10m above ground • demolition during wetter months	• total building volume 20,000 - 50,000m^3 • potentially dusty construction material • demolition activities 10 - 20m above ground level	• total building volume >50,000m^3 • potentially dusty construction material (e.g. concrete) • on-site crushing and screening • demolition activities >20m above ground level
Earthworks		
• total site area <2,500m^2 • soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • formation of bunds <4m in height • total material moved <10,000 tonnes • earthworks during wetter months	• total site area 2,500m^2 - 10,000m^2 • moderately dusty soil type (e.g. silt) • 5 – 10 heavy earth moving vehicles active at any one time • formation of bunds 4 - 8m in height • total material moved 20,000 - 100,000 tonnes	• total site area >10,000m^2 • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • formation of bunds >8m in height • total material moved >100,000 tonnes
Construction		
• total building volume <25,000m^3 • construction material with low potential for dust release (e.g. metal cladding or timber)	• total building volume 25,000 - 100,000m^3 • potentially dusty construction material (e.g. concrete) • on-site concrete batching	• total building volume >100,000m^3 • on-site concrete batching • sandblasting
Trackout		
• <10 HDV (>3.5t) outward movements in any one day • surface material with low potential for dust release • unpaved road length <50m	• 10 – 50 HDV (>3.5t) outward movements in any one day • moderately dusty surface material (e.g. high clay content) • unpaved road length 50 – 100m;	• >50 HDV (>3.5t) outward movements in any one day • potentially dusty surface material (e.g. high clay content) • unpaved road length >100m

The sensitivity of the surrounding area is then determined (Step 2B) for each dust effect from the above dust-generating activities, based on the proximity and number of receptors, their sensitivity to dust, the local PM_{10} background concentrations and any other site-specific factors. Table 7.7 and Table 7.8 show the criteria for defining the sensitivity of the area to different dust effects.

The health effects of PM_{10} on *high sensitivity receptors* includes residential areas, residential properties, schools and residential care homes in close proximity to the proposed development.

Table 7.7: Sensitivity of the Area to Human Health Impacts

Background PM_{10} concentrations (annual mean)	**Number of receptors**	**Distance from the source (m)**				
		< 20	**< 50**	**< 100**	**< 200**	**< 350**
High receptor sensitivity						
> 32µg/m^3	> 100	High	High	High	Medium	Low
	10 – 100			Medium	Low	
	< 10		Medium	Low		
28 – 32µg/m^3	> 100	High	High	Medium	Low	Low
	10 – 100		Medium	Low		
	< 10					
24 – 28µg/m^3	> 100	High	Medium	Low	Low	Low
	10 – 100					
	< 10	Medium	Low			
< 24µg/m^3	> 100	Medium	Low	Low	Low	Low
	10 – 100	Low				
	< 10					
Medium receptor sensitivity						
–	> 10	High	Medium	Low	Low	Low
	< 10	Medium	Low			
Low receptor sensitivity						
–	> 1	Low	Low	Low	Low	Low

Table 7.8: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		< 20	< 50	< 100	< 350
High	> 100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	< 10	Medium	Low	Low	Low
Medium	> 1	Medium	Low	Low	Low
Low	> 1	Low	Low	Low	Low

The overall risk of the impacts for each activity is then determined (Step 2C) prior to the application of any mitigation measures (defined in Table 7.9) and an overall risk for the site is derived.

Table 7.9: Risk of Dust Impacts

Sensitivity of area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High risk site	Medium risk site	Medium risk site
Medium	High risk site	Medium risk site	Low risk site
Low	Medium risk site	Low risk site	Negligible
Earthworks			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Construction			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Medium risk site	Low risk site
Low	Low risk site	Low risk site	Negligible
Trackout			
High	High risk site	Medium risk site	Low risk site
Medium	Medium risk site	Low risk site	Negligible
Low	Low risk site	Low risk site	Negligible

In order to determine the level of dust mitigation required during the construction phase, the potential dust emission magnitude for each dust generating activity needs to be taken into account, along with the already established sensitivity of the area.

The TII Air Quality Guidelines (TII 2011) also outlines an approach to assessing the impact of dust emissions from construction activities with standard mitigation in place, as shown in Table 7.10. The TII guidance does acknowledge however that '*it is very difficult to accurately quantify dust emissions arising from construction activities.*

It is thus not possible to easily predict changes to dust soiling rates or PM_{10} concentrations. A semi-quantitative approach is recommended to determine the likelihood of a significant impact, which should be combined with an assessment of the proposed mitigation measures'.

Table 7.10: Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from Source)		
Scale	**Description**	**Soiling**	**PM_{10}***	**Vegetation Effects**
Major	Large construction sites with high use of construction access routes	100m	25m	25m
Moderate	Moderate sized construction sites with moderate use of construction access routes	50m	15m	15m
Minor	Minor construction sites with limited use of construction access routes	25m	10m	10m

*Significance based on the PM_{10} Stage 1 limit to be complied with by 2005, which allows 35 daily exceedances / year. This standard is set out in S.I. No. 271/2002 - Air Quality Standards Regulations 2002

7.2.5.4 Operational Phase

For the operational phase, assessment of the dust impacts from maintenance of the route has been scoped out on the basis that these activities have low potential for dust release and are likely to have a negligible impact on air quality sensitive receptors. As outlined in Section 7.2.5.2, the operational phase traffic has been screened in for detailed assessment as per the screening criteria outlined in TII Guidelines and LA 105 Air Quality Guidance.

The potential changes in regional air emissions due to the operational phase traffic impacts of the Proposed Scheme have been assessed using the National Transport Authority (NTA) Environmental Appraisal Module, which is based on the ENEVAL software. Use of the ENEVAL tool allows for a robust large-scale assessment of the impact of regional air impacts due to the Proposed Scheme.

The tool allows for a better representation of potential traffic impacts at a regional level which would be otherwise left unaccounted for. This data also takes into account the modal shift from private car to bus (walk or cycle). ENEVAL was developed by Systra Ltd in 2015 on behalf of the National Transport Authority (NTA). Emissions from the zonal level ENEVAL tool can provide information on the air emissions for the different traffic scenarios on a regional basis.

Vehicle-derived air emissions were modelled using the ADMS-Roads dispersion model (Version 5.0.0.1) which has been developed by Cambridge Environmental Research Consultants (CERC). The model is a steady-state Gaussian plume model used to assess ambient pollutant concentrations associated with road sources.

The ADMS-Roads dispersion model has been used to predict the ground level concentrations (GLC) of NO_2 and PM_{10} / $PM_{2.5}$ in the vicinity of the impacted areas for the opening year (2023).

The modelling incorporated the following features:

- Hourly-sequenced meteorological information for Knock Airport in 2019 has been used in the model. The selection of the appropriate meteorological data has followed the guidance issued by the LAQM (TG16) (DEFRA 2021 A primary requirement is that the data used should have a data capture of greater than 90% for all parameters;
- The street canyon effect was taken into account in the ADMS-Roads dispersion model. Street canyons were found in the city centre locations due to narrow streets causing a small separation between facades either side of the street. The street canyon effect can impact dispersion, such as increasing concentrations on the leeside of the road. The ADMS-Roads street canyon option was selected to model this dispersion impact at receptors within the city centre and central area; and
- Specific air sensitive receptors (ASRs) were also mapped into the model. Receptor heights were input at 1.5m to represent breathing height. For elevated receptors, it has been assumed that each floor is 3m and therefore first floor receptors are at 4.5m. Concentrations were reported for each ASR modelled for all modelling scenarios.

The opening year for the Proposed Scheme is 2023 and the design year is 2038. Road traffic emission rates are derived using traffic data for the opening year of 2023 and design year of 2038 provided by the traffic consultant and using emission factors from the COPERT 5.3 database (European Environment Agency (EEA) 2019) which has been incorporated into the UK DEFRA Emission Factor Toolkit (EFT) Version 11.0 (DEFRA 2021). Furthermore, the addition of electric vehicles to the fleet will assist in significantly reducing emissions between 2023 and 2038, as outlined in Table 7.11 below, even in circumstances where the number of vehicles using a road link increases. Emissions per road link using the EFT Version 11.0 were calculated for the 2023 Do Something scenario and compared to the 2038 Do Something scenario. Conservative assumptions were made for future fleet and uptake of electric vehicles. As the fleet is expected to improve in future years, the 2023 modelled impacts can be considered worst-case. As a result, detailed modelling of the design year 2038 was scoped out for all pollutants on the basis that emissions will be lower compared to 2023 emissions.

The EFT Version 11.0 has been incorporated into the ADMS-Roads model. The toolkit provides emission rates from 2018 to 2030 and traffic emissions for the Proposed Scheme were based on the following assumptions as specified by the user guide[2]:

- EFT Version 11.0 is based on eight vehicle categories including petrol cars, diesel cars, diesel Light Goods Vehicles (LGV), rigid Heavy Goods Vehicles (HGVs) and buses;
- Northern Ireland has been selected to calculate the vehicle emissions in the DEFRA EFT, as it is considered to be most representative for the impacted areas;

[2] https://laqm.defra.gov.uk/wp-content/uploads/2021/11/EFTv11.0-user-guide-v1.0.pdf

- The 2019 projections were used for detailed modelling of the 2019 base year and 2023 projections for the opening year. The default basic fleet proportions built in the DEFRA EFT has been used for the baseline year of 2019. The transport consultant provided the fleet composition data (Table 7.11) for the opening year (2023) and they were used for car and LGV. Default fleet proportions for buses and HGV in 2023 have been used.

Table 7.11: Summary of Fleet Proportions

Vehicle Type		Opening Year 2023	Design Year 2038
Car	Petrol Car	38%	25%
	Diesel Car	55%	14%
	Electric Car	7%	61%
LGV	LGV	80%	34%
	Electric LGV	20%	66%
Bus	Electric LGV	-	100%
	Diesel Bus	100%	-

7.2.5.5 Ecology (Deposition)

The impacts of dust to ecological receptors during the construction phase is determined using the methodology outlined in Section 7.2.5.3 using the IAQM Guidance methodology. There is potential for impacts from pollutant deposition at ecologically sensitive sites due to the operation of the Proposed Scheme.

For routes which pass within 2km of a designated area of conservation (either Irish or European designation) the TII Air Quality Guidelines (TII 2011) requires the air quality specialist to consult with the project ecologist. However, in practice the potential for impact on an ecological site is highest within 200m of the Proposed Scheme and within 200m of roads where significant changes in AADT occur (CERC 2020). Sites identified within these parameters are considered Key Ecological Receptors. The TII Ecological Guidelines (TII 2009) and the Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities (DEHLG 2010) provide details regarding the legal protection of designated conservation areas.

Further guidance can also be found in the IAQM document A Guide to The Assessment of Air Quality Impacts on Designated Nature Conservation Sites (IAQM 2020) and in the DMRB guidance LA105 Air Quality (UKHA 2019), both of which describe NO_X emissions as the most likely source of significant impacts from road traffic. Pollutants such as CO_2, CO, SO_2, ammonia and volatile organic compounds are not considered in this guidance and have been scoped out of detailed assessment.

The following assessment criteria, in accordance with TII Guidance, is used to determine whether an assessment for nitrogen deposition should be conducted:

- There is a designated area of conservation within 200m of the Proposed Scheme; and

- There is a significant change in AADT flows.

In circumstances where the above criteria are met, there is the potential for impacts on ecology as a result of nitrogen deposition and thus an assessment should be undertaken. For road transport sources within 200m of a designated habitat, individual ecological receptors along a transect at 10m intervals are modelled. Ecological receptors are modelled up to a maximum distance of 200m regardless of whether the habitat extends beyond 200m. It is considered that the greatest impacts will have occurred in proximity to the road. The LA 105 Air Quality Guidance notes that only sites that are sensitive to nitrogen deposition need to be included in the assessment, it is not necessary to include sites for example that have been designated as a geological feature or water course. The ecological receptors along the 200m transect are modelled using the methodology for sensitive human receptors in Section 7.2.5.4.

The designated sites in proximity to the Proposed Scheme are listed in Section 7.2.2.2. The designated sites which are within 2km of the boundary of the Proposed Scheme are:

- Galway Bay Complex SAC and pNHA (Site Code 000268) located on the south-western boundary of the study area.
- Lough Corrib SAC (000297) located on the south-western boundary of the study area.
- Inner Galway Bay SPA (Site Code 004031) located approximately 10m south of the study area.

Consultation with the ecologist has been undertaken. Habitats of particular ecological importance at these sites include the following:

- Mudflats and sandflats;
- Coastal lagoons;
- Reefs;
- Semi-natural dry grasslands and scrublands;
- Calcareous and alkaline fens;
- Salt meadows;
- Oligotrophic and standing waters;
- Active raised bogs and raised bogs still capable of regeneration;
- Limestone pavements;
- Oak woods and bog woodland;
- Wetlands.

Species of particular ecological importance include the following:

- Otter;
- Harbour seal;

- Freshwater Pearl Mussel;
- Crayfish, Lamprey, Salmon;
- Breeding and wintering birds.

Chapter 12 (Biodiversity) includes further details on the ecological sensitivities associated with these sites.

The Air Quality Regulations outline an annual critical level for NO_X for the protection of vegetation and natural ecosystems in general. The CAFE Directive defines 'Critical Levels' as *'a level fixed on the basis of scientific knowledge, above which direct adverse effects may occur on some receptors, such as trees, other plants or natural ecosystems but not on humans.'*

The TII Ecological Guidelines reference the United Nations Economic Commission for Europe (UNECE) Critical Loads for Nitrogen where a 'Critical Load' is defined by the UNECE as a *'a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge'* (UNECE 2003). The guidance states that where the predicted environmental concentration (PEC) is less than 70% of the long-term critical level / load, the process contribution (PC) is likely to be insignificant.

The TII Ecological Guidelines outline a methodology to derive the road contribution to dry deposition and thereafter to compare with the published critical loads for the appropriate habitat.

The UNECE critical loads were subsequently updated in the 2010 Review and Revision of Empirical Critical Loads and Dose-Response Relationships (UNECE 2010). The pNHAs are not currently designated for the protection of a specific habitat type.

In order to calculate the nitrogen deposition, the NO_2 / NO_X concentration determined through modelling including the background concentration must be converted firstly into a dry deposition flux using the equation below which is taken from UK Environment Agency publication 'AGTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air' (EA 2014):

Dry deposition flux (µg m^{-2} s^{-1}) = ground-level concentration (µg/m^3) x deposition velocity (m/s)

Deposition velocities are provided in both the TII (TII 2011) and IAQM Guidance document (IAQM 2020) for NO_2 in grassland and forestry. Once the dry deposition flux (µg m^{-2} s^{-1}) is calculated it must then be converted to nitrogen equivalent acidification flux (k_{eq} ha^{-1} $year^{-1}$) for comparison with critical loads.

In order to convert the dry deposition flux from units of µg m^{-2} s^{-1} to units of kg ha^{-1} $year^{-1}$ the dry deposition flux is multiplied by the conversion factors. For NO_2 this factor is 96. In order to convert kg ha^{-1} $year^{-1}$ to k_{eq} ha^{-1} $year^{-1}$, where k_{eq} is a unit of equivalents (a measure of how acidifying the chemical species can be), the deposition flux in units of kg ha^{-1} $year^{-1}$ is multiplied by the conversion factor (taken from AQTAG06 (EA 2014)). The conversion factor for nitrogen is 0.071.

7.3 Baseline Environment

7.3.1 Overview

Galway City falls within Zone C. A desk study of the EPA air quality monitoring programs has been undertaken. Concentrations of each pollutant recorded in Zone C are averaged to represent typical background levels.

The most recent annual report on air quality Air Quality in Ireland 2020 (EPA 2021) details the range and scope of monitoring undertaken throughout Ireland. The EPA air quality monitoring data was used for NO_2, PM_{10} and $PM_{2.5}$.

In addition, scheme specific baseline air quality monitoring has been conducted. The data collected has been included to provide site specific baseline concentrations of NO_2 in areas which have the potential to be impacted by the Proposed Scheme.

7.3.2 Site Specific Monitoring (NO_2)

Monitoring of NO_2 in proximity to the Proposed Scheme, and roads that have the potential to be impacted by it, was carried out using passive diffusion tubes. The baseline monitoring study was carried out close to the alignment of the Proposed Scheme, with monitoring focusing on areas of greatest potential impact. The results of the monitoring survey allow for an indicative comparison with the annual statutory limit value for NO_2. The results also provide information on the influence of road sources relative to the prevailing background level of these pollutants in the area.

A baseline NO_2 monitoring survey was undertaken as part of the air quality assessment for the Proposed Scheme. There were 15 monitoring locations tested on a monthly basis over 3 months and in triplicate to ascertain general NO_2 concentrations around Galway City. Samples were tested using diffusion tubes (20% TEA / Water) and analysed by SP01 Photometer in an accredited laboratory. Under TII Air Quality Guidelines (TII 2011) a minimum of one month baseline monitoring is required, ideally extending to at least three months. The TII Air Quality Guidelines specifically state that:

'Monitoring should ideally be carried out for a period of six months, including both summer and winter periods. However, for practical reasons, the monitoring period may be shorter, but, wherever possible, should extend for at least 3 months and should not be less than 1 month'.

The diffusion tube monitoring results generally have a positive or negative bias when compared to continuous analysers.

This bias is laboratory specific and is dependent on the specific analysis procedures at each laboratory. The bias for the tubes was determined by assessment against a reference analyser calibrated with ISO 17025 gases. A bias adjustment factor was applied to the monitoring results to account for this bias. Refer to Appendix 7.1 (Volume 4 of this EIAR) for the full Air Quality Monitoring Report.

In addition to the bias adjustment, an annualisation factor is required as the monitoring period did not extend to a full year. The annualisation factor was prepared as per LAQM (TG16) (DEFRA, 2018). The annualisation factor is necessary as NO_2 concentrations vary across the year and this should be accounted for within the baseline monitoring. This factor was calculated using 2021 EPA published annual and period averages, from Zone C locations, with more than 90% data coverage. (Dundalk, Kilkenny, Limerick, Navan, Portlaoise, Waterford). It should be noted that while this data is ratified by the EPA, it is not yet ratified by the EU for use and therefore some caution is needed with the use of this factor until ratification is complete, though the factor itself is unlikely to change with no resultant variations in baseline levels.

The diffusion tubes were put in place from 19th September 2021 with samples taken monthly for October (17th), November (14th) and December (12th). The average across the three months were taken for each sample location, as included in Table 7.12.

Table 7.12: Monitoring Data from Sample Locations (adjusted for bias)

Monitor Sample		NO_2 Concentrations µg/m^3			Average Concentration (Period Mean) µg/m^3	NO_2 Annual Limit Calendar Year µg/m^3
No.	Location	Oct-21	Nov-21	Dec-21		
M1	Millenium Bridge	11.8	13.3	16.6	13.9	40
M2	Salmon Weir	8.3	9.2	11.5	9.7	40
M3	Dublin Road	8.0	9.5	13.0	10.2	40
M4	Tuam Road	14.4	15.5	15.7	15.2	40
M5	Newcastle Road Lower	21.6	15.4	15.2	17.4	40
M6	The Crescent	9.2	10.9	12.2	10.8	40
M7	Presentation Road	6.9	8.1	11.6	8.9	40
M8	University Road	15.1	15.3	15.8	15.4	40
M9	Francis Street	22.2	23.7	22.3	22.7	40
M10	Eglington Street	10.5	11.5	13.9	12.0	40
M11	Forester Street	15.9	18.0	20.4	18.1	40
M12	College Road	8.7	10.2	12.3	10.4	40
M13	Lough Atalia College Road	13.8	14.2	18.5	15.5	40
M14	Lough Atalia Fairgreen	9.7	12.0	13.9	11.9	40
M15	Fairgreen Road	13.2	13.6	16.8	14.5	40

Table 7.13: Calculation of the Annualization Factor Based on the EPA Data for the Annual and Period Means for Zone C Locations

Parameter	Abbrev.	NO_2 Concentration (µg/m^3)					
		Dundalk	Kilkenny	Limerick	Navan	Portlaoise	Waterford
Annual Mean (2021) for Zone C (Dundalk, Kilkenny, Limerick, Navan, Portlaoise and Waterford)	AM	14.2	5.11	13.3	38.1	11.1	8.0
Period mean for 19/09/21 to 12/12/21 (Dundalk, Kilkenny, Limerick, Navan, Portlaoise and Waterford)	PM	11.8	3.70	10.3	21.1	9.37	7.89
Ratio of AM/PM	R	1.19	1.38	1.29	1.81	1.18	1.02
Average of R (Annualised Factor)	RA	1.31					

Table 7.14 includes the results of adjusted annual mean for the monitoring locations with the annualization factor applied.

Table 7.14: Annualised Monitoring Data Relative to the AQS Limit

No.	Monitor Sample	Period Mean x Annualised Factor RA from Table 7.12 (µg/m^3)	AQS Annual Average Limit Value (µg/m^3)
M1	Millenium Bridge	18.2	40
M2	Salmon Weir	12.7	40
M3	Dublin Road	13.4	40
M4	Tuam Road	19.9	40
M5	Newcastle Road Lower	22.8	40
M6	The Crescent	10.8	40
M7	Presentation Road	14.1	40
M8	University Road	20.2	40
M9	Francis Street	29.7	40
M10	Eglington Street	15.7	40
M11	Forester Street	23.7	40
M12	College Road	13.6	40
M13	Lough Atalia College Road	20.3	40
M14	Lough Atalia Fairgreen	15.6	40
M15	Fairgreen Road	18.9	40

The annualised background concentrations are well within the air quality standards for NO_2 at all locations.

7.3.3 EPA Data

As outlined in Section 7.3.1, the Proposed Scheme is located within Zone C. The continuous monitoring data from EPA monitoring stations in Zone C was reviewed Table 7.15 presents a three-year average of background pollutant concentration values for NO_2, $PM_{2.5}$ and PM_{10}. The EPA monitoring reports state that the NOx annual mean limit value for the protection of vegetation only applies to Zone D. Background levels from 2018, 2019 and 2020 air quality monitoring of NO_2, $PM_{2.5}$ and PM_{10} in Zone C provided by the EPA are presented in Table 7.15.

Table 7.15: Annual Mean Background Pollutant Concentrations for Zone C

Year	Annual Average NO_2 (µg/m^3)	Annual Average PM_{10} (µg/m^3)	Annual Average $PM_{2.5}$ (µg/m^3)
Limit	**40 µg/m^3**	**40 µg/m^3**	**25 µg/m^3**
2018	10.3	14.00	8.25
2019	12.0	16.3	12.2

Year	Annual Average NO_2 (µg/m³)	Annual Average PM_{10} (µg/m³)	Annual Average $PM_{2.5}$ (µg/m³)
Limit	**40 µg/m³**	**40 µg/m³**	**25 µg/m³**
2020	11.4	14.4	9.5
Average	11.2	14.9	10.0

The background concentrations are well within the air quality standards for all pollutants.

7.3.4 Model Verification

Model verification used the following diffusion tube monitoring sites:

- Millennium Bridge;
- Dublin Road;
- Tuam Road;
- Newcastle Road Lower;
- Presentation Road;
- University Road;
- Forester Street;
- College Road;
- Lough Atalia College Road;
- Lough Atalia Fairgreen; and
- Fairgreen Road

These are roadside sites on the modelled road network. Other monitoring sites were not included in the model verification as they were either too far from the proposed development site, not located on the modelled road network or the substantial over-prediction concentrations at some locations.

Monitoring results for the above-mentioned locations were obtained from a site specific monitoring surveys, outlined in Section 7.3.2. The annualised results have been assumed to be representative of the baseline and they were compared with modelled concentrations at the same locations. The model verification was undertaken following the methodology described in LAQM.TG16[3]. The model both over and under-predicted concentrations at the verification sites.

A comparison of monitored and modelled annual mean NO_2 concentrations for 2019 is shown in Table 7.16.

The percentage difference between the monitored and modelled results before adjustment is between -23.9% and 21.3%, which is with the recommended

guideline stated in Defra's LAQM.TG16[3] of ±25%. As such, model results were not adjusted.

Table 7.16: Comparison of Modelled and Monitored Annual Mean NO_2 Concentrations

Site ID	Site type	Background NO_2 concentration ($\mu g/m^3$)	Monitored NO_2 concentration ($\mu g/m^3$)	Modelled NO_2 concentration ($\mu g/m^3$)	% Difference (modelled - monitored)/ monitored
Millennium Bridge	Roadside	12	18.2	18.9	3.8
Dublin Road			13.4	16.2	21
Tuam Road			19.9	20.3	1.9
Newcastle Road Lower			22.8	18.8	-17.6
Presentation Road			14.1	14.0	-0.8
University Road			20.2	17.3	-14.2
Forester Street			23.7	18.0	-23.9
College Road			13.6	16.5	21.3
Lough Atalia College Road			20.3	17.5	-13.6
Lough Atalia Fairgreen			15.6	16.2	3.7
Fairgreen Road			18.9	15.2	-20

7.3.5 Baseline Modelling Scenario

In the Existing Baseline Scenario, the current air quality environment experienced within the study area has been modelled. The Existing Baseline modelling scenario has been modelled using ADMS-Roads for the representative baseline year of 2019, to establish baseline concentrations at receptors within the Proposed Scheme study area.

Predicted annual mean concentrations of NO_2 at selected most impacted existing air quality sensitive receptors in the 2019 Existing Baseline scenario are listed in

[3] Defra (2016) Local Air Quality Management Technical Guidance. TG(16)

Table 7.17. Locations of these receptors are shown in Figure 7.2, Volume 3 of this EIAR.

Table 7.17: Existing Baseline Scenario Pollutant Statistics at Most Impacted Receptor Locations

Existing Baseline (2019)					
Receptor	**Receptor Location (ITM) (m)**		**Annual Mean Concentration (µg/m^3)**		
	X	**Y**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
R113	530919.6	726063.2	18.7	17.2	12.7
R89	530168.9	725010	18.0	17.1	12.7
R111	530978.1	726091.6	19.4	17.4	12.8
R109	530414.5	725303.9	16.8	17.0	12.6
R84	529712.2	724979.5	34.5	19.1	13.9
R76	529978	725112.9	21.3	17.5	12.9
R108	530280.2	725396.7	14.3	16.6	12.4
R7	529038.5	726082.8	19.9	17.2	12.8
R80	529873.2	725072.2	22.1	17.1	13.0
R96	529812.9	725494.8	15.3	17.4	12.4
R6	529084.1	725989.5	17.3	17.0	12.6
R85	529779.5	724950.1	15.6	19.1	12.5
R43	529234.8	725301.9	13.6	17.5	12.3
R10	528936.1	726311	24.5	16.6	13.3
R38	529135.7	725305.3	17.1	17.3	12.6
R44	529347.1	725229.5	14.2	17.7	12.4
R79	529934.7	725142.9	18.3	16.7	12.7
R15	528727.4	725985.7	18.8	17.0	12.8
R37	529087.5	725421.3	16.9	16.7	12.6
R5	529062.6	725763.3	17.7	16.5	12.6
R18	528629.9	725964.5	17.1	18.1	12.6
R78	529940	725149.3	17.8	17.0	12.6
R8	529016.3	726146.6	18.2	16.6	12.7
R14	528690	726040.9	18.8	17.1	12.8
R36	529101.6	725445	16.6	17.2	12.6
R94	530121.9	725387.8	19.5	17.0	12.8
R13	529044.6	726135.7	18.2	17.0	12.7
R39	529123.8	725209.3	20.5	17.0	12.9
R9	528992.5	726186.3	16.8	17.0	12.6
R35	529059	725561.4	15.2	17.1	12.5
R30	528308.6	725326.1	16.7	17.3	12.7
R97	529872.3	725524.5	14.2	17.0	12.4
R110	530524.1	725486.4	14.7	17.3	12.5

Existing Baseline (2019)					
Receptor	**Receptor Location (ITM) (m)**		**Annual Mean Concentration (µg/m³)**		
	X	**Y**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
R17	528637.5	726026.6	17.5	17.1	12.7
R75	530028.1	725173.7	16.3	17.5	12.5
R42	529215.1	725106.4	14.7	17.0	12.4
R41	529134	725172.2	15.8	16.8	12.5
R34	528080.1	725733	14.5	17.1	12.4
R146	531544.5	726021.2	16.5	16.6	12.6
R81	529773.2	724977.2	16.2	16.7	12.5
R31	528419.7	725280.4	16.0	17.1	12.6
R24	528196.3	726085	13.9	16.8	12.4
R138	532088.7	725860.3	15.6	16.6	12.5
R98	529994.8	725587.8	14.4	16.8	12.4
R145	531854.1	725888.1	15.1	16.6	12.5
R143	530882.8	726257.3	15.8	17.0	12.6
R144	530990.8	726278	17.6	16.8	12.7
R16	528536.2	726298	16.2	16.9	12.6
R87	529770.6	724951.7	16.0	16.6	12.5
R25	528076.9	725803.2	13.7	16.8	12.3
R63	529727.3	725377.6	14.6	16.6	12.4
R129	531205.2	726741.3	15.2	16.8	12.5
R141	531760.6	726687.1	14.8	16.7	12.4
R130	531471.8	726871.9	15.3	16.9	12.6
R62	529722.2	725397.8	18.3	17.1	12.7
R82	529619.9	724966.8	24.8	18.1	13.3
R77	530058.5	725266.2	15.3	16.7	12.5
R142	531815.6	726984.3	15.9	16.9	12.5
R65	529781.8	725462.3	16.5	16.8	12.5
R74	530077.3	725233.9	15.3	16.7	12.5
R71	530033.6	725303.9	15.2	16.7	12.4
R73	530064.4	725270.7	15.5	16.8	12.5
R112	531021.8	726174.4	19.2	17.5	12.9
R115	530518.8	725638.8	14.8	16.7	12.4
R66	529886.8	725376.8	15.9	16.7	12.5
R2	529372.3	725591.9	18.3	17.3	12.8
R3	529262.8	725625.7	17.3	17.2	12.7
R99	530076.2	725542.2	16.1	16.8	12.5
R64	529768.2	725329.6	17.0	16.9	12.6
R107	530233.4	725585.3	17.2	16.9	12.6

Existing Baseline (2019)					
Receptor	**Receptor Location (ITM) (m)**		**Annual Mean Concentration (µg/m³)**		
	X	**Y**	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
R67	529911.5	725415.9	16.2	16.8	12.5
R61	529659.2	725665.0	15.2	16.7	12.4
R105	529879.9	725756.3	18.2	17.1	12.7
R12	529491.5	725117.0	17.0	16.9	12.6
R11	529444.4	725294.3	15.5	16.7	12.5
R46	529476.3	725014.9	18.6	17.1	12.7
R59	529697.3	725575.1	23.6	17.4	12.9
R93	529767.4	725318.1	19.5	17.2	12.8
R72	530106.5	725371.1	17.0	16.9	12.6
R102	529760.1	725611.1	18.3	17.1	12.7
R45	529498.9	725074.3	19.5	17.2	12.8
R69	530036.8	725479.0	17.0	16.9	12.5
R68	530031.6	725488.2	17.1	16.9	12.6
R95	529779.3	725469.5	18.6	17.1	12.7
R106	529931.9	725810.8	20.1	17.4	12.8
R104	529883.1	725729.3	18.9	17.2	12.7
R1	529457.3	725584.9	18.0	17.2	12.7
R57	529610.2	725600.1	16.8	16.9	12.6
R100	530132.1	725629.1	21.6	17.5	12.9
R117	530258.9	725516.8	22.7	17.6	13.0
R116	530333.6	725505.9	19.5	17.3	12.8
Air Quality Limit Value Objective			**40**	**40**	**25**

In the 2019 Existing Baseline scenario, annual mean concentrations of NO_2 are below the relevant national air quality limit value objective at all modelled receptors. Annual mean NO_2 concentrations did not exceed 20µg/m^3, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur. Annual mean PM_{10} concentrations are below the relevant national air quality limit value objective in 2019 for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration indicated that there is likely to be no exceedances of the 50mg/m^3 ambient limit value compared to the threshold which allows 35 daily exceedances in any one calendar year. Annual mean $PM_{2.5}$ concentrations are also below the relevant national air quality limit value objective for all modelled receptors. Therefore, as PM is in line with statutory limits it can be screened out of further assessment, in line with the LA 105 Air Quality guidance outlined in Section 7.2.5.2.

7.4 Potential Impacts

7.4.1 Characteristics of the Proposed Scheme

In the context of the Proposed Scheme, the potential air quality impact on the surrounding environment must be considered for two distinct stages:

- Construction Phase; and
- Operational Phase

7.4.2 Construction Phase

The Construction Phase of the Proposed Scheme will involve predominately utility diversions, road widening works, road excavation works (where required), road and junction reconfiguration and resurfacing works, public realm improvements including landscaping, pavement works including bus lanes, cycle tracks, bus terminals, and movement of machinery and materials along the Proposed Scheme.

7.4.2.1 Construction Dust

Chapter 4 **(**Proposed Scheme Description) provides a description of the proposed development with Chapter 5 **(**Construction) providing details of the proposed construction strategy for the proposed development.

Dust emissions are likely to arise from the following activities:

- Site clearance;
- Utility diversions;
- Earthworks;
- Stockpiling of excavated materials;
- Use of the on-site crusher for processing materials for recycling/reuse;
- Handling of construction materials; and
- Construction traffic movements.

Where possible, excavated material will be reused and quantities of waste minimised, as outlined in Chapter 17 (Waste & Resources) of this EIAR.

Dust Emission Magnitude

Following the methodology outlined in Section 7.2.5.3 each dust generating activity has been assigned a dust emission magnitude as shown in Table 7.18, in accordance with Table 7.6. As outlined in Section 7.2.5.3 the IAQM guidance was used to assess the potential air quality impacts on sensitive receptors during the construction phase.

Table 7.18: Dust Emission Magnitude for Construction Activities

Activity	Dust emission magnitude	Reasoning
Demolition	Small	Demolition activities <10m above ground
Earthworks	Large	Total site area >10,000 m^2
Construction	Medium	Potentially dusty construction material
Trackout	Small	<10 HDV (>3.5t) outward movements in any one day

Sensitivity of the Area

The sensitivity of the area to dust soiling has been assigned as *high*, due to the number of sensitive receptors within proximity of dust generating activities.

The sensitivity of the area to human health has been assigned as *low* as the background PM_{10} concentration is less than the lower value of 24µg/m^3 outlined in Table 3 of the IAQM Guidance.

The overall sensitivity has been summarised as shown in Table 7.19.

Table 7.19: Sensitivity of the Area

Potential Impact	Sensitivity
Human Health	Low
Dust Soiling	High
Ecological	Medium

Risk of Impacts

Taking into consideration the dust emission magnitude and the sensitivity of the area, the risk of dust impacts is presented in Table 7.20.

Table 7.20: Risk of Dust Impacts

Potential Impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Human Health	Negligible	Low	Low	Negligible
Dust Soiling	Medium	High	Medium	Low
Ecological	Low	Medium	Medium	Negligible

Overall, the site has been classified as *high risk* for earthworks, *medium risk* for demolition and construction, and *low risk* for trackout, without mitigation as summarised in Table 7.21.

Table 7.21: Result of Dust Assessment Prior to Mitigation

Activity	Dust risk prior to mitigation
Demolition	Medium
Earthworks	High

Activity	Dust risk prior to mitigation
Demolition	Medium
Construction	Medium
Track-out	Low

There are a number of sensitive receptors located close to the proposed works, as described in Section 7.2.2.2, therefore, there is potential for air quality effects arising from dust during construction activities. The impact risk is assigned a worst-case risk, as shown in Table 7.19, prior to the implementation of mitigation measures. In accordance with IAQM guidance, the significance of effects is determined after the application of mitigation measures. Specific mitigation is described in Section 7.5.

7.4.2.2 Construction Traffic

As outlined in Chapter 6 (Traffic and Transport) (Section 6.5.6.2), a maximum of 2-3 HGVs in the AM and PM hours are likely to be generated during the construction phase. In accordance with the methodology outlined in Section 7.2.5, as there is no projected increase in traffic volumes above 10% during the construction phase, no further assessment is required. Furthermore, there are no significant effects expected to regional emissions or from nitrogen deposition during the construction phase. Any potential significant impacts associated with the diversion of traffic is considered under the operational phase assessment.

7.4.3 Operational Phase

The redistribution of traffic during the operational phase of the proposed road development has the potential to generate air quality impacts at sensitive receptors[4] thus has been assessed with ADMS modelling as outlined Section 7.2.5. The effects of operational traffic to regional air quality and ecological receptors are also considered.

7.4.3.1 'Do-Minimum' Scenario

The Do Minimum (DM) is a defined scenario within the traffic modelling exercise in Chapter 6 (Traffic and Transport). The output of this analysis and its impact on air quality has been modelled using AMDS-Roads for the opening year of 2023. Predicted annual mean concentrations of NO_2, at selected most impacted existing air quality sensitive receptors in the 2023 DM scenario are listed in Table 7.22. Locations of these receptors are shown in Figure 7.2 in Volume 3 of this EIAR. The full list of modelled receptors can be found in Appendix 7.2 (Volume 4 of this EIAR).

[4] Sensitive receptor locations include: residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present (TII, Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, 2011)

Table 7.22: Predicted 2023 Do Minimum Scenario Pollutant Statistics at Most Impacted Receptor Locations

DM (2023)			
Receptor	**Receptor Location (ITM) (m)**		**Annual Mean Concentration (µg/m^3)**
	x	**y**	**NO_2**
R113	530919.6	726063.2	19.4
R89	530168.9	725010.0	17.3
R111	530978.1	726091.6	19.4
R109	530414.5	725303.9	16.5
R84	529712.2	724979.5	30.5
R76	529978.0	725112.9	20.1
R108	530280.2	725396.7	14.4
R7	529038.5	726082.8	17.9
R80	529873.2	725072.2	20.2
R96	529812.9	725494.8	15.4
R6	529084.1	725989.5	16.1
R85	529779.5	724950.1	15.0
R43	529234.8	725301.9	13.6
R10	528936.1	726311.0	22.4
R38	529135.7	725305.3	17.1
R44	529347.1	725229.5	14.1
R79	529934.7	725142.9	17.2
R15	528727.4	725985.7	18.1
R37	529087.5	725421.3	16.7
R5	529062.6	725763.3	20.9
R18	528629.9	725964.5	16.8
R78	529940.0	725149.3	16.8
R8	529016.3	726146.6	16.9
R14	528690.0	726040.9	18.0
R36	529101.6	725445.0	16.3
R94	530121.9	725387.8	19.8
R13	529044.6	726135.7	16.9
R39	529123.8	725209.3	20.6
R9	528992.5	726186.3	15.8
R35	529059.0	725561.4	15.0
R30	528308.6	725326.1	15.9
R97	529872.3	725524.5	14.3
R110	530524.1	725486.4	14.5
R17	528637.5	726026.6	16.9
R75	530028.1	725173.7	15.7
R42	529215.1	725106.4	14.3

DM (2023)			
Receptor	**Receptor Location (ITM) (m)**		**Annual Mean Concentration (µg/m^3)**
	x	**y**	**NO_2**
R41	529134.0	725172.2	15.7
R34	528080.1	725733.0	15.1
R146	531544.5	726021.2	16.0
R81	529773.2	724977.2	15.5
R31	528419.7	725280.4	15.2
R24	528196.3	726085.0	13.9
R138	532088.7	725860.3	15.3
R98	529994.8	725587.8	14.5
R145	531854.1	725888.1	14.7
R143	530882.8	726257.3	15.3
R144	530990.8	726278.0	17.1
R16	528536.2	726298.0	15.9
R87	529770.6	724951.7	15.3
R25	528076.9	725803.2	13.7
R63	529727.3	725377.6	14.3
R129	531205.2	726741.3	14.8
R141	531760.6	726687.1	14.7
R130	531471.8	726871.9	14.8
R62	529722.2	725397.8	17.5
R82	529619.9	724966.8	22.4
R77	530058.5	725266.2	15.0
R142	531815.6	726984.4	15.4
R65	529781.8	725462.3	16.8
R74	530077.3	725234.0	15.0
R71	530033.6	725303.9	14.9
R73	530064.4	725270.7	15.1
R112	531021.8	726174.4	19.1
R115	530518.8	725638.8	15.3
R66	529886.8	725376.8	16.3
R2	529372.3	725592.0	18.6
R3	529262.8	725625.7	17.6
R99	530076.2	725542.2	16.4
R64	529768.1	725329.6	16.2
R107	530233.4	725585.3	17.5
R67	529911.5	725415.9	16.8
R61	529659.2	725665.0	14.8
R105	529879.9	725756.3	17.7
R12	529491.5	725117.0	16.4

DM (2023)			
Receptor	**Receptor Location (ITM) (m)**		**Annual Mean Concentration (µg/m^3)**
	x	**y**	**NO_2**
R11	529444.4	725294.3	15.1
R46	529476.3	725014.9	17.6
R59	529697.3	725575.1	25.5
R93	529767.4	725318.1	18.2
R72	530106.5	725371.1	17.1
R102	529760.1	725611.1	18.0
R45	529498.9	725074.3	18.4
R69	530036.8	725479.0	18.1
R68	530031.6	725488.2	18.2
R95	529779.3	725469.5	18.5
R106	529932.0	725810.8	19.5
R104	529883.1	725729.3	18.4
R1	529457.3	725584.9	18.5
R57	529610.2	725600.1	17.0
R100	530132.1	725629.1	21.3
R117	530259.0	725516.8	24.3
Air Quality Limit Value			**40.0**

In the 2023 DM scenario annual mean concentrations of NO_2 are below the relevant national air quality limit value objective for all modelled receptors. Concentrations at all modelled receptors can be found in Appendix 7.2 (Detailed Modelling Results) in Volume 4 of this EIAR. Annual mean NO_2 concentrations did not exceed 20µg/m3, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur.

7.4.3.2 'Do Something' Scenario

The Do Something (DS) is a defined scenario within the traffic modelling exercise in Chapter 6 (Traffic and Transport). The output of this analysis and its impact on air quality has been modelled using AMDS-Roads for the opening year of 2023 in line with the methodology set out in Section 7.2.5. Predicted annual mean concentrations of NO_2 at selected most impacted existing air quality sensitive receptors in the 2023 DS scenario are listed in Table 7.23.

Locations of these receptors are shown in Figure 7.2 in Volume 3 of this EIAR. The full list of modelled receptors can be found in Appendix 7.2 (Volume 4 of this EIAR).

Table 7.23: Predicted 2023 Do Something Scenario Pollutant Statistics at Most Impacted Receptor Locations

DS (2023)			
Receptor	**Receptor Location (ITM) (m)**		**Annual Mean Concentration (µg/m^3)**
	x	**y**	**NO_2**
R113	530919.6	726063.2	23.8
R89	530168.9	725010	21.6
R111	530978.1	726091.6	23.5
R109	530414.5	725303.9	20.3
R84	529712.2	724979.5	33.9
R76	529978	725112.9	22.5
R108	530280.2	725396.7	16.7
R7	529038.5	726082.8	20.1
R80	529873.2	725072.2	22.3
R96	529812.9	725494.8	17.2
R6	529084.1	725989.5	17.6
R85	529779.5	724950.1	16.5
R43	529234.8	725301.9	15.0
R10	528936.1	726311	23.9
R38	529135.7	725305.3	18.4
R44	529347.1	725229.5	15.5
R79	529934.7	725142.9	18.6
R15	528727.4	725985.7	19.4
R37	529087.5	725421.3	18.0
R5	529062.6	725763.3	22.2
R18	528629.9	725964.5	18.0
R78	529940	725149.3	18.0
R8	529016.3	726146.6	18.1
R14	528690	726040.9	19.2
R36	529101.6	725445	17.5
R94	530121.9	725387.8	20.9
R13	529044.6	726135.7	18.0
R39	529123.8	725209.3	21.6
R9	528992.5	726186.3	16.7
R35	529059	725561.4	15.9
R30	528308.6	725326.1	16.6
R97	529872.3	725524.5	15.0
R110	530524.1	725486.4	15.2
R17	528637.5	726026.6	17.6
R75	530028.1	725173.7	16.4

DS (2023)			
Receptor	**Receptor Location (ITM) (m)**		**Annual Mean Concentration (µg/m³)**
	x	**y**	**NO_2**
R42	529215.1	725106.4	14.8
R41	529134	725172.2	16.2
R34	528080.1	725733	15.6
R146	531544.5	726021.2	16.5
R81	529773.2	724977.2	16.0
R31	528419.7	725280.4	15.6
R24	528196.3	726085	14.3
R138	532088.7	725860.3	15.6
R98	529994.8	725587.8	14.9
R145	531854.1	725888.1	15.1
R143	530882.8	726257.3	15.7
R144	530990.8	726278	17.4
R16	528536.2	726298	16.2
R87	529770.6	724951.7	15.6
R25	528076.9	725803.2	14.0
R63	529727.3	725377.6	14.0
R129	531205.2	726741.3	14.4
R141	531760.6	726687.1	14.3
R130	531471.7	726871.9	14.4
R62	529722.2	725397.8	17.0
R82	529619.9	724966.8	21.9
R77	530058.5	725266.2	14.5
R142	531815.6	726984.3	14.9
R65	529781.8	725462.3	16.3
R74	530077.3	725234.0	14.5
R71	530033.6	725303.9	14.3
R73	530064.5	725270.7	14.6
R112	531021.7	726174.4	18.5
R115	530518.8	725638.8	14.6
R66	529886.8	725376.8	15.5
R2	529372.3	725591.9	17.8
R3	529262.8	725625.6	16.8
R99	530076.2	725542.2	15.6
R64	529768.1	725329.5	15.4
R107	530233.4	725585.3	16.5
R67	529911.5	725415.9	15.7
R61	529659.2	725665.0	13.7

DS (2023)			
Receptor	**Receptor Location (ITM) (m)**		**Annual Mean Concentration (µg/m³)**
	x	**y**	**NO_2**
R105	529879.9	725756.3	16.4
R12	529491.4	725116.9	15.1
R11	529444.4	725294.3	13.7
R46	529476.3	725014.8	16.3
R59	529697.3	725575.1	24.1
R93	529767.4	725318.1	16.8
R72	530106.5	725371.1	15.7
R102	529760.1	725611.1	16.3
R45	529498.9	725074.	16.4
R69	530036.8	725479.0	16.0
R68	530031.6	725488.2	16.0
R95	529779.3	725469.5	16.2
R106	529931.9	725810.8	17.2
R104	529883.1	725729.3	15.9
R1	529457.3	725584.9	15.9
R57	529610.2	725600.1	14.4
R100	530132.1	725629.1	18.6
R117	530258.9	725516.7	20.3
Air Quality Limit Value			**40**

In the 2023 DS scenario annual mean concentrations of NO_2 are below the relevant national air quality limit value objective at all modelled receptors, which is no change from the DM scenario. Concentrations at all modelled receptors can be found in Appendix 7.2 (Detailed Modelling Results) in Volume 4 of this EIAR. Annual mean NO_2 concentrations did not exceed 25µg/m³, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur.

7.4.3.3 Comparison of 'Do-Minimum' and 'Do Something' Scenarios

Table 7.24 provides the predicted change in and impact on pollutant concentrations, between the DM and DS in 2023. Statistics for the full list of modelled receptors can be found in Appendix 7.2 (Detailed Modelling Results) in Volume 4 of this EIAR.

Table 7.24: Predicted Changes in Operational DM and DS and Impact Significance Criteria at Most Impacted Receptor Locations

Difference (2023)				
Receptor	**Receptor Location (ITM) (m)**		**Difference in Annual Mean Conc. (µg/m^3)**	**Impact on Annual Mean Concentration**
	x	**y**	**NO_2**	**NO_2**
R113	530919.6	726063.2	4.37	Slight Adverse
R89	530168.9	725010	4.3	Slight Adverse
R111	530978.1	726091.6	4.13	Slight Adverse
R109	530414.5	725303.9	3.74	Negligible
R84	529712.2	724979.5	3.35	Negligible
R76	529978	725112.9	2.43	Negligible
R108	530280.2	725396.7	2.3	Negligible
R7	529038.5	726082.8	2.18	Negligible
R80	529873.2	725072.2	2.1	Negligible
R96	529812.9	725494.8	1.81	Negligible
R6	529084.1	725989.5	1.55	Negligible
R85	529779.5	724950.1	1.5	Negligible
R43	529234.8	725301.9	1.47	Negligible
R10	528936.1	726311	1.42	Negligible
R38	529135.7	725305.3	1.34	Negligible
R44	529347.1	725229.5	1.34	Negligible
R79	529934.7	725142.9	1.32	Negligible
R15	528727.4	725985.7	1.27	Negligible
R37	529087.5	725421.3	1.27	Negligible
R5	529062.6	725763.3	1.26	Negligible
R18	528629.9	725964.5	1.21	Negligible
R78	529940	725149.3	1.19	Negligible
R8	529016.3	726146.6	1.17	Negligible
R14	528690	726040.9	1.17	Negligible
R36	529101.6	725445	1.16	Negligible
R94	530121.9	725387.8	1.11	Negligible
R13	529044.6	726135.7	1.1	Negligible
R39	529123.8	725209.3	1.06	Negligible
R9	528992.5	726186.3	0.9	Negligible
R35	529059	725561.4	0.87	Negligible
R30	528308.6	725326.1	0.74	Negligible
R97	529872.3	725524.5	0.67	Negligible
R110	530524.1	725486.4	0.67	Negligible
R17	528637.5	726026.6	0.66	Negligible
R75	530028.1	725173.7	0.63	Negligible

Difference (2023)				
Receptor	**Receptor Location (ITM) (m)**		**Difference in Annual Mean Conc. (µg/m^3)**	**Impact on Annual Mean Concentration**
	x	**y**	**NO_2**	**NO_2**
R42	529215.1	725106.4	0.55	Negligible
R41	529134	725172.2	0.52	Negligible
R34	528080.1	725733	0.52	Negligible
R146	531544.5	726021.2	0.52	Negligible
R81	529773.2	724977.2	0.49	Negligible
R31	528419.7	725280.4	0.45	Negligible
R24	528196.3	726085	0.4	Negligible
R138	532088.7	725860.3	0.39	Negligible
R98	529994.8	725587.8	0.36	Negligible
R145	531854.1	725888.1	0.36	Negligible
R143	530882.8	726257.3	0.34	Negligible
R144	530990.8	726278	0.32	Negligible
R16	528536.2	726298	0.31	Negligible
R87	529770.6	724951.7	0.31	Negligible
R25	528076.9	725803.2	0.3	Negligible
R63	529727.3	725377.6	-0.31	Negligible
R129	531205.2	726741.3	-0.35	Negligible
R141	531760.6	726687.1	-0.38	Negligible
R130	531471.8	726871.9	-0.39	Negligible
R62	529722.2	725397.8	-0.41	Negligible
R82	529619.9	724966.8	-0.45	Negligible
R77	530058.5	725266.2	-0.45	Negligible
R142	531815.6	726984.4	-0.48	Negligible
R65	529781.8	725462.3	-0.5	Negligible
R74	530077.3	725234	-0.5	Negligible
R71	530033.6	725303.9	-0.55	Negligible
R73	530064.4	725270.7	-0.59	Negligible
R112	531021.8	726174.4	-0.59	Negligible
R115	530518.8	725638.8	-0.72	Negligible
R66	529886.8	725376.8	-0.77	Negligible
R2	529372.3	725592	-0.78	Negligible
R3	529262.8	725625.7	-0.81	Negligible
R99	530076.2	725542.2	-0.84	Negligible
R64	529768.1	725329.6	-0.86	Negligible
R107	530233.4	725585.3	-1.02	Negligible
R67	529911.5	725415.9	-1.09	Negligible
R61	529659.2	725665	-1.12	Negligible

Difference (2023)				
Receptor	**Receptor Location (ITM) (m)**		**Difference in Annual Mean Conc. (µg/m^3)**	**Impact on Annual Mean Concentration**
	x	**y**	**NO_2**	**NO_2**
R105	529879.9	725756.3	-1.37	Negligible
R12	529491.5	725117	-1.37	Negligible
R11	529444.4	725294.3	-1.38	Negligible
R46	529476.3	725014.9	-1.38	Negligible
R59	529697.3	725575.1	-1.4	Negligible
R93	529767.4	725318.1	-1.41	Negligible
R72	530106.5	725371.1	-1.44	Negligible
R102	529760.1	725611.1	-1.66	Negligible
R45	529498.9	725074.3	-2	Negligible
R69	530036.8	725479	-2.15	Negligible
R68	530031.6	725488.2	-2.19	Negligible
R95	529779.3	725469.5	-2.26	Negligible
R106	529932	725810.8	-2.33	Negligible
R104	529883.1	725729.3	-2.53	Negligible
R1	529457.3	725584.9	-2.56	Negligible
R57	529610.2	725600.1	-2.62	Negligible
R100	530132.1	725629.1	-2.71	Negligible
R117	530259	725516.8	-3.95	Negligible
R116	530333.6	725505.9	-4.1	Slight Beneficial
Air Quality Standard			**40**	

The significance of the changes in the concentration of each of the ambient receptors has been determined in the context of the TII significance criteria (TII 2011). As shown in Table 7.24 the majority of modelled receptors are estimated to experience a negligible impact due to the Proposed Scheme in terms of the annual mean NO_2 concentration. A slightly beneficial impact is estimated at one receptor and a slight adverse impact is expected at three receptors, refer to Table 7.24.

In accordance with the EPA Guidelines (EPA 2022) the impacts associated with the operational phase traffic emissions pre-mitigation are overall neutral and long-term.

7.4.3.4 Ecological

An assessment of the impact of the Proposed Scheme has been undertaken using the approach outlined in the IAQM guidance document A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1) (IAQM 2020). An assessment of the ecologically sensitive sites listed in Section 7.2.5.5 has been carried out.

As outlined in Section 7.2.5.5, there are three ecologically designated sites which are within 2km of the boundary of the Proposed Scheme, namely Galway Bay Complex SAC and pNHA (Site Code 000268), Lough Corrib SAC (Site Code 000297) and Inner Galway Bay SPA (Site Code 004031).

However, the predicted annual mean NO_2 concentrations at Galway Bay Complex SAC and Inner Galway Bay SPA are lower in the 2023 Do Something scenario in comparison to the 2023 Do Minimum for all locations modelled. This is due to a decrease in traffic along Grattan Road and the Seapoint Promenade when the Proposed Scheme is operational. As such, these designated sites are predicted to experience beneficial impacts due to the Proposed Scheme, therefore, further assessment at these sites will not be required. The model results of Galway Bay Complex SAC and Inner Galway Bay SPA are presented in Appendix 7.2 (Detailed Modelling Results) in Volume 4 of this EIAR).

Nitrogen deposition levels have been compared to the relevant critical loads for the Lough Corrib SAC (Site Code 00297) in Table 7.25, for the worst-case ecologically sensitive receptors. The ground level concentrations are assessed at the closest locations within the ecological site to the nearest road. The dry nitrogen deposition results are included for the highest maximum ground level concentration and the highest concentration contribution. The full modelling results of Lough Corrib SAC are presented in Appendix 7.2 (Detailed Modelling Results in Volume 4 of this EIAR).

Table 7.25: Predicted Dry Deposition Results at Closest Point within Ecological Sites to Road

Parameter (Annual Mean)	Predicted Ground Level Concentration (including background) µg/m3	Deposition velocity (m/s)	Dry deposition flux (µg m2/s)	Dry deposition flux conversion factors (kg N / ha / yr)	Result (kg N / ha / yr)	Limit-critical load (kg N/ha/yr)
Lough Corrib SAC						
Maximum predicted ground level concentration						
Do-Minimum NO_2	14.82	0.003	0.044	96	4.3	5-10
Do-Something NO_2	14.34	0.003	0.043	96	4.1	5-10
Difference between Do-Something and Do-Minimum					-0.5	
Change relative to lower critical load (%)					-10%	
Maximum predicted ground level concentration due to Proposed Scheme						
Do-Minimum NO_2	12.94	0.003	0.039	96	3.7	5-10
Do-Something NO_2	13.08	0.003	0.039	96	3.8	5-10
Difference between Do-Something and Do-Minimum					0.1	

Parameter (Annual Mean)	Predicted Ground Level Concentration (including background) µg/m3	Deposition velocity (m/s)	Dry deposition flux (µg m2/s)	Dry deposition flux conversion factors (kg N / ha / yr)	Result (kg N / ha / yr)	Limit-critical load (kg N/ha/yr)
Change relative to lower critical load (%)					2%	

The results are all lower than the Critical Loads for Nitrogen for oligotrophic waters of 5-10 KgN/ha/yr (Table A9.1: UNECE (2003) Critical Loads for Nitrogen, TII guidance).

Predicted maximum deposition of nitrogen (including background) is in compliance with the worst-case critical load at the worst-case receptor. The IAQM guidance states that where the PC is less than 70% of the long-term critical level / load, the PC is likely to be insignificant. There will therefore be no impact on ecologically sensitive sites. In accordance with the EPA Guidelines (EPA 2022) the ecological impacts associated with the operational phase traffic emissions are overall neutral and long-term.

7.4.3.5 Regional Air Quality Assessment

The potential changes in regional air emissions due to the traffic impacts of the Proposed Scheme during the operational phase has been assessed using the NTA Environmental Appraisal Tool, which is based on ENEVAL.

The latest version of the NTA Eastern Regional Model Transport model incorporates ENEVAL, as part of the Appraisal Tool, in a Geographical Information System environment. ENEVAL measures the air emissions associated with road transport based on the various road links and their corresponding emissions.

Pollutant emissions (in tonnes) produced in both the DM and DS scenarios during the opening year of the operational phase are shown in Table 7.26. The Proposed Scheme will result in minor increases in regional emission concentrations for all pollutants modelled for the opening year. However, given the low ambient air concentrations, these increases are expected to have a slight, negative, long-term impact to air quality. There is potential for the predicted emissions to be lower with potential for an increased modal shift, further decreasing car usage and thus the associated emissions.

Table 7.26: Operational Phase Regional Pollutant Emissions (Tonnes) – Opening Year 2023

	Vehicle Class	NO_X (tonnes)	NO_2 (tonnes)	PM_{10} (tonnes)	$PM_{2.5}$ (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)
DM	Car	437.5	136.1	47.2	28.4	21.3	648.5	0.478
DS		438.3	136.3	47.3	28.5	21.3	649.7	0.479
Change		0.8	0.2	0.1	0.0	0.1	1.2	0.001

	Vehicle Class	NO_X (tonnes)	NO_2 (tonnes)	PM_{10} (tonnes)	$PM_{2.5}$ (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)
% Change		0.18%	0.18%	0.12%	0.12%	0.26%	0.19%	0.26%
DM	Goods	189.7	54.2	14.9	9.1	6.1	30.3	0.039
DS		192.0	54.9	15.0	9.1	6.2	30.8	0.040
Change		2.3	0.6	0.1	0.1	0.1	0.5	0.001
% Change		1.22%	1.15%	0.66%	0.73%	1.10%	1.67%	2.95%
DM	Urban Bus	13.5	1.4	1.2	0.7	0.4	2.2	0
DS		13.8	1.4	1.2	0.7	0.4	2.2	0
Change		0.3	0.0	0.0	0.0	0.0	0.0	0
% Change		2.14%	2.14%	-0.14%	-0.11%	0.02%	0.87%	0.00%
DM	Total	640.7	191.7	63.3	38.2	27.8	680.9	0.517
DS		644.1	192.6	63.5	38.3	27.9	682.7	0.519
Change		3.4	0.9	0.2	0.1	0.1	1.8	0.002
% Change		0.53%	0.47%	0.24%	0.26%	0.44%	0.26%	0.47%

Pollutant emissions (in tonnes) produced in both the DM and DS scenarios during the design year of the operational phase are shown in Table 7.27. The Proposed Scheme will result in slight increases in regional emission concentrations for all pollutants modelled for the design year. This reflects the technical challenges in converting particularly the heavy goods fleet to electric vehicles, which would reduce emissions. However, given the low ambient air concentrations, these increases are expected to have a slight, negative, long-term impact to air quality. There is potential for the predicted emissions to be lower with potential for an increased modal shift, further decreasing car usage and thus the associated emissions.

Table 7.27: Operational Phase Regional Pollutant Emissions (Tonnes) – Design Year 2038

Scenario	Vehicle Class	NO_X (tonnes)	NO_2 (tonnes)	PM_{10} (tonnes)	$PM_{2.5}$ (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)
DM	Car	70.5	17.7	51.2	28.4	10.4	474	0.16
DS		70.9	17.8	51.6	28.6	10.4	475	0.16
Change		0.4	0.1	0.4	0.2	0.05	1	0
% Change		0.6	0.5	0.6	0.6	0.5	0.2	0
DM	Goods	123.6	33.1	13.12	7.23	4.01	21.9	0.023
DS		124.1	33.2	13.16	7.25	4.03	22.1	0.023
Change		0.5	0.1	0.04	0.02	0.02	0.2	0
% Change		0.4	0.4	0.31	0.31	0.7	0.9	0
DM	Urban Bus	0	0	0.99	0.53	0	0	0
DS		0	0	0.99	0.53	0	0	0

Scenario	Vehicle Class	NO_X (tonnes)	NO_2 (tonnes)	PM_{10} (tonnes)	$PM_{2.5}$ (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)
Change		0	0	0	0	0	0	0
% Change		0	0	0	0	0	0	0
DM	Total	194.2	50.8	65.4	36.2	14.36	496.3	0.18
DS		195.0	51.1	65.7	36.3	14.44	497.4	0.18
Change		0.8	0.3	0.3	0.1	0.08	1.1	0
% Change		0.45	0.45	0.5	0.5	0.56	0.21	0

In accordance with the EPA Guidelines (2022), the regional impacts associated with the operational phase traffic emissions pre-mitigation are considered overall neutral and long-term.

7.5 Mitigation and Monitoring Measures

The appropriate mitigation and monitoring measures are proposed to minimise the effects of the Proposed Scheme, as detailed below.

7.5.1 Construction Phase

7.5.1.1 Construction Phase Mitigation Measures

The following mitigation measures will be implemented for the construction phase of the proposed development, in order to reduce the dust risk associated with the construction activities.

In order to ensure that no significant dust nuisance occurs, a series of mitigation measures that are applicable to the Construction Phase of the Proposed Scheme will be implemented. In summary, the mitigation measures will include:

- Fully enclose structures with screens during demolition to minimise dust dispersion;
- Public roads outside the Proposed Scheme will be regularly inspected for cleanliness and cleaned as necessary;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays (or similar dust suppression methods) will be used as required if particularly dusty activities associated with the construction contract are necessary during dry or windy periods;
- During movement of dust-generating or potentially hazardous materials both on and off-site, trucks will be covered with tarpaulin and before entrance onto public roads, trucks will be checked to ensure the tarpaulins are properly in place; and

- The appointed contractor will provide a site hoarding of 2.4m height along boundaries where works are taking place adjacent ecological sensitive receptors (Lough Atalia and Lough Corrib) and at the Harbour Construction Compounds which will assist in minimising the potential for dust impacts off-site.

The appointed Contractor will keep the effectiveness of the mitigation measures under review and revise them as necessary. In the event of dust nuisance occurring outside the works boundary associated with the Proposed Scheme, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem.

7.5.1.2 Construction Phase Monitoring Measures

The following monitoring measures, will be implemented for the construction phase of the proposed development:

- The contractor will undertake on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to Galway City Council on request. The frequency of the inspections will be increased during site activities with a high potential to produce dust are being carried out.
- Dust monitoring will be undertaken at the three nearest sensitive receptors (with agreement from the landowner) to the works during the construction phase. The TA Luft dust deposition limit values of 350 mg/m^2/day applied as a 30-day average.

The monitoring measures are included in the Construction Environmental Management Plan (CEMP) (Appendix 5.1 of Volume 4 of this EIAR).

7.5.1.3 Summary of Construction Effects

The construction works will be short-term and temporary in nature, the impact on air quality will not be significant. When the dust minimisation measures detailed in Section 7.5.1.1 are implemented, fugitive emissions of dust from the site will be slight, negative, short-term.

7.5.2 Operational Phase

7.5.2.1 Operational Phase Mitigation and Monitoring

There are no significant effects to air quality predicted during the operational phase as all ambient air pollutants will remain in compliance with the ambient air quality standards and the scheme will have a generally neutral impact on air quality, therefore, no specific operation phase mitigation or monitoring measures are required.

7.5.2.2 Summary of Operational Effects

Table 7.28 summarises the Operational Phase impacts prior and post mitigation.

Table 7.28: Summary of Potential Operational Phase Impacts Following the Implementation of Mitigation and Monitoring Measures

Assessment Topic	Potential Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post Mitigation and Monitoring)
Construction dust emissions	-	Slight, negative, short-term
Road traffic impacts on local human receptors	Neutral, Long-term	Neutral, Long-term
Road traffic impacts on local ecological receptors	Neutral, Long-term	Neutral, Long-term
Regional air quality	Slight, Negative, Long-term	Slight, Negative, Long-term

7.6 Residual Impacts

7.6.1 Construction Phase

With the implementation of the mitigation measures outlined in Section 7.5.1, no significant adverse residual effects on air quality are predicted during the construction phase of the Proposed Scheme. Overall, it is considered that the residual effects as a result of the Proposed Scheme's construction are slight, negative and short-term.

7.6.2 Operational Phase

The air dispersion modelling assessment has found that all receptors will be in compliance with ambient air quality standards for the Do Something (and Do Minimum) scenario. There are no substantial or moderate adverse effects predicted as a result of the operational phase of the Proposed Scheme.

Therefore, it is considered that the residual effects as a result of the Proposed Scheme's operation are neutral and long-term. No significant negative residual impacts have been identified during the operation of the Proposed Scheme, whilst meeting the scheme objectives set out in Chapter 1 (Introduction).

7.7 References

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Chapter 08
Climate

Contents

8 Climate

8.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the potential climate impacts (both positive and negative) associated with the Construction and Operational Phases of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) Scheme (hereafter referred to as the Proposed Scheme).

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure in Galway city, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction) of this EIAR. The Proposed Scheme which is described in Chapter 4 (Proposed Scheme Description) of this EIAR has been designed to meet these objectives.

The Proposed Scheme will facilitate a resilient, accessible public transport and cycling network providing an attractive alternative to private car travel, encouraging more passenger travel by sustainable modes while providing a better quality of life for citizens. The improvements to sustainable modes provision as a result of the Proposed Scheme will facilitate a reduction in congestion, reduced greenhouse gas (GHG) emissions and associated air quality improvements along the Proposed Scheme, resulting in enhanced community wellbeing. The delivery of the Proposed Scheme will also aid in contributing to the national target of 500,000 additional trips by walking, cycling and public transport per day by 2030 as outlined as a target in the 2021 Climate Action Plan (CAP) (DCCAE 2021).

Potential climate impacts associated with the Construction Phase of the Proposed Scheme assessed, included temporary activities such as utility diversions, road resurfacing and road realignments. Construction access routes are also assessed for this phase of the works.

Potential climate impacts associated with the Operational Phase of the Proposed Scheme took into account predicted changes in traffic flows along the Proposed Scheme, reallocation of road space for sustainable modes and potential for displaced traffic flows. In addition, an assessment of the Proposed Scheme in relation to its vulnerability to climate change has been undertaken.

8.2 Climate Assessment Considerations

The Proposed Scheme aims to provide an attractive alternative to the private car and promote a modal shift to public transport, cycling and walking. It is, however, recognised that there will be an overall reduction in operational capacity for general traffic along the direct study area given the proposed changes to the road layout and the rebalancing of priority to walking, cycling and bus.

This reduction in operational capacity for general traffic along the Proposed Scheme is likely to create some level of trip redistribution onto the surrounding road network, in the absence of wider regional demand management measures (outside the scope of the Proposed Scheme).

It should be noted that the Do Minimum and Do Something scenarios are based on the assumption that travel behaviour will remain broadly consistent over the assessment period (2023-2038) and that car demand data used for this assessment, represents a reasonable worst-case scenario. However, it is anticipated that societal trends in the medium to long term may reduce car demand further due to the ongoing changes to travel behaviours and further shifts towards sustainable travel; flexibility in working arrangements brought on following COVID-19 restrictions; and delayed car ownership trends that are emerging.

The assessment also assumes that goods vehicles (HGVs and LGVs) continue to grow in line with forecasted economic activity with patterns of travel remaining the same. It should be noted, however, that the 2021 Climate Action Plan (CAP) (DCCAE 2021) includes reference to a freight strategy for the Country which will seek to further integrate smart technologies in logistics management and may include the regulation of delivery times as far as practicable to off-peak periods to limit traffic congestion in urban areas. The Plan outlines proposals to manage the increase in delivery and servicing requirements as the population grows, which may include the development of consolidation centres to limit the number of 'last-mile' trips made by larger goods vehicles with plans for higher use of smaller electric vans or cargo bikes for 'last-mile' deliveries in urban areas. As proposals for the above are at a pre-planning stage, it was not possible to account for them in the assessments and a worst-case assessment has been undertaken based on continued growth in goods traffic.

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are achieved. Significant design iterations were undertaken to mitigate against traffic re-distribution impacts and consequent increases in trip kilometres and in turn GHG emissions. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process has been incorporated where appropriate.

8.3 Methodology

This section presents the study area, relevant guidance, legislation and appraisal method for the assessment of impacts to climate from the Proposed Scheme.

8.3.1 General

In the absence of appropriate guidance in Ireland, guidance from the United Kingdom Highway Agency (UKHA) Design Manual for Roads and Bridges (DMRB) - LA 114 Climate (hereafter referred to as LA 114 Climate) (UKHA 2021) has been consulted.

LA 114 Climate advises that the assessment of a Proposed Scheme should describe the likely significant effects on the environment resulting from both the:

- Impact of a project on climate (GHG emissions); and
- Vulnerability of a project to climate change (adaptation).

The assessment methodology has been derived with reference to the most appropriate guidance documents relating to climate which are set out in the following sections of this Chapter. An overview of the methodology undertaken for the climate impact assessment is outlined below:

- A detailed baseline review of GHG emissions has been undertaken to characterise the baseline environment. This has been undertaken through review of available published GHG emission data;
- A review of the most applicable guidelines for the assessment of GHG emissions has been reviewed in order to define the significance criteria for the construction and operational phases of the Proposed Scheme in both the Opening Year (2023) and the Design Year (2038);
- Predictive calculations and impact assessment relating to the construction phase of the Proposed Scheme have been undertaken;
- Predictive calculations have been performed to assess the potential climatic impacts associated with the operation of the Proposed Scheme;
- An assessment of the vulnerability of the Proposed Scheme to climate change has been undertaken; and
- Mitigation measures have been incorporated, where required to reduce, where necessary, the identified potential climatic impacts associated with the Proposed Scheme.

8.3.2 Study Area

The Proposed Scheme is located across Galway City centre, representing a west-east public transport corridor commencing at the junction of University Road/Newcastle Road, routing over Salmon Weir Bridge and onto St. Francis Street/Eglinton Street, continuing through Eyre Square and onto Forster Street and College Road, ultimately connecting with the existing outbound bus lane on the R338 Dublin Road to the east of the junction at Moneenageisha. Refer to Diagram 1.1 Chapter 1 (Introduction) of this EIAR for the extents of the Proposed Scheme. In terms of the climate study area, the assessment has taken into account the travel distances associated with the construction phase of the Proposed Scheme and, for the operational phase, changes to traffic flow due to Proposed Scheme across Galway city.

The likely significant climatic impacts for the construction and operational phases are discussed below.

During the construction phase, the focus is on the enabling infrastructure provision, which forms the Proposed Scheme including utility road widening works, road excavation works (where required), road reconfiguration and resurfacing works, and construction traffic.

During the operational phase, the focus is on GHG emissions associated with the Proposed Scheme including GHG emissions due to changes to mobility demands, changes to modal split and changes in traffic along diverted traffic routes within the study area. Potential impacts to climate relate to modal shifts towards more sustainable modes of transport, changes to traffic patterns, maintenance and changes to the number and type of traffic trips including public transport.

The assessment of the operational phase will also examine the vulnerability of the Proposed Scheme to climate change, including the risk of flooding and the potential increased frequency of storms and the measures that have been put in place to ensure the resilience of the Proposed Scheme to climate change.

8.3.3 Relevant Guidelines, Policy and Legislation

8.3.4 General

The assessment has been undertaken with reference to the most appropriate guidance documents relating to climate which are set out in the following sections.

In addition to specific climate guidance documents, the following guideline was considered and consulted in the preparation of this assessment:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022).

The assessment has made reference to national guidelines, where available, in addition to international standards and guidelines relating to the assessment of GHG emissions and associated climatic impacts from road schemes. These are summarised below:

- National Adaptation Framework (hereafter referred to as the NAF) (DCCAE 2018);
- Climate Action Plan 2019 (hereafter referred to as the CAP 2019) (DCCAE 2019);
- Climate Action Plan 2021 (hereafter referred to as the CAP 2021) (DCCAE 2021);
- Department of Transport, Tourism and Sport (DTTAS) Transport – Climate Change Sectoral Adaptation Plan (DTTAS 2019);
- 2030 EU Climate Target Plan (European Commission 2021);
- Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (hereafter referred to as the TII Air Quality Guidelines) (TII 2011);

- LA 114 Climate (UKHA 2021);
- Institute of Environmental Management and Assessment (IEMA) Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition (IEMA 2022);
- IEMA EIA Guide to: Climate Change Resilience and Adaptation (IEMA 2020);
- IEMA Greenhouse Gas Management Hierarchy (IEMA 2020) and
- Climate Action and Low Carbon Development (Amendment) Act 2021 (the 2021 Climate Act) (No. 32 of 2021).

8.3.5 International Policy

The Paris Agreement (UNFCCC 2015), which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C (degrees Celsius) above pre-industrial levels with efforts to limit this rise to 1.5°C. Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs comprise the efforts and actions by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement requires each country to prepare the NDCs that it intends to achieve, updating and enhancing the NDCs every 5 years. Countries are required to implement mitigation measures, with the aim of achieving the objectives of such contributions. Each of the EU Member States submit their own NDCs, which contribute to the overall EU NDC.

The European Green Deal, published by the European Commission in December 2019, provides an action plan which aims for the EU to be climate neutral by 2050. The EU Green Deal highlights that further decarbonisation of the energy sector is critical to reach climate objectives in 2030 and 2050. The European Green Deal will increase the GHG emissions reduction 2030 target to at least 55% in comparison to 1990 levels. Targets for renewable energy and energy efficiency are also likely to be increased.

On 14 July 2021, the European Commission adopted a series of legislative proposals setting out how it intends to achieve climate neutrality in the EU by 2050, including the intermediate target of at least a 55% net reduction in greenhouse gas emissions by 2030. The package of proposals is known as the ‘Fit for 55’ package.

The package includes revisions to the legislation put forward as part of the Climate and Energy Framework 2021-2030, including the EU Emissions Trading System (ETS), Effort Sharing Regulation, transport and land use legislation, setting out in real terms the ways in which the Commission intends to reach EU climate targets under the European Green Deal.

The EU ETS was launched in 2005 as the world’s first international company-level ‘cap-and trade’ system for reducing emissions of greenhouse gases cost-effectively. The EU ETS regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing and heavy industry.

Under this new package of legislative proposals, the sectors of the economy covered by the current ETS must reduce emissions by 61% by 2030 compared to 2005 levels by increasing annual emissions reduction to 4.2% per annum. This is a substantial increase from the previous target which was a 43% reduction by 2030.

The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS scheme and thus includes GHG emissions from transport, residential and commercial buildings and agriculture. Under this new package of proposals the Commission is now proposing to reduce emissions under the non-ETS sectors or the sectors which fall under the Effort Sharing Regulation by at least 40%, compared to 2005 levels. This is an increase of 11 percentage points compared to the existing target of a 29% emission reduction.

The European Climate Law aims to write into law the goal set out in the European Green Deal – for Europe's economy and society to become climate-neutral by 2050. On 17 September 2020, the Commission adopted a proposal to include a revised EU emissions reduction target of at least 55% by 2030 as part of the European Climate Law.

The 2021 EU Strategy on Adaptation to Climate Change sets out the pathway to prepare for the unavoidable impacts of climate change. The aim is that "*by 2050, when we aim to have reached climate neutrality, we will have reinforced adaptive capacity and minimised vulnerability to climate impacts…"* Adaptation refers to measures that can reduce the negative impact of climate change by, for example, ensuring a project is resilient to future increases in storm frequency and rainfall levels.

The EU has adopted integrated monitoring and reporting rules to ensure progress towards its 2030 climate and energy targets and its international commitments under the *2015 Paris Agreement*.

8.3.6 National Policy

In 2015, the Climate Act was enacted by the Oireachtas. The purpose of the Climate Act was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050'*. This is referred to in the Climate Act as the '*national transition objective'*. The Climate Act allows for the submission of an adaptation framework for Ireland referred to as the 'National Adaptation Framework', which is required to be submitted to Government for approval every five years.

Ireland's first statutory National Adaptation Framework[1] (NAF) which was published in 2018, sets out the national strategy, for government and society, to reduce the vulnerability of the country to the negative effects of climate change.

[1] Department of the Environment, Climate and Communications (2021) National Adaptation Framework. Available from: https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/

In May 2019, the Government of Ireland declared a climate and biodiversity emergency. Following on from this, the Government of Ireland's first national Climate Action Plan (CAP)[2] was published in 2019. It commits to achieving a net zero carbon energy systems objective for Ireland.

In October 2019, the Transport Climate Change Sectoral Adaption Plan[3] was published under the NCCAF. The Plan identifies the key vulnerabilities in the transport network and looks to promote greater resilience to safeguard its continued operation.

The new Programme for Government Our Shared Future[4], agreed in June 2020, accelerated the decarbonisation agenda, committing to a 7% average yearly reduction in overall greenhouse gases over the next decade, and to achieving net zero emissions by 2050.

The Government of Ireland's updated Climate Action Plan (CAP)[5] (2021) sets out a detailed sectoral roadmap to deliver a cumulative reduction in emissions, building on the commitments of the first Climate Action Plan (2019). The core measures for transport focus on accelerating the electrification of road transport, increasing the use of biofuels and a shift to low energy transport modes such as walking, cycling, active travel and public transport. There are measures focused on increasing the 'modal shift' to reduce the fossil fuelled distances taken by car by 10%. The CAP acknowledges that policies need to be better aligned to achieve more ambitious targets for modal shift, which will involve the building of supporting infrastructure.

The Climate Action and Low Carbon Development (Amendment) Act[6] was enacted into national law in July 2021. The Act commits Ireland, in law, to move to a climate resilient and climate neutral economy by 2050 in alignment with the European Green Deal, and includes the following elements:

- Establishes a 2050 emissions target;
- Introduces a system of successive 5-year, economy-wide carbon budgets. The first two carbon budgets covering the periods 2021-2025 and 2026-2030 were announced by the Climate Change Advisory Council in 2021 (with a provisional budget from 2031). Once adopted by the Oireachtas, the carbon budgets will be used to prepare sectoral emissions ceilings for relevant sectors of the economy - this will include emission ceilings for the transport sector;

[2] Department of the Environment, Climate and Communications, (2019). Climate Action Plan 2019. Available from: https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/
[3] Department of Transport (2019), Sectoral Adaptation Plan for Transport Infrastructure. Available from: https://www.gov.ie/en/publication/a2444e-sectoral-adaptation-plan-for-transport-infrastructure/
[4] Department of the Taoiseach (2020) Programme for Government: Our Share Future [online] Available at: https://www.gov.ie/en/publication/7e05d-programme-for-government-our-shared-future/
[5] Department of the Environment, Climate and Communications (2021) Climate Action Plan 2021 [online] Available at: https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/
[6] Climate Action and Low Carbon Development (Amendment) Act 2021 [online] Available at: https://www.irishstatutebook.ie/eli/2021/act/32/section/15/enacted/en/html

- Strengthens the role of the Climate Change Advisory Council in proposing carbon budgets;
- Introduces a requirement to annually revise the Climate Action Plan and prepare a National Long Term Climate Action Strategy at least every decade;
- Introduces a requirement for all Local Authorities to prepare individual Climate Action Plans which will include both mitigation and adaptation measures.

The EU ETS is implemented in Ireland under the European Communities (Greenhouse Gas Emissions Trading) Regulations, SI 490 of 2012, and amendments and European Communities (Greenhouse Gas Emissions Trading) (Aviation) Regulations SI 261 of 2010 and amendments.

8.3.7 Local Policy

Galway City Council has prepared a Climate Change Adaptation Strategy for period 2019-2024 as a requirement under the National Adaptation Framework. The Climate Change Adaptation Strategy takes on the role as the primary instrument at local level to ensure a proper comprehension of the key risks and vulnerabilities of climate change and bring forward the implementation of climate resilient actions in a planned and proactive manner. The strategy ensures that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of Galway City Council.

8.3.8 Data Collection and Collation

Baseline data has been collected through carrying out a desk study, availing of the most up-to-date available data, at the time of writing. This comprises research data and relevant publications from the following organisations which have been reviewed.

- Galway City Council;
- Department of the Environment, Climate and Communications;
- Met Eireann;
- Environmental Protection Agency (EPA); and
- Sustainable Energy Authority Ireland (SEAI).

Detailed traffic data used in the assessment of the construction and operational phases was supplied by the traffic consultants for the Proposed Scheme.

8.3.9 Appraisal Method for the Assessment of Impacts

This section sets out how the climate assessment has been undertaken and highlights where input from other environmental disciplines has been included within the assessment.

8.3.9.1 Overview

The climate assessment has been carried out in accordance with the Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022). The EPA significance of impacts matrix has been used to determine the significance of impact (Table 8.1).

Table 8.1: EPA Significance Matrix

Significance		**Sensitivity**				
		Very Low	Low	Medium	High	Very High
Magnitude	Very Low	Imperceptible	Not significant	Slight	Slight	Slight
	Low	Not significant	Slight	Moderate	Moderate	Moderate
	Medium	Slight	Moderate	Moderate	Significant	Significant
	High	Slight	Moderate	Significant	Very significant	Profound
	Very High	Slight	Moderate	Significant	Profound	Profound

The LA 114 Climate Version 0.0.1 (UKHA 2021) outlines the recommended sources of input data and the appraisal methodology for the assessment of impacts for both the construction phase and operational phase as outlined in Table 8.2 (reproduced from Table 3.11.1 of LA 114 Climate). A detailed discussion of the input data and appraisal methodology for both the construction and operational phases is detailed in Section 8.3.9.2 to Section 8.3.9.5.

8.3.9.2 Construction Phase – Carbon

The assessment of carbon emissions was carried out to determine the likely greenhouse gas emissions (CO_2 eq) predicted due to the construction phase of the proposed development. The construction materials are manufactured using carbon intensive practices, which results in embodied carbon associated with the materials. The results of this assessment have been compared with the EPA's projected GHG emissions for Ireland's total projected emissions for 2024 (assumed worst case construction year). It is expected that construction will commence in Q4 2023, subject to approval, with a duration of approximately 18-20 months (75 working weeks). The assessment considers the material manufacture, the transport of construction materials to site, the construction processes and the construction compounds.

Section 3.13 of LA 114 Climate (UKHA 2021) recommends, that when calculating GHG emissions for a project life cycle, '*an industry recognized carbon calculation tool(s)*' should be used. The TII Carbon Assessment Tool (Version 2.1) (hereafter referred to as the TII Carbon Tool) (TII 2021) has been used to calculate the embodied carbon of materials in terms of carbon dioxide equivalency (CO_2 eq). The TII Carbon Tool uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database.

For a small number of materials not covered by the TII Carbon Tool, the UK Environment Agency's (UKEA) Carbon Calculator has been used to estimate carbon emissions due to construction activities in terms of carbon dioxide equivalency (CO_2eq). In addition, the UKEA Carbon Calculator has been used to estimate embodied carbon associated with the transportation of materials to and from site.

The carbon emissions are calculated by multiplying the emission factor by the quantity of the material that will be used over the construction phase. The varying, relevant transport distances have been included in the calculations for the transportation of materials to site.

The assessment includes the pre-construction (site clearance) stage, the assessment of the embodied carbon associated with all materials used in the construction of the road, the emissions during the construction phase and additionally emissions related to waste generated during the construction phase.

There is an increase in permeable area due to the Proposed Scheme, as outlined in Chapter 13 (Water) of this EIAR, therefore during the operational phase there will be a reduction in the area to be maintained when compared to the existing situation. On this basis, the Proposed Scheme will result in a reduction in the ongoing maintenance works compared to the Do Minimum situation, as such there will be a reduction in the carbon associated with operational maintenance compared to the Do Minimum situation. Therefore, the ongoing maintenance works have been excluded from further assessment.

It is generally assumed that end-of-life demolition is not relevant, and thus, there are no emissions associated with this stage.

The construction phase of the Proposed Scheme will result in GHG emissions from various sources as outlined in Table 8.2. The construction phase embodied GHG emissions are considered at all construction stages including the following:

- Land clearance activities (including the removal of trees / vegetation);
- Manufacture of materials and transport to site;
- Construction works (including excavations, construction, water usage, personnel travel and project size); and
- Construction waste products (including transport off site).

Detailed information for the Proposed Scheme including volumes of materials were obtained from the design team for the Proposed Scheme.

Given the extent of the operational phase, decommissioning has been excluded from the climate assessment, in accordance with LA 114 Climate.

Table 8.2: Sources and Life Cycle Stages for a Project's GHG Emissions (reproduced from Table 3.11.1 of LA 114 Climate (UKHA 2021))

Main Stage of a Project Life Cycle	Sub-Stage of Life Cycle	Potential Sources of GHG Emissions (Not Exhaustive)	Examples of Activity Data
Construction Stage	Product stage: including raw material supply, transport and manufacture.	Embodied GHG emissions associated with the required raw materials.	Material quantities.
	Construction process stage; including transport to / from works site and construction/installation processes.	Activities for organisations conducting construction work.	Fuel/electricity consumption. Construction activity type/duration. Transportation of materials from point of purchase to site, mode / distance. Area of land use change.
	Land use change.	GHG emissions mobilised from vegetation or soil loss during construction.	Type and area of land subject to change of usage.
Operation ('use-stage') (to extend 60 years in line with appraisal period)	Use of infrastructure by the end-use (road user).	Vehicles using highways infrastructure.	Traffic count / speed by vehicle type for highway links.
	Operation and maintenance (including repair, replacement and refurbishment).	Energy consumption for infrastructure operation and activities of organisations conducting routine maintenance.	Fuel / electricity consumption. For vehicles, lighting and plant. Raw material quantities and transport mode / distance. Waste and arisings quantities, transport mode/distance and disposal fate.
	Land use and forestry.	Ongoing land use GHG emissions / sequestration each year.	Type and area of land subject to change in usage. Net change in vegetation.
Opportunities for Reduction	GHG emissions potential of recovery including reuse and recycling GHG emissions potential of benefits and loads of additional functions associated with the study system.	Avoided GHG emissions through substitution of virgin raw materials with those from recovered sources.	Waste and arisings material quantities and recycling/reuse fate.

Note: The first life cycle stage is 'construction', which includes GHG emissions from the construction process and the manufacture/transport of materials. The second life cycle stage is 'operation', which includes: 1) Operation and maintenance, repair, replacement, refurbishment and land use change (operational maintenance GHG emissions); and 2) Emissions from end-users (operational user GHG emissions). The third life cycle stage comprises opportunities to minimise production/use of GHG emissions i.e. the potential for reduction of GHG emissions through reuse and recycling during the construction of the Proposed Scheme.

The land use change associated with the construction phase of the Proposed Scheme has also been quantified using the approach outlined in Table 8.2. Trees are a natural carbon sink and absorb carbon dioxide (CO_2) from the atmosphere helping in the reduction of climate change.

A default value for the amount of CO_2 which a mature tree can absorb is approximately 22 kg CO_2eq/annum (EEA 2011). Trees have the ability to sequester carbon with the peak CO_2eq (carbon dioxide equivalent) uptake rate for tree stands in the order of 5t CO_2eq/hectare/year (tonnes of carbon dioxide equivalent per hectare per year) to 20t CO_2eq/hectare/year with CO_2eq uptake rates declining with maturity and health (UK Forestry Commission 2012). Thus, based on these emission rates, a hectare will typically contain between 225 – 900 trees depending on tree type and maturity. Any felling of trees has the potential to result in a loss of this carbon sink thus increasing the levels of CO_2 in the atmosphere. In contrast, increased planting of trees on suitable lands will, over time, help to increase the carbon sink potential of the land and benefit climate. The change in land use associated with the Proposed Scheme, including the felling and planting of trees and vegetation, has been considered.

8.3.9.3 Operational Phase - Carbon

There will be carbon emissions associated with the operation of the Proposed Scheme due to the operational traffic.

The change in emissions due to operational phase traffic impacts of the Proposed Scheme have been assessed using the NTA Environmental Appraisal Module, which is based on the ENEVAL software. ENEVAL was developed by Systra Ltd in 2015 on behalf of the NTA. ENEVAL incorporates the official EU vehicle standard emission factor database, termed COPERT, and the emission data from the UK National Atmospheric Emissions Inventory (NAEI). Emissions from the zonal level ENEVAL tool can provide information on the carbon emissions for the different traffic scenarios on a regional basis. The ENEVAL software is recommended by the Codema in the publication Developing CO_2 Baselines – A Step-by-Step Guide for Your Local Authority (Codema 2017). The fleet assumptions for the opening year of 2023 and design year of 2038 provided by the traffic consultant are summarised in Table 8.3.

Table 8.3: Summary of Fleet Proportions

Vehicle Type		Opening Year 2023	Design Year 2038
Car	Petrol Car	38%	25%
	Diesel Car	55%	14%
	Electric Car	7%	61%
LGV	LGV	80%	34%
	Electric LGV	20%	66%
Bus	Electric LGV		100%
	Diesel Bus	100%	

Section 3.16 of LA 114 Climate (UKHA 2021) appraisal guidance recommends that ‘an appropriate validated traffic model shall be used to estimate operational

road user GHG emissions'. LA 114 Climate also outlines the approach for defining the scope of the assessment. LA 114 Climate states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the assessment:

- A change of more than 10% in annual average daily traffic (AADT);
- A change of more than 10% to the number of heavy-duty vehicles; and
- A change in daily average speed of more than 20km/hr (kilometres per hour).

Table 8.2 outlines the sources and activity classes for the operational phase of the Proposed Scheme including operational end-use (road user). The Construction Phase traffic movements are modelled using the same approach.

The results of this assessment have been compared with the EPA's projected transport sector GHG emissions for Ireland for 2023 and 2038.

8.3.9.4 Construction and Operational Phase Significance Criteria

LA 114 Climate (UKHA 2021) outlines a recommended approach for determining the significance of both the construction and operational phases of a road project. The approach is based on comparing the Do Something scenario and the net project GHG emissions (i.e. Do Something to Do Minimum) to the relevant carbon budgets, where available.

Currently, in Ireland the proposed carbon budgets have not been translated into sectoral emissions ceilings. The Climate Action and Low Carbon Development (Amendment) Act was enacted into national law in July 2021, as detailed in Section 8.3.6. These sectoral carbon budgets, including a budget for the transport sector, will be available for comparison with the net CO_2 project GHG emissions once adopted by the Oireachtas. When assessing significance, LA 114 Climate guidance recommends that the assessment of projects as significant should only occur '*where increases in GHG emissions will have a material impact on the ability of Government to meet its carbon reduction targets*'.

Given the current absence of specific sectoral carbon budgets in Ireland, for the purposes of this assessment any changes in net GHG emissions (either positive or negative) due to the Proposed Scheme will be compared to EPA's projected emissions for Ireland. The Institute of Environmental Management and Assessment (IEMA) Guidance Note on Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA 2022) notes the importance of contextualising carbon emissions however an individual project's contribution to national emissions projections will always be small, thus the value may be limited. The IEMA 2022 guidance presents more nuanced levels of significance compared to the same 2017 guidance. The IEMA 2022 guidance stipulates that while all carbon emissions contribute to climate change, the significance ratings should not solely based on whether a project emits GHG emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero. The comparison to sectoral carbon budgets would allow for an assessment of the contribution towards sectoral targets rather

than a comparison to the projected baseline scenarios only. This would give a better indication of the project's alignment with decarbonisation targets. However, as mentioned, the sectoral carbon budgets are not available at the time of writing this assessment.

The IEMA guidance also states that when evaluating significance, '*some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over time, which may be positive, negative or negligible*.' It goes on to state that '*where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages'*.

The EPA Guidelines (EPA 2022) describe the quality of effects in terms of positive, neutral and negative where neutral is defined as effects that are imperceptible, within normal bounds of variation. Taking into account both the IEMA and EPA guidance approach, this chapter has assessed impacts as being either neutral or positively / negatively significant with neutral defined as a change in GHG emissions which is less than ±0.5% of the baseline emission level.

8.3.9.5 Vulnerability of the Proposed Scheme to Climate Change

LA 114 Climate (UKHA 2021) outlines an approach for undertaking a risk assessment where there is a potentially significant impact on the Proposed Scheme receptors due to climate change. The risk assessment assesses the likelihood and consequence of the impact occurring to each receptor, leading to the evaluation of the significance of the impact. This assessment criteria is approved as an appropriate method in the IEMA EIA Guide to Climate Change Resilience and Adaptation (2020). The operational phase assessment, after identifying the hazards and benefits of the climate change impacts, assesses the likelihood and consequences using the framework outlined in Table 8.4 and Table 8.5. The guidance advises that for the construction phase, a qualitative description of disruption risk be reported.

Table 8.4: Likelihood Categories

Likelihood Category	Description (Probability and Frequency of Occurrence)
Very High	The event occurs multiple times during the lifetime of the project (60 years) e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the project (60 years) e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project (60 years) e.g. approximately once every 15 years, typically four events.
Low	The event occurs during the lifetime of the project (60 years) e.g. once in 60 years.
Very Low	The event occurs can occur during the lifetime of the project (60 years).

Table 8.5: Measure of Consequence

Consequence of Impact	Description
Very Large Adverse	Operation – national level (or greater) disruption to strategic route(s) lasting more than one week.
Large Adverse	Operation – national level (or greater) disruption to strategic route(s) lasting more than one day but less than one week or regional level disruption to strategic route(s) lasting more than one week.
Moderately Adverse	Operation – regional level disruption to strategic route(s) lasting more than one day but less than one week.
Minor Adverse	Operation – regional level disruption to strategic route(s) lasting less than one day.
Negligible	Operation –disruption to an isolated section of a strategic route lasting more less than one day.

The likelihood and consequence of each impact will then be combined in the form of a matrix to identify the significance of each impact as outlined in Table 8.6. The significance conclusions for each impact should be based on and incorporate confirmed design and mitigation measures. Where the assessment concludes that the impact is significant, LA 114 Climate states that '*the design and mitigation hierarchy should be reassessed to reduce the significance of impacts to an acceptable level (not significant)'*.

Table 8.6: Significance Matrix

		Measure of Likelihood				
		Very Low	**Low**	**Medium**	**High**	**Very High**
Measure of Consequence	**Very Large**	NS	S	S	S	S
	Large	NS	NS	S	S	S
	Moderate	NS	NS	S	S	S
	Minor	NS	NS	NS	NS	NS
	Negligible	NS	NS	NS	NS	NS

Note: NS = Not significant; S = Significant

8.4 Baseline Environment

8.4.1 Local Climate

The Galway City Council Climate Adaptation Strategy 2019-2024 states that the main risks around the City of Galway include the following:

- Sea level rise and inundation of low-lying communities
- Ocean warming and acidification
- Changes to natural ecosystems
- Increased temperatures increasing heat stress and diseases
- Increased incidence of heavy rainfall events, flooding and more sever cyclones.

The EPA (2019) Irish Climate Futures: Data for Decision Making report states that it is expected that weather extremes will become more likely and more frequent with future climate change.

The EPA (2021) The Status of Ireland's Climate 2020 includes a number of recent climate observations for Ireland. The report states that the annual average surface air temperature in Ireland has increased by approximately 0.9°C over the last 120 years, with a rise in temperatures being observed in all seasons. This compares with a global average temperature estimated to be 1.1°C above pre-industrial levels. The report indicates that the sea level around Ireland has risen by approximately 2–3 mm per year since the early 1990s. In addition, annual precipitation was 6% higher in the period 1989 to 2018, compared to the 30-year period 1961 to 1990.

The EPA's Climate Change Research Programme carries out relevant and up to date studies on climate change in Ireland (available at www.epa.ie). Analysis of the meteorological records shows that Ireland's climate is changing in line with global patterns.

According to the EPA (www.epa.ie) climate change is expected to lead to the following adverse effects:

- sea level rise;
- more intense storms and rainfall events;
- increased likelihood and magnitude of river and coastal flooding;
- water shortages in summer in the east;
- adverse impacts on water quality;
- changes in distribution of plant and animal species; and
- effects on fisheries sensitive to changes in temperature.

LA 114 Climate (UKHA 2021) outlines that the study area for assessing a project's vulnerability to climate change should be based on the construction footprint / project boundary (including compounds and temporary land take).

The region where the Proposed Scheme will be located has a temperate, oceanic climate, resulting in mild winters and cool summers. The recent weather patterns and extreme weather events recorded by Met Éireann have been reviewed. A noticeable feature of the recent weather has been an increase in the frequency and severity of storms with notable events including Storm Darwin in February 2014, Storm Emma in March 2018, and Storm Ophelia in October 2018. Heavier historical rainfall events have also been recorded in recent years including heavy rainfall and flooding.

8.4.2 Climate Pollutants

Climate is defined as the average weather over a period of time, whilst climate change is a significant change to the average weather. Climate change is a natural phenomenon but in recent years human activities, through the release of GHGs, have impacted on the climate (IPCC 2021).

The release of anthropogenic GHGs is altering the Earth's atmosphere resulting in a 'Greenhouse Effect'. This effect is causing an increase in the atmosphere's heat trapping abilities resulting in increased average global temperatures over the past number of decades. The release of CO_2 as a result of burning fossil fuels, has been one of the leading factors in the creation of this 'Greenhouse Effect'. The most significant GHGs are CO_2, methane (CH_4) and nitrous oxide (N_2O).

GHGs have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere. In order to compare different GHGs, emissions are calculated on the basis of their Global Warming Potential (GWPs) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The IPCC AR6 Synthesis Report: Climate Change 2021 sets out the global warming potential for a 100-year time period (GWP100) for CO_2 as the basic unit (GWP = 1) whereas CH_4 has a global warming potential equivalent to 29.8 units of CO_2 (for fossil sources) and N_2O has a GWP100 of 273. These values have been refined since the AR5 report.

8.4.3 Baseline Emissions

Given the circumstances of Ireland's declaration of a climate and biodiversity emergency in May 2019 and the November 2019 European Parliament approval of a resolution declaring a climate and environment emergency in Europe, in conjunction with Ireland's current failure to meet its EU binding targets under the EU Effort Sharing Regulation, changes in GHG emissions either beneficially or adversely are of more significance than previously viewed prior to these declarations. Thus, the baseline climatic environment should be considered a highly sensitive environment for the assessment of impacts.

In June 2021, the EPA released the report Ireland's Greenhouse Gas Emissions Projections 2020-2040, which includes total projected emissions and a breakdown of projected emissions per sector under the "With Existing Measures" and "With Additional Measures" scenarios.

Implementation of "Additional Measures" (including those in the 2019 Climate Action Plan) is projected to save 58 Mt $CO_{2\,eq}$ over the period 2021-2030 compared to the "With Existing Measures". This represents a reduction of 1.8% per annum in emissions over the period. The latest greenhouse gas emissions projections show total emissions decreasing from the latest Inventory (2019) levels by 3% by 2030 under the With Existing Measures scenario and by 20% under the With Additional Measures scenario.

Table 8.7 presents the EPA With Existing Measures and Additional Measures scenarios for 2023 (Opening Year, Construction Year) and 2038 (Design Year).

Table 8.7: Projected Emissions for the Transport Sector and Total Emissions (EPA, 2021)

Projections	Year	Transport Sector Only (Mt CO_2 eq.)	Road Transport Only (Mt CO2 eq.)	Total (Mt CO_2 eq.)
Projections (with existing measures)[7]	2023	12.74	12.15	62.41
	2038	10.24	9.59	62.49
Projections (with additional measures)[8]	2023	11.89	11.31	58.46
	2038	7.49	6.88	50.93

The transport sector accounts for approximately 20% of Ireland's total GHG emissions, which is the second largest contribution after the agricultural sector. In relation to transport GHG emissions, the dominant source is road transportation. In terms of modal split, private cars accounted for 73.7% of all road trips in 2019 whilst public transport accounted for 6.5% (DOT 2020). Compared to 2018, there was a 3% increase in the number of public transport passenger journeys in 2019 whilst the total kilometres driven by private cars reduced by 1.5% (DOT 2020). Private cars also remain the largest source of GHG emissions in the transport sector accounting for 50.4% of total transport emissions.

8.5 Potential Impacts

8.5.1 Characteristics of the Proposed Scheme

In the context of the Proposed Scheme, the potential air quality impact on the surrounding environment must be considered for two distinct stages:

- Construction Phase; and
- Operational Phase

8.5.2 Construction Phase

The construction phase of the Proposed Scheme will involve predominately utility diversions, road widening works, road excavation works (where required), road and junction reconfiguration and resurfacing works, public realm improvements including landscaping, pavement works including bus lanes, cycle tracks, bus terminals, and movement of machinery and materials within and to and from the Construction Compound along the Proposed Scheme.

During the construction phase, site clearance, landscaping, road and junction construction works all have the potential to generate GHG emissions on-site.

[7] With Existing Measures Scenario assume that no additional policies and measures beyond those already in place by the end of the latest national GHG inventory year at the time of the projections compilation. (EPA, 2021)

[8] With Additional Measures scenarios assume implementation of the WEM scenario in addition to, based on current progress, further implementation of planned government policies and measures adopted after the end of the latest inventory year. In the case of the latest projections (published in June 2021), this includes the implementation of Ireland's 2019 Climate Action Plan. (EPA, 2021)

Chapter 5 (Construction) of this EIAR provides a full description of the proposed construction phasing and works for the Proposed Scheme.

The total construction phase for the overall Proposed Scheme is estimated at approximately 18-20 months. However, individual activities will have shorter durations. The programme identifies the estimated duration of works at each sub-section. Works are envisaged to proceed concurrently on multiple work-fronts to minimise the overall construction duration.

In general, road works are transient in nature as the works will progress along the length of the route of the Proposed Scheme. This includes excavation and fill works, structures, and road completion works. Construction compounds will be set up typically at the commencement of the works and will remain in place until all construction in the area is completed.

8.5.2.1 Embodied Carbon Calculations

To quantify the construction phase embodied carbon, the assessment team utilised the TII Carbon Tool (2021), as outlined in Section 8.3.9.2. The TII Carbon Tool has the ability to quantify carbon in infrastructure projects using Ireland-specific emission factors and data suitable for the Irish context. In addition, the UK Environment Agency's (UKEA) Carbon Calculator has been used to estimate embodied carbon associated with transport distances and for a small number of materials not covered by the TII Carbon Tool.

The carbon footprint of the proposed development during the construction phase is estimated, based on an assessment of worst-case carbon equivalents, outlined in Table 8.8. The carbon assessment assumes no improvement in the carbon intensity of the production of cement and steel is achieved through time. The assessment assumes as a worst-case the recycling processes for materials being reused on site will occur off-site which is reflected in the transport distances. However, it is likely that some of these processes will occur on site to minimise transport distances.

Detailed project information including tonnage of materials was obtained from the engineering design team. The Proposed Scheme is expected to have a construction phase of 18-20 months approximately.

The predicted GHG emissions can be averaged over the full construction phase and the lifespan of the Proposed Scheme to give the predicted annual emissions to allow for a direct comparison with annual emissions and targets.

The construction phase emissions have been compared against the national GHG emissions in Ireland for 2024 (assumed the worst-case construction year), based on EPA projections outlined in Section 8.2.

End-of-life demolition is not assessed as it is assumed to be the same as without the Proposed Scheme and thus there are no emissions associated with this stage.

The predicted results are compared to the EPA's projected total CO_2 eq. emissions for Ireland in 2023 assuming additional measures, as a worst-case projection, in Table 8.9.

Table 8.8: Estimated embodied carbon associated with the construction phase

Element	Embodied Carbon Contribution tonnes CO_2eq	Estimated Quantity of material (tonnes)	Comment / Assumptions	Tonnes CO_2eq	Sources (TII / UKEA)
Pavements and Earthworks					
Aggregate (reuse on-site)	0.018	1,609	Assumed density 2t/m^3. Assumed recycling process off-site. Additional 101 tonnes for transport (assumed 70km).	40	TII
Aggregate (disposal)	0.001	13,525	Assumed density 2t/m^3. Assumed disposal to landfill as not suitable for reuse. Additional 12 tonnes for transport (assumed 70km).	115	TII
Aggregate (reuse off-site)	0.001	13,499	Assumed density 2t/m^3. Assumed to be reused off site. Additional 101 tonnes for transport (assumed 70km).	115	TII
Soil and stone (fill) (disposal)	0.018	1,394	Assumed density 2t/m^3. Assumed disposal to landfill as not suitable for reuse. Additional 3 tonnes for transport (assumed 70km).	28	TII
Aggregate (import)	0.0046	15,644	Assumed density 2t/m^3. Granular material average. Additional 67 tonnes for transport (assumed 40km)	139	TII
Asphalt (import)	0.0107	7,636	Assumed density 1.7t/m^3. Asphalt average. Additional 33 tonnes for transport (assumed 40km)	115	TII
Asphalt (reuse on-site)	0.001	1,648	Assumed density 1.7t/m^3. Assumed recycling process off-site. Additional 12 tonnes for transport (assumed 70km).	14	TII
Asphalt (reuse off-site)	0.001	11,998	Assumed density 1.7t/m^3. Assumed recycling process off-site. Additional 90 tonnes for transport (assumed 70km).	102	TII
Foamed bitumen (import)	0.0003	26	Assumed density 1.7t/m^3. Assumed as bituminous spray. Additional 0.1 tonnes for transport (assumed 40km).	0.11	TII
Concrete flags (import)	0.029	1,394	Assumed density 2.4t/m^3. Assumed average concrete flags. Additional 6 tonnes for transport (assumed 40km).	46	TII
Concrete materials (import)	0.0008	21,054	Assumed density 2.4t/m^3. Assumed 30% GGBS content.	107	TII

Element	Embodied Carbon Contribution tonnes CO_2eq	Estimated Quantity of material (tonnes)	Comment / Assumptions	Tonnes CO_2eq	Sources (TII / UKEA)
			Additional 90 tonnes for transport (assumed 40km).		
Concrete materials (reuse on-site)	0.001	2,430	Assumed density 2.4t/m^3. Assumed reuse on site with no additional transport.	2	TII
Concrete materials (reuse off-site)	0.001	7,774	Assumed density 2.4t/m^3. Assumed reuse on another site. Additional 58 tonnes for transport (assumed 70km).	66	TII
Concrete materials (disposed)	0.002	1,335	Assumed density 2.4t/m^3. Assumed disposal to landfill as not suitable for reuse. Additional 10 tonnes for transport (assumed 70km).	13	TII
Sand (reuse on-site)	0	38	Assumed density 2.24t/m^3. Assumed reuse on site with no additional transport.	0	TII
Sand (disposal)	0.001	239	Assumed density 2.24t/m^3. Assumed reuse off site. Additional 1.8 tonnes for transport (assumed 70km).	2	TII
Mortar (import)	0.16	1,418	Assumed density 2.2t/m^3. Assumed grout material. Additional 6 tonnes for transport (assumed 40km).	232	TII
Mortar (disposal)	0.002	1,034	Assumed density 2.2t/m^3. Assumed disposal to landfill as not suitable for reuse. Additional 8 tonnes for transport (assumed 70km).	10	TII
Geotextile (disposal)	0.009	0.05	Assumed density 1.38t/m^3. Assumed disposal to landfill as not suitable for reuse. Additional 0.004 tonnes for transport (assumed 70km).	0.005	TII
Gravel (reuse off-site)	0.001	7.4	Assumed density 2t/m^3. Assumed reuse off site. Additional 0.03 tonnes for transport (assumed 40km).	0.04	TII
Top-soil (reuse on-site)	452	0	Assumed density 2t/m^3. Assumed reuse on site with no additional transport.	0	TII
Stone paving (import)	0.08	2,239	Assumed density 2t/m^3. Common stonework. Additional 10 tonnes for transport (assumed 40km).	180	TII

Element	Embodied Carbon Contribution tonnes CO_2eq	Estimated Quantity of material (tonnes)	Comment / Assumptions	Tonnes CO_2eq	Sources (TII / UKEA)
Stone paving (disposal)	0.002	311	Assumed density 2t/m^3. Assumed disposal to landfill as not suitable for reuse. Additional 2.3 tonnes for transport (assumed 70km).	2.9	TII
Soil and stone (fill) (import)	0.001	372	Assumed density 2t/m^3. Assumed granular materials. Additional 1.6 tonnes for transport (assumed 40km).	3.3	TII
Soil and stone (cut) (reuse off-site)	0.001	1,391	Assumed density 2t/m^3. Assumed granular materials to be reused off site. Additional 10.4 tonnes for transport (assumed 70km).	12	TII
Above Ground Elements					
Masonry brick/blocks demolition (disposal)	0.001	600	Assumed reuse off site. Additional 2.5 tonnes for transport (assumed 40km).	3	TII
Mixed metals demolition (recycled off-site)	0.021	100	Assumed recycled off-site. Additional 0.8 tonnes for transport (assumed 70km).	3	TII
Plastic demolition (disposal)	0.009	10	Assumed disposal by incineration (waste to energy). Additional 0.2 tonnes for transport (assumed 180km).	0.41	TII
Timber demolition (disposal)	0.01	2	Assumed removal off site for composting. Additional 0.02 tonnes for transport (assumed 70km).	0.04	TII
Glass demolition (reuse/recycling off-site)	0.009	10	Assumed reuse/recycling off-site. Additional 0.08 tonnes for transport (assumed 70km).	0.3	TII
Masonry brick/block (import)	0.08	600	Common brickwork. Additional 2.5 tonnes for transport (assumed 40km).	48	TII
Mixed metals (import)	0.3	100	Assumed mixed metals -any type (average). Additional 0.8 tonnes for transport (assumed 70km).	32	TII
Plastic materials (import)	3.3	10	Assumed disposal to landfill as not suitable for reuse. Additional 0.08 tonnes for transport (assumed 70km).	33	UKEA
Timber (import)	0.31	2	Assumed removal off site for composting. Additional 0.007	0.6	UKEA

Element	Embodied Carbon Contribution tonnes CO_2eq	Estimated Quantity of material (tonnes)	Comment / Assumptions	Tonnes CO_2eq	Sources (TII / UKEA)
			tonnes for transport (assumed 70km).		
Glass (import)	1.35	10	Assumed disposed to landfill as not suitable for reuse. Additional 0.007 tonnes for transport (assumed 70km).	13.5	UKEA
Tree clearance	0.1	6	Assumed 59 trees removed off-site for composting. Additional 0.06 tonnes for transport (assumed 70km).	0.12	TII
Very Large size construction site, 3.5 tonnes CO_2eq per week, 87-week duration				304	TII
Total (tonnes of CO_2)					1,783

Table 8.9: Estimated carbon relative to projected carbon baselines

Estimated CO_2 eq during Construction Phase (Mtonnes)	Projected Total Irish CO_2 eq emissions in 2024 with additional measures (Mtonnes)	As a percentage of 2024 Total CO_2 eq emissions with additional measures
0.0018	56.9	0.003%

The Proposed Scheme is estimated to result in total construction phase GHG emissions of 1,783 tonnes embedded CO_2eq for materials, equivalent to an annualised total of 0.003% of Ireland's national GHG emissions in 2023.

On this basis, the potential impact to climate due to embodied carbon emissions during the construction phase, prior to mitigation, will be negligible and long-term. This finding aligns with the IEMA approach (IEMA 2022) which advises that the net impact over time should be considered and that the significance should depend on if the project will replace existing development with a higher GHG profile. As the Proposed Scheme will replace existing infrastructure with a more sustainable option, this advice is considered in the determination of the impact rating.

As improvements in sustainability and recycling measures are progressed throughout the construction industry it is expected that the embodied carbon calculated as part of this assessment can be taken as a worst case, as with time this figure will improve. In addition, the embodied carbon is calculated on the basis that all emissions occur over one year, a worst-case consideration.

8.5.2.2 Construction Traffic

In addition to direct impacts from the construction works including the construction compounds, as included in Table 8.8, there is also the potential for GHG impacts from additional construction vehicles using public roads. The transport distances have been included in the embodied carbon calculations for the

transportation and delivery of materials to and from site. Additional traffic generated due to construction works is considered negligible, as outlined in Chapter 6 (Traffic and Transport) of this EIAR.

Therefore, GHG emissions from additional construction traffic generated from the Proposed Scheme, other than the transportation of materials (accounted for in Table 8.8) is considered negligible.

8.5.2.3 Vulnerability to Climate Change

The appropriate flood risk measures and extreme weather events have been considered as part of the construction phase. However, the potential for changes to long-term seasonal averages as a result of climate change are not considered to be as significant by the construction year (2024). If appropriate, additional measures to ensure the resilience of the Proposed Scheme to impacts during extreme weather events will be implemented for the construction phase. Thus, in line with the methodology outlined in Table 8.4, Table 8.5 and Table 8.6, the likelihood of extreme weather and flooding in the year 2024 is assessed to be of medium likelihood and with a minor adverse effect leading to a not significant impact.

8.5.2.4 Land Use Change

The construction phase of the Proposed Scheme is predicted to result in the removal of 59 trees to facilitate construction works. However, these 59 trees will be replanted as well as additional planting of 127 trees as part of the reinstatement works. In addition, the Proposed Scheme will result in an increase in permeable area of approximately 1,770m^2. However, the impacts to carbon sequestration will not be effective until the operational phase. Therefore, there will be a negligible impact on carbon sequestration as a result of the construction phase of the Proposed Scheme.

8.5.3 Operational Phase

As outlined in Chapter 4 **(**Proposed Scheme Description) of this EIAR, the Proposed Scheme includes the reconfiguration of traffic movements to facilitate improved pedestrian, cyclist and bus accessibility and movement, infrastructural works at certain roads and junctions, and improvements to the public realm at a number of locations.

The Proposed Scheme will result in the redistribution of traffic which may result in an increase in vehicle kilometre travelled in some locations. However, this is expected to be offset by a shift away from private car use.

8.5.3.1 Operational Phase Carbon Emissions

The infrastructural works proposed as part of the Proposed Scheme will provide an attractive alternative to private car travel, encouraging more passenger travel by more sustainable modes. A greater share of the demand will be by sustainable modes (public transport, walking and cycling).

The potential changes in GHG emissions due to the direct operational phase traffic impacts of the Proposed Scheme have been assessed using the Environmental Appraisal Module, which is based on the ENEVAL software.

As shown in Table 8.10, a comparison between the Do Something and Do Minimum GHG emissions in 2023 within the study area predicts an increase 1.3ktonnes in CO_2eq. This is equivalent to a 0.39% increase in CO_2eq relative to the Opening Year Do Minimum estimates. This is equivalent to 0.01% of the projected transport sector emissions in 2023 under the With Additional Measures scenario, outlined in Section 8.4.3.

Table 8.10: Operational Phase GHG emissions – Opening Year (2023)

Scenario	Vehicle Class	CO_{2eq} (kt CO_{2eq})
DM	Car	214.2
DS		213.9
Change		0.3
% Change		0.18%
DM	Goods	97.4
DS		98.2
Change		0.8
% Change		0.82%
DM	Urban Bus	8.48
DS		8.53
Change		0.05
% Change		0.64%
DM	**Total**	319.7
DS		320.9
Change		1.3
% Change		**0.39%**

As shown in Table 8.11, a comparison between the estimated Do Something and Do Minimum GHG emissions in the Design Year (2038) indicates that there is potential for an overall increase of 6.7ktonnes in CO_2eq. This is equivalent to a 0.33% increase in CO_2eq relative to the Design Year Do Minimum estimates. This is equivalent to 0.09% of the projected transport sector emissions in 2038 under the With Additional Measures scenario, outlined in Section 8.4.3.

Table 8.11: Operational Phase GHG emissions – Design Year (2038)

	Vehicle Class	CO_{2eq} (kt CO_{2eq})
DM	Car	101.8
DS		102.2
Change		0.4
% Change		0.36%
DM	Goods	100.1

	Vehicle Class	CO_{2eq} (kt CO_{2eq})
DS		100.3
Change		0.2
% Change		0.3%
DM	Urban Bus	0
DS		0
Change		0
% Change		0%
DM	**Total**	201.9
DS		202.5
Change		0.6
% Change		**0.33%**

There will be a marginal increase in GHG emissions associated with the Proposed Scheme, which is attributable to the redistribution of traffic in both 2023 and 2038. Thus, the predicted impact to climate during the operational phase of the Proposed Scheme is predicted to be neutral and long-term as the change is less than 0.5%.

Furthermore, as outlined in Section 8.3.9.4, the IEMA guidance stipulates that significance ratings should not solely be based on GHG emissions alone, but how the project makes a relative contribution towards achieving a transition to net zero emissions. The infrastructural works proposed as part of the Proposed Scheme will support the delivery of government strategies outlined in the Climate Action Plan (CAP) and the Climate Action and Low Carbon Development (Amendment) Act, outlined in Section 8.3.4, by enabling sustainable mobility and delivering a sustainable transport system. Its aim is to provide enhanced walking, cycling and bus infrastructure on key access corridors in Galway City. This will subsequently enable and deliver integrated sustainable transport movement along these corridors. The proposed infrastructural works will provide connectivity and integration with other public transport services leading to more people availing of public transport.

By creating a resilient, accessible public transport network, the proposed infrastructural works will provide an attractive alternative to private car travel, encouraging more passenger travel by more sustainable modes. A greater share of the demand will be by sustainable modes (public transport, walking and cycling).

In terms of policy measures, CO_2 emissions for the average new car fleet will reduce from 130g/km (grams per kilometre) over the period 2015 to 2019 to 95g/km in 2021 (European Commission 2020). In addition, from 2025 the average emissions from new car fleet are required to reduce by 15% relative to 2021 levels and, by 2030, the average emissions from new car fleet are required to reduce by 37.5% relative to 2021 levels as outlined in Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO_2 emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011.

In relation to decarbonising the transport sector, the CAP has set a target that all new cars and vans sold in Ireland will be zero carbon emissions or zero emission capable by 2030. Targets are also included for public transport buses and trains.

8.5.3.2 Vulnerability to Climate Change

Climate adaptation seeks to ensure adequate resilience of major projects to the adverse impacts of climate change, such as increased flooding or droughts. Mitigation, on the other hand, seeks to reduce the emissions of GHGs by implementing low-carbon energy options.

Adaptation during the operational phase of the Proposed Scheme aims to ensure potential climate change impacts will not significantly impact the operational phase.

A risk assessment has been conducted for potentially significant impacts on the Proposed Scheme associated with climate change. The risk assessment assesses the likelihood and consequence of potential impacts occurring and then provides an evaluation of the significance of the impact using the framework set out in Section 8.3.9.5.

Flood Risk

Flooding of the local transport infrastructure is a potential impact of climate change on the Proposed Scheme. A comprehensive flood risk assessment (FRA) has been carried out, full details of the FRA can be found in Appendix 13.1 Volume 4 of this EIAR.

The assessment found that one section of the Proposed Scheme will be partially located within Flood Zone A and B. As such, there are two locations at high risk of flooding (Flood Zone A) from tidal sources and further seven areas at moderate risk of flooding (Flood Zone B) from fluvial sources within the development area. A Stage 2 FRA is required as the Stage 1 assessment determined that the site, at least in part, is at risk of flooding from fluvial, tidal and groundwater sources.

The project scope does not include proposals to raise the road levels at any location or significantly increase the impermeable areas which will alter the hydrologic/hydraulic regime of the project area and hence the risk of flooding to the existing sites does not increase. Therefore, it was found that progression to Stage-3 Flood Risk Assessment is not required.

A Justification Test was applied for the whole development area. The Proposed Scheme has been determined to have satisfied all requirements of the justification test.

The mitigation proposed includes the upgrading or construction of the drainage network to ensure no worsening of flooding along the Proposed Scheme corridor, including an increase of 20% in rainfall to allow for climate change. In addition to increasing the green areas and providing additional gullies.

Thus, in line with the methodology outlined in Table 8.4, Table 8.5 and Table 8.6, the likelihood of flooding during operation is assessed to be of high likelihood and with a minor adverse effect leading to a not significant impact.

Increased Temperature and Extreme Weather

Future climate predictions undertaken by Met Éireann have been published in Ireland's Climate: the road ahead (Met Éireann 2013) based on four scenarios (RCP2.6, RCP4.5, RCP6.0 and RCP8.5) which are named with reference to a range of radiative forcing values for the year 2100 (i.e. 2.6, 4.5, 6.0 and 8.5 W/m^2) respectively with focus on RCP4.5 (medium-low) and RCP8.5 (high) scenarios. In terms of mean temperatures, it is predicted that increases of between 1°C to 3°C will occur under RCP4.5 rising to 2°C to 4°C under RCP8.5. Warm extremes are expected to rise by 2°C to 3°C (RCP4.5) but by up to 5°C under RCP8.5.

These increased temperatures have the potential to cause the temperature of construction materials, such as asphalt / bitumen, to increase. However, based on an increase in temperature of between 1°C to 3°C under RCP4.5, it is considered that the impact of increased temperatures on construction materials will be not significant.

Thus, in line with the methodology outlined in Table 8.4, Table 8.5 and Table 8.6, the likelihood of increased temperatures impacting on the Proposed Scheme during the operational phase is assessed to be of high likelihood and with a negligible adverse effect, leading to a predicted impact of not significant.
In terms of extreme weather, the EPA Ensemble of Regional Climate Model Projections for Ireland (2015) there is a reduction in storms and wind intensity by mi-century predicted, thus the risk of extreme weather impacting on the Proposed Scheme will be not significant.

8.5.3.3 Land Use Change

The operational phase of Proposed Scheme will require some vegetation removal to facilitate the construction works however there will be additional planting and increased permeable areas compared to the existing situation, as outlined in Section 8.5.2.4. The additional tree planting has the potential to sequester up to 2.8 tonnes of CO_2 per annum (additional to the existing situation) during the operational phase. This is based on sequestration information outlined in Section 8.3.9.2. The additional permeable areas (assuming 0.1ha of grass and scrub areas, excluding additional trees) has the potential to sequester up to 2.6 tonnes of CO_2 per annum (additional to the existing situation) during the operational phase. This is based on the TII Carbon Tool sequestration factors. This amounts to additional sequestration potential of up to 5.4 tonnes of CO_2 per annum (additional to the existing situation) during the operational phase. Thus, there will be a slight, positive and long-term impact on carbon sequestration as a result of the operational phase of the Proposed Scheme.

8.6 Mitigation and Monitoring Measures

A schedule of mitigation measures has been formulated for the construction and operational phases of the Proposed Scheme.

8.6.1 Construction Phase

The construction traffic and the embodied energy of construction materials will be the dominant source of GHG emissions as a result of the construction phase of the Proposed Scheme. Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions.

8.6.1.1 Construction Phase Carbon Mitigation

A series of mitigation measures have been incorporated into the construction design with the goal of reducing the embodied carbon associated with the construction phase of the Proposed Scheme.

These mitigation measures include:

- The replacement, where feasible, of concrete containing Portland cement with concrete containing ground granulated blast furnace slag (GGBS). This measure has the potential to result in an estimated saving of 5,352 tonnes of CO_{2eq} in the current design of the Proposed Scheme;
- The Proposed Scheme will minimise wastage of materials due to poor timing or over ordering on site thus helping to minimise the embodied carbon footprint of the Proposed Scheme;
- Where practicable, opportunities for materials reuse will be incorporated within the extent of the Proposed Scheme including the use of reclaimed asphalt and recycled aggregate. This measure has led to an estimated saving of 705 tonnes of CO_2eq; and
- Where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport.

The combined measures, including the incorporation of GGBS, recycled and reused material where practicable has led to an estimated saving of 6,057 tonnes of CO_2eq.

The embodied carbon emissions associated with the construction phase of the Proposed Scheme will be short-term and temporary in nature with the implementation of the mitigation measures outlined above. The impact on GHG emissions, after mitigation, as outlined in Table 8.8, due to the embodied carbon associated with the construction phase of the Proposed Scheme is negligible and long-term. The impact rating post-mitigation is the same as pre-mitigation, as the mitigation measures proposed are inherent to the construction design. The mitigation measures will have the effect of reducing carbon emissions during the construction phase.

The construction traffic GHG emissions associated with the construction phase of the Proposed Scheme will be short-term and temporary in nature. The appointed contractor will develop a Construction Traffic Management Plan (CTMP) to manage traffic during the construction phase. An outline CTMP is included in the CEMP (Appendix 5.1 in Volume 4 of this EIAR). As outlined in Section 8.5.3.2, the GHG emissions associated with the additional construction traffic due to the Proposed Scheme will be negligible.

8.6.2 Operational Phase

8.6.2.1 Operational Phase Traffic Carbon Mitigation

The impact of the operational phase traffic of the Proposed Scheme is predicted to be neutral. Thus, the predicted impact to climate due to operational phase traffic as a result of the Proposed Scheme, after mitigation, will be neutral and long-term. However, as outlined above, the proposed infrastructural works will support the delivery of government strategies outlined in the Climate Action and Low Carbon Development (Amendment) Act by enabling sustainable mobility and delivering a sustainable transport system.

Its aim is to provide enhanced walking, cycling and bus infrastructure on key access corridors in Galway city. This will subsequently enable and deliver an integrated sustainable transport movement along these corridors.

By creating a resilient, accessible public transport network, the proposed infrastructural works will provide an attractive alternative to private car travel, encouraging more passenger travel by more sustainable modes while providing a better quality of life for citizens. Total trip demand is increasing into the future in line with population, employment and growth of jobs. The projected population growth within Galway City and its suburbs is expected to grow by 50-60% by 2040, or up to a total of 120,000 individuals. A greater share of the demand will be by sustainable modes (public transport, walking and cycling). It is expected that the infrastructural works will reduce car use and increase sustainable modes by 2038, as outlined in Chapter 6 (Traffic and Transport) of this EIAR. This will facilitate a reduction in congestion and associated air quality improvements along the corridors, resulting in enhanced community wellbeing. It will also enable the development of more efficient urban and intermodal transport solutions by removing traffic from Galway City.

8.7 Residual Impacts

8.7.1 Construction Phase

When the construction phase GHG mitigation measures detailed in Section 8.6 are implemented, GHG emissions from the Proposed Scheme are predicted to be neutral, long-term. This impact rating aligns with IEMA guidance on the basis that the Proposed Scheme replaces existing development that has a higher GHG profile and that the significance of a project's emissions should be based on its net impact over its lifetime, refer to Section 8.3 for further details. In addition, GHG emissions have been reduced where possible during the construction phase.

8.7.2 Operational Phase

The operational traffic GHG emissions associated with the operational phase of the Proposed Scheme is predicted to be neutral and long-term.

The proposed infrastructural works will also support the delivery of government strategies, outlined in Section 8.3.6, by enabling sustainable mobility and

delivering a sustainable transport system. Its aim is to provide enhanced walking, cycling and bus infrastructure on key access corridors in Galway City. This will subsequently enable and deliver an integrated sustainable transport movement along these corridors. The proposed infrastructural works will provide connectivity and integration with other public transport services leading to more people availing of public transport.

By creating a resilient, accessible public transport network, the proposed infrastructural works will provide an attractive alternative to private car travel, encouraging more passenger travel by more sustainable modes.

As a result, a greater share of the demand will be by sustainable modes (public transport, walking and cycling), which aligns with the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

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Chapter 09
Noise & Vibration

Contents

9 Noise & Vibration

9.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the potential noise and vibration impacts associated with the Construction and Operational Phases of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) Scheme, hereafter referred to as the Proposed Scheme.

During the Construction Phase, the potential noise and vibration impacts associated with the development of the Proposed Scheme are assessed. This included construction activities such as utility diversions, road resurfacing and road realignments as well as construction traffic construction access routes.

During the Operational Phase, the potential noise and vibration impacts associated with altered traffic flows along the Proposed Scheme, realigned traffic lanes and displaced traffic flows are assessed.

The assessment is carried out according to best practice standard and guidelines relating to environmental noise and vibration.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure in the city centre of Galway, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the city. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction) of this EIAR. The Proposed Scheme, which is described in Chapter 4 (Proposed Scheme Description) of this EIAR has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedbacks received from the comprehensive consultation programme undertaken throughout the option selection and design development process have been incorporated, where appropriate.

9.2 Methodology

The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out in the following sections of this chapter.

An overview of the methodology undertaken for this noise and vibration impact assessment is outlined below:

- A baseline noise study has been undertaken in order to characterise the environment at areas most likely to be affected by noise associated with the Proposed Scheme. This has been undertaken through site-specific noise monitoring at Noise Sensitive Locations (NSLs) along the Proposed Scheme;

- A review of the most applicable standards and guidelines has been undertaken in order to set a range of acceptable noise and vibration criteria for the Construction and Operational Phases of the Proposed Scheme;
- Predictive calculations and impact assessments relating to the likely Construction Phase noise and vibration impacts have been undertaken at the NSLs closest to the construction work areas associated with the Proposed Scheme;
- Predictive calculations have been performed to assess the potential noise and vibration impacts associated with changes in predicted traffic associated with the operation of the Proposed Scheme at the most sensitive locations; and
- A schedule of mitigation measures has been incorporated to reduce, where necessary, the identified potential significant noise and vibration impacts associated with the Proposed Scheme.

9.2.1 Study Area

The study area for this assessment covers the length of the Proposed Scheme, from University Road in the west, across Galway City Centre to the College Road/Lough Atalia Junction in the east, including the area either side of the Proposed Scheme and other diverted routes up to a maximum distance of 300 m during the Construction Phase and up to 1 km during the Operational Phase. A detailed description of the Proposed Scheme can be found in Chapter 4 (Proposed Scheme Description).

The study area for potential noise and vibration impacts during both Construction and Operational Phases relate to areas of potentially impacted NSLs, which include areas where people spend significant periods of time and where concentration, sleep and amenity are important considerations. Examples of these NSLs include residential dwellings, schools and other educational establishments, hospitals and nursing homes, hotels and other short-term accommodation buildings, buildings of religious sensitivity, recreational and noise sensitive amenity areas and offices. Vibration sensitive locations (VSLs) include buildings with vibration sensitive equipment (sensitive equipment within laboratories, highly sensitive medical equipment etc.) and structures that are structurally unsound. Further details regarding specific NSLs are provided in Section 9.2.3.

For the Construction Phase, the assessment of the study area is focused on NSLs and VSLs adjacent to the works, e.g., utility diversions, road widening works, road excavation works (where required), road reconfiguration and resurfacing works, and construction traffic access routes within the study area. The extent of the overall study area is typically up to 300 m from a specific area of construction work with the key impacted study areas focused within 50 m to 100 m depending on the noise and vibration sources in question and the local area under consideration.

For the Operational Phase, the focus of the assessment is on NSLs that bound the Proposed Scheme and those along diverted traffic routes. Potential noise impacts relate to alterations to traffic patterns, with particular attention on roads where traffic is diverted because of road closures associated with the Proposed Scheme.

The key impacted study areas for the Operational Phase are within 50 m to 100 m of the Proposed Scheme and roads affected by redistributed traffic which captures those locations where potential significant impacts can occur. Roads modelled as part of the Transport Impact Assessment (TIA) of the Proposed Scheme have been included in the noise impact assessment study area for the Operational Phase assessment.

9.2.2 Relevant Guidelines, Policy and Legislation

Guidelines, policy and legislation specifically relevant to the population assessment are outlined in Table 9.1.

Table 9.1: Relevant Guidelines, Policies and Legislation

Guidance	Description	Relevance to Assessment
Environmental Protection Agency (EPA) Guidelines on the information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022)	This document outlines EPA guidance for conducting Environmental Impact Assessments (EIAs) / EIARs and provides the fundamental requirements of the EIAR.	This guidance has been used to inform the significance of effect for all topics in the population assessment.
British Standard Institute (BSI) British Standard (BS) 5228-1:2009 +A1 2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise	A code of practice for assessing noise from construction sites	Informs construction noise limits and assessment
BS 5228-2:2009+A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (hereafter referred to as BS 5228 – 2)	Code of practice for assessing vibration from construction sites	Informs construction vibration limits and assessment
BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration	Guide to assessing building damage from vibration	Informs vibration limits for buildings
BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting	Guide to assessing vibration with respect to the human response	Informs vibration limits for humans

Guidance	Description	Relevance to Assessment
UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability & Environmental Appraisal LA 111 Noise and Vibration Revision 2	Guide to assessing noise and vibration from roads projects to nearby sensitive receptors	Informs noise and vibration assessment methodology
Galway City Council Draft Noise Action Plan 2019 – 2023	Noise action plan for Galway City Council for the years 2019 to 2023	Informs noise assessment methodology
S.I. No. 549/2018 – European Communities (Environmental Noise) Regulations 2018	Guidance for implementing a common noise strategy across Europe, specifically for Ireland	Informs noise assessment methodology
S.I. No. 241/2006 - European Communities Noise Emission by Equipment for Use Outdoors (Amendment) Regulations 2006	Provides guidance for outdoor equipment noise	Informs noise assessment methodology
International Organization for Standardization (ISO) 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation	Guidance for how to calculate noise propagation outdoors	Used in noise assessment calculations
ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures	Guidance for undertaking noise measurements for environmental noise	Informs noise measurement methodology
ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels	Guidance for undertaking noise measurements for environmental noise	Informs noise measurement methodology
Transport Infrastructure Ireland (TII) (previously National Roads Authority (NRA)) Guidelines for the Treatment of	Guidance for assessing road traffic noise in Ireland	Informs noise assessment methodology

Guidance	Description	Relevance to Assessment
Noise and Vibration in National Road Schemes		
Good Practice Guide for the Treatment of Noise during the Planning of National Road Schemes (hereafter referred to as the TII Noise Guidelines 2014) (NRA 2014)	Guidance for assessing road traffic noise in Ireland	Informs noise assessment methodology
The UK Department of Transport Calculation of Road Traffic Noise (hereafter referred to as the CRTN) (UK Department of Transport 1998)	Guidance for the calculation of road traffic noise levels	Informs traffic noise calculation methodology
World Health Organization (WHO) Environmental Noise Guidelines for the European Region (2018)	Guidance for appropriate noise levels for human health	Informs noise assessment methodology
Institute of Acoustics (IOA) ProPG: Planning and Noise. Professional Practice Guidance on Planning and Noise. New Residential Development. 2017	Guidance for appropriate noise levels for residential properties	Informs noise assessment methodology

9.2.2.1 Galway City Council Noise Action Plan (2019 – 2023)

No limits exist for environmental noise in Ireland, however, the Galway City Council Noise Action Plan references the recommended proposed levels from the EPA. The noise levels recommended for assessment of noise mitigation measures for noise due to road traffic are as follows:

- 70 dB, L_{den}
- 57 dB, L_{night}

The scheme is only proposed to operate during the day time period, so only L_{den} will be considered in this assessment.

9.2.3 Data Collection and Collation

9.2.3.1 Baseline Noise Surveys

Baseline noise surveys have been conducted at locations representative of the nearest noise sensitive areas which have the potential to be impacted during the Operational Phase of the Proposed Scheme. Baseline noise measurements were undertaken using attended surveys. Attended surveys were undertaken at a total of 16 locations in the vicinity of the Proposed Scheme in January 2022. The selection, number and type of surveys undertaken are in line with those prescribed in the TII Noise Guidelines 2004 (NRA 2004) and TII Noise Guidelines 2014 (NRA 2014) as far as practicable.

Details of the noise monitoring locations are presented in Table 9.2.

Table 9.2: Noise monitoring locations

Location	Description of Survey Location
University Road	On pavement outside residential receptor to the south of University Road. 1 m from road edge. Cars parallel parked on street with traffic beyond that.
232 Corrib Park	On pavement outside terrace houses. Approximately 15 m north of Seamus Quirke Road. Corrib Park is a quiet, residential street. Seamus Quirke Road is a heavily trafficked road. The houses on Corrib Park are slightly screened from Seamus Quirke Road by a small earth berm.
81 Ardiluan Road	On pavement outside houses. Approximately 17 m east of Thomas Hynes Road. Ardilaun Road is a quiet, residential street. Thomas Hynes Road is a busy road. This location is representative of Moyola Park.
24 Inchagill Road	On pavement outside houses. Approximately 13 m south-east of R338. Inchagill Road is a quiet cul-de-sac. The R338 is a heavily trafficked road. The houses on Inchagill Road are screen from the R338 by a 1.5 m high wall.
N6/Upper Newcastle Road	On pavement outside terrace houses approximately 1 m from the road edge, north-east of the junction. Upper Newcastle and the N6 are both busy roads.
188 Dun Na Coiribe	On pavement outside houses. Approximately 30 m north of N6. Dun Na Coiribe is a residential street with a constant stream of pedestrian traffic. The N6 is a heavily trafficked road.
120 College Road	On pavement outside residential receptor to the south of College Road. 1 m from road edge. Cars parallel parked on street with traffic beyond that.
Lough Atalia Road (behind 118 College Road)	On pavement outside residential receptor to the north of Lough Atalia Road. 3 m from road edge.
Presentation Road/Mill Street	On pavement outside residential receptor to the east of Mill St, just south of the junction with New Road. 1 m from road edge.
Woodquay	On pavement outside residential receptor to the south of Dalys Place. 1 m from road edge.
Eyre Street	On pavement outside residential receptor to the south of Eyre Street. 1 m from road edge. Cars parallel parked on street with traffic beyond.

Location	Description of Survey Location
Bothar na mBan	On pavement outside Sleepzone Galway Hostel to the west of Bothar na mBan. 1 m from road edge.
Coach Station	On pavement outside the Forster Court Hotel to the west of Fairgreen Road, opposite Galway Coach Station. 1 m from road edge.
Fairgreen Road/ Lough Atalia Road	On pavement outside the Galmont Hotel to the north of Lough Atalia Road. 2 m from road edge.
Middle Street	On pavement outside the residential receptor to the south of Middle Street. 1 m from road edge.

Full details of the baseline surveys, including methodologies, survey dates, terminology and glossary, and results are included in Appendix 9.1 (Noise and Vibration Survey) in Volume 4 of this EIAR.

Figure 9.1 in Volume 3 of this EIAR illustrates the baseline noise monitoring locations. These noise monitoring locations have been selected based on the representative noise sensitive locations for the Proposed Scheme, as presented in Figure 9.2 in Volume 3 of this EIAR.

9.2.4 Appraisal Method for the Assessment of Impacts

The significance of impacts has been assessed in accordance with the EPA Guidelines (EPA 2022). The relevant definitions relating to quality, significance and duration of impacts are defined as per the EPA Guidelines and are set out in Chapter 1 (Introduction) of this EIAR. These have been used to define the category of impacts throughout this chapter. The assessment of impacts is discussed in terms of a range of acoustic parameters.

The key terms discussed in the following sections are summarised as follows:

- **$L_{Aeq,T}$** is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The time period T referred to in this section include the following:
  - **$L_{Aeq,16hr}$**: the daytime ambient noise level between 07:00hrs and 23:00hrs;
  - **$L_{Aeq,18hr}$**: the daytime ambient noise level between 06:00hrs and 00:00hrs;
  - **$L_{Aeq,12hr}$**: the daytime ambient noise level between 07:00hrs and 19:00hrs, which is defined as the L_{day} parameter.
- **L_{ASmax}** is the maximum root mean squared (RMS) A-weighted sound pressure level occurring within a specified time period, measured using the 'Slow' time weighting;
- **L_{den}** is the 24hour noise rating level determined by the averaging of the L_{day} with the $L_{evening}$ (plus a 5dB penalty) and the L_{night} (plus a 10dB penalty). L_{den} is calculated using the following formula, as defined within the Environmental Noise Regulations (S.I.140 / 2006):

$$L_{den} = 10log\left(\frac{1}{24}\right)\left(12 * \left(10^{\frac{Lday}{10}}\right) + 4 * \left(10^{\frac{Levening+5}{10}}\right) + 8 * \left(10^{\frac{Lnight+10}{10}}\right)\right)$$

Where:

- **L_{day}** is the A-weighted long-term average sound level as defined in ISO 1996-2:2017 Part 2: Determination of sound pressure levels (hereafter referred to as ISO 1996-2) (ISO 2017), determined over all the day periods of a year. The 12hr daytime period is between 07:00 to 19:00hrs;

- **$L_{evening}$** is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the evening periods of a year. The 4hr evening period is between 19:00 to 23:00hrs;

- **L_{night}** is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the night periods of a year. The 8hr night-time period is between 23:00 to 07:00hrs.

- **Peak Particle Velocity (PPV)** is a measure of the velocity of vibration displacement in terms of millimetres per second (mm/s). It is defined as follows within BS 7385-2 (BSI 1993) as 'the maximum instantaneous velocity of a particle at a point during a given time interval'; and
- **Vibration Dose Value (VDV)** is an evaluation of human exposure to vibration in buildings. It defines a relationship that yields a consistent assessment of continuous, intermittent, occasional and impulsive vibration and correlates well with subjective response. It is defined as follows within BS 6472-1 (BSI 2008), as:

  'The VDV is the fourth root of the integral of the fourth power of acceleration after it has been frequency-weighted (as defined in BS6472: 2008). The frequency-weighted acceleration is measured in m/s^2 and the time period over which the VDV is measured is in seconds. This yields VDVs in $m/s^{1.75}$.'

As the EPA Guidelines do not quantify the criteria for assessing impacts specifically for noise or vibration, reference has been made to relevant guidelines and standards relating to noise and vibration to further define significance ratings. These are discussed in the following sections.

9.2.4.1 Construction Phase Appraisal of Impacts

Criteria for Rating Construction Noise Impacts

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the Construction Phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion. In general, higher noise levels are tolerated during a Construction Phase of a project compared to its long-term Operational Phase, as construction works are temporary to short term and are varied over the course of the work duration.

In the absence of specific statutory guidance, reference has been made to the TII Noise Guidelines 2004 (NRA 2004), TII Noise Guidelines 2014 (NRA 2014) and

BS 5228–1 (BSI 2014a) in order to review and set appropriate noise construction criteria.

TII Guidelines

The TII Noise Guidelines 2004 (NRA 2004) and TII Noise Guidelines 2014 (NRA 2014) specify noise levels that are deemed acceptable in terms of construction noise for national road projects. These limits have been derived for the construction of new national road projects which predominately pass through rural environments with quieter ambient noise levels compared to those in urban setting. In this instance, these limits are typically lower than those typically used for urban infrastructure projects. These limits are set out in Table 9.3.

Table 9.3: TII Construction Noise Levels at the Façade of Dwellings during the Construction Phase

Days and Times	Noise Levels (dB re 2 x 10^{-5} Pa)	
	L_{Aeq}	L_{ASmax}
Monday to Friday 07:00hrs to 19:00hrs	70	80
Monday to Friday 19:00hrs to 22:00hrs	60*	65*
Saturdays 08:00hrs to 16:30hrs	65	75
Sundays and Bank Holidays 08:00hrs to 16:30hrs	60*	65*

Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the local authority.

British Standard BS 5228 – 1: 2009+A1:2014

Potential noise impacts during the construction stage of a project are often assessed in accordance with BS 5228–1 (BSI 2014a). Various mechanisms are presented as examples of recommended threshold values for determining if an impact is occurring, these are discussed in the following paragraphs.

Potential Significance Based on Noise Change - ABC Method

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on the existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a potential significant noise impact is associated with the construction activities, depending on context.

Table 9.4 sets out the values which, when exceeded, signify a potential significant effect at the facades of residential receptors.

Table 9.4: BS 5228-1 Example of Thresholds of Potential Significant Effect

Assessment Category & Threshold Value Period (LAeq)	Threshold Value (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings & Weekends (19:00 – 23:00hrs weekdays) (13:00 - 23:00hrs Saturdays) (07:00 – 23:00hrs Sundays)	55	60	65
Daytime (07:00 – 19:00hrs) and Saturdays (07:00 – 13:00hrs)	65	70	75
Notes: [A] threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values [B] threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. [C] threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.			

It should be noted that this assessment method is only valid for residential properties and if applied to commercial premises without consideration of other factors may result in an excessively onerous thresholds being set.

Potential Significance Based on Fixed Noise Limits

Section E.2 of BS 5228-1 (BSI 2014a) sets out recommended threshold levels using a fixed limit value set depending on the setting of the noise environment. For example, paragraph E.2 states: -

> *"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."*

Paragraph E.2 goes on to state: -

> *"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:-*
>
> > *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;*
> >
> > *75 decibels (dBA) in urban areas near main roads in heavy industrial areas".*

These limits apply to daytime working outside living rooms and offices. The document notes that where works occur outside other noise sensitive situations with daytime sensitivities, e.g., near hospitals and educational establishments or if works are occurring outside of normal daytime working hours, reduced construction noise levels may be more appropriate.

Proposed Threshold Noise Levels for Proposed Scheme

Taking into account the documents outlined above, the linear and transient nature of construction works associated with the Proposed Scheme, and making reference to the baseline noise environment, Table 9.5 sets out the Construction Noise Threshold (CNT) levels proposed for the construction stage of this development.

Table 9.5: Construction Noise Threshold (CNT) Levels for Proposed Scheme

Period over Which Criterion Applies	Location	Construction Noise Threshold (CNT) (L_{Aeq}, period)
Monday to Friday: Daytime (07:00 – 19:00hrs)	Residential properties & sensitive commercial buildings (e.g., offices) in urban areas near main roads in heavy industrial areas:	75 dB
Monday to Friday: Evening: (19:00 – 23:00hrs)	Residential Properties	65 dB
Monday to Friday: Night-time (23:00 – 07:00hrs)	BS 5228-1: Category A locations BS 5228-1: Category B Locations BS 5228-1: Category C Locations	45 dB 50 dB 55 dB
Saturdays (08:00 – 16:30hrs)	Residential Properties Urban and Suburban	65 dB
Sundays and Bank holidays (08:00 – 13:00hrs)	Residential Properties Urban and Suburban	60 dB

In order to assist with interpretation of CNTs, Table 9.6 includes guidance as to the likely magnitude of impact associated with construction activities, relative to the CNT. This guidance is derived from Table 3.16 of DMRB: Noise and Vibration (UKHA 2020) and adapted to include the relevant significance effects from the EPA Guidelines (EPA 2022).

In accordance with the DMRB Noise and Vibration (UKHA 2020), construction noise and construction traffic noise impacts shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- Ten or more days or night in any 15 consecutive day or nights;
- A total number of days exceeding 40 in any six consecutive months.

Table 9.6: Construction Noise Significance Ratings

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA EIAR Significance Effects	Determination
Negligible	Below or equal to baseline noise level	Not Significant	Depending on CNT, duration & baseline noise level

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA EIAR Significance Effects	Determination
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate	
Moderate	Above CNT and below or equal to CNT +5 dB	Moderate to Significant	
Major	Above CNT +5 to +15 dB	Significant, to Very Significant	
	Above CNT +15 dB	Very Significant to Profound	

The adapted DMRB guidance outlined is used to assess the predicted construction noise levels at NSLs and comment on the likely impacts during the construction stages.

Section 9.3 sets out the baseline noise levels surveyed along the Proposed Scheme. The typical measured daytime baseline noise levels are between 58 to 77 dB$L_{Aeq,T}$ at distances within 1 m to 20 m from the road edge. At the closest properties impacted by the Construction Phase (typically between 1 m and 30 m from construction activities), the average daytime baseline noise level is 67 dB $L_{Aeq,T}$. Based on review of the baseline survey results, the average evening noise level is 2 dB lower than the daytime noise level. In order to categorise the relevant construction noise significance impacts in line with Table 9.6 a daytime baseline noise level of 67 dB $L_{Aeq,12\ hr}$ and an evening baseline noise level of 65 dB $L_{Aeq,4hr}$ has been used when assessing construction noise impacts in Section 9.4.2.2.

Criteria for Rating Construction Traffic Noise Impacts

In order to assist with the interpretation of construction traffic noise, Table 9.7 includes guidance as to the likely magnitude of impact associated with changes in traffic noise levels along an existing road. This is taken from Table 3.17 of the DMRB Noise and Vibration (UKHA 2020).

Table 9.7: Magnitude of Impact Relating to Changes in Road Traffic Noise Level - Construction Phase

Magnitude of Impact	Increase in Traffic Noise Level (dB)	Duration	Initial Significance Rating
Major	Greater than or equal to 5.0	>10 days/nights over 15 consecutive day/nights & >40 days over 6 consecutive months	Significant
Moderate	Greater than or equal to 3.0 and less than 5.0		Significant
Minor	Greater than or equal to 1.0 and less than 3.0		Not Significant
Negligible	Less than 1.0		Not Significant

The overall significance rating is determined taking account of the change in road traffic noise levels in addition to the specific absolute noise level. Further discussion relating to road traffic noise levels and overall significance rating tables are included in Section 9.2.5 dealing with operational traffic noise.

Criteria for Rating Vibration Impacts

Vibration standards deal with two issues: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of PPV for construction activities.

Building Response Criteria

BS 7385 - 2 (BSI 1993) gives guidance regarding acceptable vibration in order to avoid damage to buildings. BS 5228 – 2 (BSI 2014b) reproduces these same guidance values.

These standards differentiate between transient and continuous vibration. Both documents recommend that, for soundly constructed residential property and similar light framed structures that are generally in good repair, a threshold for minor or cosmetic damage (i.e., non-structural damage) should be taken as a PPV (in frequency range of predominant pulse) of 15 mm/s at 4 Hertz (Hz) increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero. Where the dynamic loading caused by continuous vibration is such that it will give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in BS 5228 – 2 (BSI 2014b) may need to be reduced by up to 50%. On a cautious basis, therefore, continuous vibration limits are set as 50% of those for transient vibration across all frequency ranges. Historically important buildings that are difficult to repair might require special consideration on a case-by-case basis, but buildings of historical importance should not be assumed to be more sensitive unless they are structurally unsound.

If a building is in an unstable state, then it will tend to be more vulnerable to the possibility of damage arising from vibration or any other groundborne disturbance. The vibration limit range for protected and historical buildings is equal to or up to 50% of those for light framed buildings, depending on their structural integrity. Where no structural defects are noted, the same limit as those for light framed buildings apply. For other structures and buildings that are determined to be potentially vulnerable to vibration due to significant structural defects, a further stringent criteria have been applied for transient vibration. It is assumed that known buildings and structures of this kind will be subject to condition surveys well in advance of the works, and any identified defects repaired.

The results of the condition surveys will determine whether a building or structure is classed as “vulnerable”. Table 9.8 sets out the limits as they apply to vibration frequencies at 4 Hz where the most conservative limits are required.

At higher frequencies, the relevant limit values for transient vibration within Table B.2 and Figure B.1 of BS5228-2 (BSI 2014b) will apply, with similar

reductions applied for continuous vibration and those for protected structures. For line 2 of Figure B.1. at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded. Taking the above into consideration the vibration criteria for building response is set out in Table 9.8.

Table 9.8: Recommended Construction Vibration Thresholds for Buildings

Vibration Limits for Buildings (PPV) at the closest part of building to the source of vibration, at a frequency of 4Hz		
Building Type	Transient Vibration	Continuous Vibration
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s	25 mm/s
Unreinforced or light framed structures. Residential or light commercial-type buildings	12.5 mm/s	6 mm/s
Protected and Historic Buildings *Note 1	6 mm/s – 12.5 mm/s	3 mm/s – 7 mm/s
Identified Potentially Vulnerable Structures and Buildings with Low Vibration Threshold	3 mm/s	

Note 1: The relevant threshold value to be determined on a case-by-case basis. Where sufficient structural information is unavailable at the time of assessment, the lower values within the range will be used, depending on the specific vibration frequency.

Human Response Criteria

Humans are sensitive to vibration stimuli, and perception of vibration at high magnitudes may cause concern to building occupants. BS 5228–2 (BSI 2014b) notes that vibration typically becomes perceptible at around 0.15 to 0.3 mm/s and may become disturbing or annoying at higher magnitudes.

Table 9.9 presents the significance table relating to potential impacts to building occupants during construction based on guidance from BS 5228 – 2 (BSI 2014b), DMRB Noise and Vibration (UKHA 2020). and associated EPA significance ratings.

Table 9.9: Human Response Vibration Significance Ratings

Criteria	**Likely Effect (DMRB)**	**Significance Rating**
≥10 mm/s PPV	Major	Significant to Very Significant
≥1 to <10 mm/s PPV	Moderate	Moderate to Significant
≥0.3 to <1 mm/s PPV	Minor	Not Significant to Slight
≥0.14 to 0.3mm/s PPV	Negligible	Imperceptible to Not significant
Less than 0.14 mm/s PPV		Imperceptible

Disturbance of Particularly Vibration Sensitive Equipment or Processes

There are no standard criteria for assessing the potential impacts of vibration on sensitive equipment or processes. BS 5228–2 (BSI 2014b) provides a guide of vibration sensitivities of differing types of sensitive equipment from microscopes

to microelectronic manufacturing equipment. However, these ranges are generic and relate to the sensitivity of the equipment as installed, not the external façade of the building. The most advisable approach for the control of potential vibration impacts at areas of vibration sensitive equipment or processes, was to review each location on its own merit to determine the site-specific vibration limits taking into account any building or machinery isolation already in place. In this instance, if a receptor was identified or made known within the study area for being potentially sensitive to vibration, this area would be highlighted for consideration.

9.2.5 Operational Phase Appraisal of Impacts

Changes in Traffic Noise

The Proposed Scheme will be located along the existing road network which will be reconfigured at various locations to facilitate the Proposed Scheme. Once operational, the Proposed Scheme will include a realigned road corridor comprising dedicated footpaths, cycle lanes, bus lanes, and other vehicular lanes. Given that sections of the existing road network already carry traffic, it is appropriate to consider the change in traffic noise level that will arise as a result of changes in traffic flow (in terms of volume and fleet mix) and the realignment of traffic lanes, where relevant.

In the absence of any Irish guidelines or standards describing the effects associated with changes in road traffic noise levels, reference has been made to the DMRB Noise and Vibration (UKHA 2020). The DMRB Noise and Vibration (UKHA 2020) document provides magnitude rating tables relating to changes in road traffic noise. The document suggests that during the year of opening the magnitude of impacts between the Do Minimum and the Do Something scenarios are likely to be greater compared to the longer-term period (fifteen years post opening) when people are used to the noise level change.

For the Proposed Scheme, the initial significance criteria are used to describe the magnitude of change for the short- and medium-term period (the year of opening up to 15 years post). For these assessment years, a 1 dB change between the Do Minimum and Do Something scenarios (refer to Chapter 6 (Traffic and Transport) of this EIAR for full description of these modelled traffic scenarios) is the smallest that is considered perceptible. Table 9.10 summarises the potential impact associated with defined changes in traffic noise level during the short to medium periods of the scheme's operation.

Table 9.10: Significance of Change Criteria – Short to Medium Term

Change in Noise Level, dB	Short to Medium Term Magnitude	Initial Significance Rating
Greater than or equal to 5.0	Major	Significant
3.0 to 4.9	Moderate	Significant
1.0 to 2.9	Minor	Not Significant
Less than 1.0	Negligible	Not Significant

Where changes in traffic noise levels at NSLs along the Proposed Scheme in the short to medium term are less than 3 dB, the impact is deemed Not Significant.

Where changes in traffic noise levels are greater than 3 dB, the impact is deemed to be potentially Significant.

Further consideration of the magnitude of change in noise levels are determined for the long-term period (i.e., between the year of opening Do Minimum and the design year Do Something).

For this assessment year (design year 2038), a 3 dB change is the smallest that is considered to have any notable impact when considered over the life span of the project (the long term 15 year period between year of opening and design year in accordance with the DMRB Noise and Vibration (UKHA 2020) guidance document). Table 9.11 summarises the significance criteria associated with defined changes in traffic noise level between the Do Minimum and Do Something scenarios during the long-term period.

Table 9.11: Significance of Change Criteria – Long-Term

Change in Noise Level, dB	Long-Term Magnitude	Initial Significance Rating
Greater than or equal to 10.0	Major	Significant
5 to 9.9	Moderate	Significant
3.0 to 4.9	Minor	Not Significant
Less than 3.0	Negligible	Not Significant

Absolute Noise Levels

The absolute noise level is an important consideration when determining the response to noise levels along affected roads within the study area. This is particularly valid for locations where a 'moderate' or 'major' magnitude of change rating applies against comparably low absolute noise levels.

There are no statutory guidelines associated with road traffic noise levels in Ireland. There are no new roads associated with the Proposed Scheme and therefore application of a road traffic noise design threshold is not appropriate in this instance. Notwithstanding, it is important to provide context for the range of traffic noise levels along the Proposed Scheme which includes an extensive existing road network with varying traffic volumes and associated varying levels of road traffic noise.

The most appropriate documentation for guidance on road traffic noise level ranges across the study area is the Galway City Council Noise Action Plan 2019-2023 (NAP). This document proposes the following thresholds for onset of assessment for noise mitigation measures due to road traffic:

- 70 dB, L_{den}
- 57 dB, L_{night}

The following thresholds are also used to define a Quiet Area:

- <55 dB L_{day}
- <45 dB L_{night}

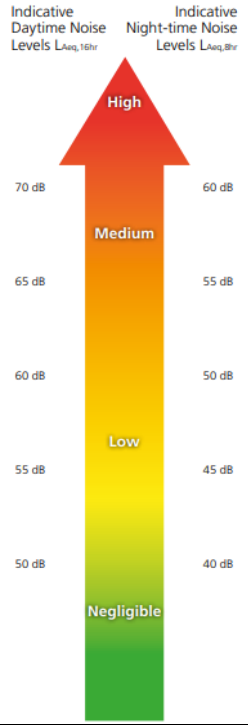
To further define noise levels between these thresholds reference is made to ProPG (IoA 2017). Whilst the scope of this document is used for the consideration of new residential development exposed to transport sources, the range of noise levels included provides a means of further categorising road traffic noise between the upper and lower threshold values described in the NAP with respect to noise sensitive properties.

This document categorises noise level ranges from Negligible (< 50 dB $L_{Aeq,16hr}$ /< 40 dB $L_{Aeq,8hr}$) to High (< 70 dB $L_{Aeq,16hr}$ /< 60 dB $L_{Aeq,8hr}$) in steps of 5 dBA to enable a site-specific risk assessment for an area to be undertaken depending on its noise exposure ranges.

It is noted that the daytime period within the ProPG (IoA 2017) document is described using the $L_{Aeq,16hr}$ parameter. This is the L_{Aeq} noise level between 07:00hrs and 23:00hrs which encompasses the L_{day} (07:00hrs to 19:00hrs) and $L_{evening}$ (19:00hrs to 23:00hrs) periods. The night-time period is described using the $L_{Aeq,8hr}$ parameter, i.e., the L_{Aeq} noise level between 23:00 and 07:00hrs which is equivalent to the L_{night} and used in the NAP.

Table 9.12 combines the threshold values from both documents to provide a combined range of noise level categories and their noise exposure levels. For the purposes of this assessment, the daytime period is defined as the $L_{Aeq,16hr}$ to capture both the L_{day} and $L_{evening}$ periods.

Table 9.12: Noise Level Ranges and Exposure Categorisation (ProPG 2017 & Galway City Council Noise Action Plan)

<table>
<tr><td rowspan="7"> 
</td><td>Daytime: dB $L_{Aeq,16hr}$</td><td>Night-time: dB $L_{Aeq,8hr}$</td><td>Pro PG - Noise Risk Assess Pro PG - Noise Risk Assessment</td><td>Galway City Council Noise Action Plan</td></tr>
<tr><td>>70dB</td><td>>60</td><td>High</td><td>High day level</td></tr>
<tr><td>65 – 70</td><td>55 - 60</td><td>Medium – High</td><td>High night level</td></tr>
<tr><td>60 – 65</td><td>50 - 55</td><td>Medium</td><td rowspan="2"></td></tr>
<tr><td>55 – 60</td><td>45 - 50</td><td rowspan="2">Low – Medium</td></tr>
<tr><td><55</td><td><45</td><td rowspan="2">Good day time level
Good night level</td></tr>
<tr><td><50</td><td><40</td><td>Negligible</td></tr>
</table>

Both documents define a daytime noise level below 55 $dBL_{Aeq,16hr}$ as being Low/Good, and both define daytime noise levels above 70 $dB_{Aeq,16hr}$ as High. For night-time periods, noise levels below 45 $dBL_{Aeq,8hr}$ are defined as being low with increasing magnitude of impact with higher noise levels.

As part of the noise impact assessment consideration is given to the magnitude of change in traffic noise levels in addition to the noise level category in which a road is defined.

WHO Environmental Noise Guidelines (WHO 2018)

The WHO Environmental Noise Guidelines (WHO 2018) provide recommendations for protecting human health from exposure to environmental noise originating from various sources. For road traffic, the WHO Environmental Noise Guidelines (WHO 2018) document recommends limiting traffic noise to below 53 dBL_{den} and below 45 dBL_{night}. The recommended road traffic noise levels within the WHO guidance are set on the basis of limiting annoyance and sleep disturbance.

The WHO Environmental Noise Guidelines (WHO 2018) guideline values are recommended to serve as the basis for policy-making process, to allow public health orientated recommendations to control noise exposure within populations on a European and national level.

The WHO Environmental Noise Guidelines (WHO 2018) document states the following regarding the implementation of the guidelines:

> "*The WHO guideline values are evidence-based public health-oriented recommendations. As such, they are recommended to serve as the basis for a policy-making process in which policy options are considered. In the policy decisions on reference values, such as noise limits for a possible standard or legislation, additional considerations – such as feasibility, costs, preferences and so on – feature in and can influence the ultimate value chosen as a noise limit. WHO acknowledges that implementing the guideline recommendations will require coordinated effort from ministries, public and private sectors and nongovernmental organizations, as well as possible input from international development and finance organisations."*

These guidelines are to be considered therefore in the context of national policy making to adopt and/or propose alternative noise limits for use, should they be deemed feasible, based on a range of factors which must be considered. In making these decisions, economic, physical, and social considerations all need to be factored in. It is important, therefore, to highlight that the WHO Environmental Noise Guidelines (WHO 2018) should be considered across populations as a whole and used to review and manage health related noise exposure across national and European populations. They set a guideline as to what is desirable at a population level. They are not always achievable and are not intended to be applied as a level on an individual receptor or project basis.

It is important to put the WHO Environmental Noise Guidelines (WHO 2018) recommended traffic noise limits into context with respect to the existing noise levels within Galway City. For the existing road network within Galway City, the

most recent NAP notes that the existing road network already contributes to road traffic noise above the recommended levels within the WHO Environmental Noise Guidelines (WHO 2018) for a large portion of the population.

An important part of the WHO guidelines relates to the recommended interventions or mitigation measures to be considered with respect to controlling and reducing road traffic noise exposure across populations. These include:

- changes in infrastructure;
- reduction in road traffic flows;
- pathway interventions (barriers), and
- quieter road surfaces.

The NAP includes further mitigation options to reduce traffic noise at exposed populations as part of the next 5-year plan. These include national and regional level strategies for improved public transport. Other key intervention strategies include but are not limited to; replacement of diesel fleet to electric / natural gas vehicles, restrictions to HGV / truck routes, traffic re-routing and / or road closures and road resurfacing.

The Proposed Scheme forms a key part of implementing the noise mitigation strategies discussed within the NAP which also aligns with the recommended interventions and overall policies of the WHO Environmental Noise Guidelines (WHO 2018) to reduce population exposure to road traffic noise.

The absolute noise levels within the WHO Environmental Noise Guidelines (WHO 2018) are not used to compare against at individual properties, however, changes in traffic noise levels are reviewed in the overall context of the Proposed Scheme to assess against the broad principles of the WHO Environmental Noise Guidelines (WHO 2018).

Significance Ratings

The following overall significance ratings for the Operational Phase of the Proposed Scheme are applied along the road network taking account of both the calculated changes in road traffic noise levels (Table 9.10 and Table 9.11) and the noise level ranges at NSLs. A daytime threshold value of 55 dB $L_{Aeq,16hr}$ and a night-time threshold value of 45 dB $L_{Aeq,8hr}$ has been applied for significance ratings, irrespective of the magnitude of change in noise levels. Operational traffic noise levels below these threshold levels during the Do Something scenarios are not considered to pose a significant noise impact such that overall significance ratings are not significant to slight depending on the change in noise levels.

The overall significance ratings are shown in Table 9.13 with the relevant L_{den} range in brackets. The L_{den} is converted from the $L_{Aeq,16hr}$ shown above by using the following formula:

$$L_{den} = 0.86(L_{Aeq,16hr} + 2) + 9.86$$

This is calculated assuming a conversion of $L_{A10,18hr} = L_{Aeq,16hr} - 2$, which is the average conversion across the Proposed Scheme, as calculated from the baseline noise measurements.

Table 9.13: Significance Ratings for Operational Phase Traffic Noise Impacts

Noise Level Range (day/night) (L_{den})	Magnitude of Change in Noise Levels (Short to Medium Term & Long Term)				
	No Change / Reduction	Negligible	Minor	Moderate	Major
Negligible (< 52 dBA)	Imperceptible / Positive	Not Significant	Not Significant	Not Significant	Not Significant - Slight
Negligible – Low (52 – 57 dBA)	Imperceptible / Positive	Not Significant	Not Significant	Not Significant - Slight	Slight
Low – Medium (57 – 62 dBA)	Imperceptible / Positive	Not Significant	Slight	Slight - Moderate	Moderate
Medium (62 – 67 dBA)	Imperceptible / Positive	Not Significant	Slight	Moderate	Moderate - Significant
Medium – High (67 – 72 dBA)	Imperceptible / Positive	Not Significant	Slight - Moderate	Moderate - Significant	Significant
High (> 72 dBA)	Imperceptible / Positive	Not Significant - Slight	Slight - Moderate	Significant	Very Significant

9.2.5.1 Operational Vibration

Magnitudes of vibration associated with road traffic are orders of magnitude below those associated with building or structural response to vibration. Operational phase impacts are therefore limited to human response to vibration where much lower magnitudes of vibration apply.

In terms of human response, vibration associated with road traffic is negligible and generally do not result in perceptible levels of vibration within buildings along normal maintained roads with no significant defects. Notwithstanding, reference is made to BS 6472–1 (BSI 2008) which provides the following VDV ranges which result in various probabilities of adverse comment resulting from exposure to vibration within residential buildings, refer to Table 9.14. An adverse comment is an unfavourable human reaction or response to vibration in accordance with BS 6472–1 (BSI 2008). Specific vibration data for the Operational Phase are included in Section 9.4.4.

Table 9.14: BS 6472 -1 VDV Ranges and Associated Impact Probabilities for Building Occupants (BSI 2008)

Place and Time	Low Probability of Adverse Comment $m \cdot s^{-1.75}$ (Note 1)	Adverse Comment Possible $m \cdot s^{-1.75}$	Adverse Comment Probable $m \cdot s^{-1.75}$ (Note 2)
Residential buildings 16-hour day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8-hour night	0.1 to 0.2	0.2 to 0.4	to 0.8

Note 1: Below these ranges adverse comment is not expected.
Note 2: Above these ranges adverse comment is very likely.

9.3 Baseline Environment

The baseline noise environment has been characterised with measured noise levels. The following sections summarise the results of the baseline noise surveys. Full details of the baseline surveys, including methodologies, survey dates, terminology and glossary, and results are included in Appendix 9.1 in Volume 4 of this EIAR.

The survey results are presented as the average daytime L_{Aeq} parameter, sampled over a three-hour daytime survey period and the calculated L_{den} parameter.

The noise survey results recorded during the baseline surveys in the study area are summarised in Table 9.15.

Table 9.15: Noise Monitoring Results

Attended Location	Average daytime, $L_{Aeq,T}$ (dB)	L_{den} (dB)
University Road	68	71
232 Corrib Park	58	62
81 Ardiluan Road	63	65
24 Inchagill Road	62	64
N6/Upper Newcastle Road	71	72
188 Dun Na Coiribe	63	65
120 College Road	67	70
Lough Atalia Road (behind 118 College Road)	76	77
Presentation Road	65	68
Woodquay	63	66
Eyre Street	60	63
Bothar na mBan	69	72
Fairgreen Road	67	78
Fairgreen Road/Lough Atalia Road	76	78
Middle Street	59	61

Noise at the measurement locations was dominated by road traffic noise in addition to localised urban noise sources (e.g., pedestrian conversations), and sporadic bird song.

Average daytime noise levels at the measurement locations ranged from 58 to 76 $dBL_{Aeq,T,}$ with the higher values being recorded along highly trafficked roads.

L_{den} values calculated for the measurement locations ranged between 62 and 78 dBL_{den}.

9.4 Potential Impacts

9.4.1 Do Minimum Scenario

The Do Minimum scenario is a defined scenario within the traffic modelling exercise in the Traffic and Transport (Chapter 6) of this EIAR. The output of this analysis has been used for traffic noise calculations. The Do Minimum scenario considers a range of committed developments and transport plans within the study area for the year of opening (2023) and the design year (2038). Refer to the Traffic and Transport (Chapter 6) of this EIAR for a full description of the assumptions included in the Do Minimum scenario forecast years.

Traffic flows associated with the Do Minimum scenario have been assessed as part of the operational traffic noise impact assessment. This is set out in Section 9.4.3

9.4.2 Construction Phase

9.4.2.1 Construction Impact Assessment

The TII Noise Guidelines 2004 (NRA 2004) and TII Noise Guidelines 2014 (NRA 2014) specifically note that there is limited information available on specific construction methods, numbers and types of plant before the appointment of a Contractor, which will normally happen after a scheme has been approved. The guidelines note that it is more appropriate to address the way in which potential construction impacts will be assessed and how they will be managed, including forms of mitigation and codes of practices that will be applied.

Whilst the phasing of works and location of activities and work sites have been progressed to detailed stages as part of the EIAR, the specifics in terms of plant items, plant numbers, their locations and operational duration will be subject to site conditions, work scheduling and contractor proposals. Notwithstanding, it is possible to determine indicative noise levels associated with typical construction activities associated with the various phases of works.

The TII Noise Guidelines 2004 (NRA 2004) and TII Noise Guidelines 2014 (NRA 2014) note that in the absence of an Irish or international standard relevant to construction noise, reference can be made to BS 5228 – 1 (BSI 2014a) and BS 5228 – 2 (BSI 2014b). These standards include recommended methodologies for calculating Construction Noise Levels (CNL) and include a range of best practice mitigation and management measures for the control of noise and vibration from construction sites.

In terms of calculation, BS 5228 – 1 (BSI 2014a) sets out sound pressure levels for a wide range of plant items normally encountered on construction sites, which in turn enables the prediction of indicative noise levels at distances from the works. BS 5228 – 2 (BSI 2014b) also includes empirical data on vibration levels measured at set distances from specific vibration generating activities in different ground and site conditions.

9.4.2.2 Construction Activity Noise

Due to the nature of the activities undertaken on a construction site, there is the potential for high noise levels from some activities. The flow of vehicular traffic to and from a construction site is also a potential source of noise. The impact at nearby NSLs will depend upon a number of variables, including:

- the amount of noise generated by plant and equipment being used at any one time generally expressed as a sound power level;
- the periods of operation of the plant at the development site, known as the "on-time";
- the distance between the noise source and the NSLs;
- the attenuation due to ground absorption or barrier screening effects; and
- reflections of noise due to the presence of hard vertical surfaces such as walls.

Using the typical noise levels for items of construction plant set out in BS 5228 – 1 (BSI 2014a), CNLs at specific distances have been calculated to determine a range of potential noise levels representative of the key Construction Phases of the Proposed Scheme. The following sections set out the calculated CNLs associated with the key phases of construction representing the closest NSLs to the likely work phases.

Along the Proposed Scheme, the key Construction Phases of the project are:

- General road works;
- Road widening and road surface upgrade activities;
- Utility diversions;
- Urban realm landscaping, including repaving and excavation for planting of trees;
- Construction Compounds, which will be used for storage of materials, plant and equipment, site offices, worker welfare facilities and limited car parking.

Items of plant and equipment that may be used during construction are identified in Chapter 5 (Construction) of this EIAR. Typical operating on-times have been developed for the purposes of construction noise calculation. The plant items along with their associated sound pressure levels taken from BS 5228 – 1 (BSI 2014a) are summarised in Table 9.16.

The calculations set out in the following sections do not include any attenuation from screening of site hoarding, buildings or structures, hence relate only to uninterrupted distance attenuation over hard ground.

NSLs located beyond the road edge, which are screened by intervening buildings and solid boundary treatments, therefore, will experience lower construction noise emissions than those presented at the varying distances set out in the following sections.

Table 9.16: Indicative Plant Noise Levels and Predicted CNL at Varying Distances

Plant Item (BS 5228 Ref.)	Plant Noise Level at 10m Distance (dB $L_{Aeq,12hr}$ or $L_{Aeq,4hr}$)	% Plant On-Time	Predicted CNL at Stated Distance from Edge of Works Based on % Plant On-Time (dB $L_{Aeq,12hr}$ or $L_{Aeq,4hr}$)						
			10 m	15 m	20 m	30 m	50 m	100 m	150 m
Lorry (Table C2.34)	80	40	76	72	70	66	62	56	52
Backhoe Mounted Hydraulic Breaker (Table C5.1)	88	20	81	77	75	71	67	61	57
Tracked Excavator 8t (Table C4.17)	71	100	71	67	65	61	57	51	47
Wheeled Excavator 14t (Table C4.56)	83	40	79	75	73	69	65	59	55
Wheeled Excavator 17t (Table C5.11)	73	40	69	65	63	59	55	49	45
Dumper (Table D3.98)	77	50	74	70	68	64	60	54	50
Road Planer (Table C5.7)	82	10	72	68	66	62	58	52	48
Road Sweeper (Table C4.90)	76	15	67	63	61	57	53	47	43
Asphalt Paver (Table C5.33)	75	15	66	62	60	56	52	46	42
Asphalt Roller (Table C5.20)	75	20	68	64	62	58	54	48	44
Roller 3t (Table C5.27)	67	50	64	60	58	54	50	44	40
Diesel generator (Table C4.79)	64	100	64	60	58	54	50	44	40
Crusher (Table C1.14)	81	40	81	78	75	71	67	63	61

General Road Works

This section assesses the indicative noise levels generated from general road works. As per the noise levels presented in Table 9.16, noise levels for plant types typically associated with general road works (lorries, dumpers, road planers, pavers and rollers), are typically in the range of 64 to 76 $dBL_{Aeq,T}$ at 10 m taking account of their typical 'on-time' in a working area. Table 9.17 presents the predicted CNL at different distances associated road works activity. The plant noise level has been calculated accounting for the fact that plant items will be operating at varying distances from a NSL at any one time. The calculated levels relate to activities operating over a full day, full evening or Saturday period.

Table 9.17: Indicative Road Works Construction Noise Calculations at Varying Distances

Predicted CNL at Stated Distance from Edge of Works Based on % Plant On-Time and Plant Items Operating Simultaneously (dB $L_{Aeq,12hr}$ or $L_{Aeq,4hr}$)								
10m	**15m**	**20m**	**30m**	**50m**	**75m**	**100m**	**150m**	**250m**
79	76	73	69	65	61	59	55	51

During normal road work the daytime CNT value of 75 $dBL_{Aeq,12hr}$ Monday through Friday (07:00 to 19:00hrs) is likely to be exceeded at distances of up to 15 m from the works boundary in the absence of any noise mitigation. The evening and weekend CNT value of 65 $dBL_{Aeq,T}$ would be exceeded at distances up to 50 m in the absence of any mitigation. Noise mitigation will therefore be required to reduce CNLs from this type of activity, particularly during any evening and weekend works. The identified areas where this work will take place and calculated construction noise levels are presented in Table 9.18. The identified NSLs are those which bound the road edge and are not screened by other buildings. The identified NSL list in Table 9.18 is representative of all receptors but does not list each individual NSL.

Table 9.18: Road Works Construction Noise Calculations at Nearest Noise Sensitive Locations

Construction Section Reference	Nearest NSL to Edge of Works	Predicted Total Construction Noise Level at Stated Distance from Edge of Works (dB $L_{Aeq,T}$)
Section A1	Residential NSLs south of University Road (<10m)	79
Section A2	SOTI Inc.to south-west of Gaol Road (<10m)	79
Section A3	Alastair Purdy & Co. Solicitors to east of Salmon Weir Bridge (<30m)	69
Section A4	Galway Diocesan Pastoral Centre to east of Newtownsmith Road (<10m)	79
Section A5	Residential NSLs to south of Corrib Terrace (<10m)	79
Section A6	Residential NSLs to east of Headford Road (<10m)	79
Section A7	Mercy Primary School to east of St. Francis Street (<10m)	79
Section A8	Residential NSLs to east of Woodquay Street (<10m)	79
Section B1	Residential NSLs to east of t. Brendan's Avenue (<10m)	79
Section B2	Residential and retail NSLs to east of the R336 (<10m)	79
Section B3	ESB Galway to east of Eyre Square (<10m)	79
Section B4	AIB Galway to east of Victoria Pl. (<10m)	79
Section B5	Eyre Square Hotel to east of Forster Street (<10m)	79

Construction Section Reference	Nearest NSL to Edge of Works	Predicted Total Construction Noise Level at Stated Distance from Edge of Works (dB $L_{Aeq,T}$)
Section B6	Intreo Centre Galway south-east of junction, east of Fairgreen Road (<10m)	79
Section B7	SIPTU Galway to north-east of Bóthar Bhreandain Uí Eithir (<10m)	79
Section B8	Fairgreen house to west of Fairgreen Road (<10m)	79
Section C1	Residential NSLs to south of Forster Street (<10m)	79
Section C2	Residential NSLs to west of College Road (<10m)	79
Section C3	Residential NSLs to east of College Road (<10m)	79
Section C4	Residential NSL north of junction, west of Wellpark Road (<10m)	79
Section C5	The g Hotel & Spa, Wellpark to north of Dublin Road (<20m)	73

As summarised in Table 9.18, general road works realignments are within 10 m to 30 m of the nearest NSLs. The potential cumulative noise levels for these works at the closest NSL façades are between 69 to 79 $dBL_{Aeq,T}$ in the absence of any noise mitigation. The potential noise impacts range between Negative, Slight to Significant, and Temporary during the daytime period and Negative, Moderate to Very Significant, and Temporary during the evening and weekend periods in the absence of noise mitigation.

Reference to Table 9.16 indicates that the highest noise levels will occur when road planers are operating near the NSLs. During specific periods when these activities are operating immediately outside NSLs, higher noise levels will occur compared to those discussed in Table 9.18. Specific plant will operate only intermittently at any one location over the course of a working day.

Road Widening, Road Upgrade and Utility Diversion Construction Works

This section assesses the indicative noise levels generated from road widening and utility diversion activities. Construction plant typically associated with road widening and utility diversion works (i.e., lorries, breakers, excavators (including vacuum excavators), dumpers, road planers, sweepers, pavers and rollers) will operate as required depending on the specific activity taking place. As per Table 9.16, noise levels associated with these activities are typically in the range of 64 to 82 $dBL_{Aeq,T}$ at 10 m taking into account their typical ‘on-time’. Table 9.19 presents the predicted CNL associated with the proposed works for this element of the construction phase, assuming six items of plant operating simultaneously. The calculated levels relate to activities operating over a full day, full evening or Saturday period.

Table 9.19: Indicative Road Widening and Utility Diversion Construction Work Noise Calculations at Varying Distances

Predicted CNL at Stated Distance from Edge of Works Based on % Plant On-Time and Plant Items Operating Simultaneously (dB $L_{Aeq,12hr}$ or $L_{Aeq,4hr}$)								
10m	**15m**	**20m**	**30m**	**50m**	**75m**	**100m**	**150m**	**250m**
84	81	78	74	70	66	64	60	56

During road widening and utility diversion works, the daytime CNT value of 75 $dBL_{Aeq,12hr}$ Monday through Friday (07:00 to 19:00hrs) is likely to be exceeded at distances of up to 25 m from the works boundary in the absence of any noise mitigation.

The evening and weekend CNT value of 65 $dBL_{Aeq,T}$ is likely to be exceeded at distances up to 75 m in the absence of any mitigation. Noise mitigation will therefore be required to reduce CNLs from this activity, particularly during any evening and weekend works. Potential construction noise levels at nearby NSLs are presented in Table 9.20.

Table 9.20: Road Widening, Road Upgrade and Utility Diversion Construction Noise Calculations at Nearest NSLs

Construction Section Reference	Nearest NSL to Edge of Works	Potential Total CNL at Stated Distance from Edge of Works (dB $L_{Aeq,T}$)
Section A1	Residential NSLs south of University Road (<10m)	84
Section A2	SOTI Inc. to south-west of Gaol Road (<10m)	84
Section A3	Alastair Purdy & Co. Solicitors to east of Salmon Weir Bridge (<30m)	74
Section A4	Galway Diocesan Pastoral Centre to east of Newtownsmith Road (<10m)	84
Section A5	Residential NSLs to south of Corrib Terrace (<10m)	84
Section A6	Residential NSLs to east of Headford Road (<10m)	84
Section A7	Mercy Primary School to east of St. Francis Street (<10m)	84
Section A8	Residential NSLs to east of Woodquay Street (<10m)	84
Section B1	Residential NSLs to east of t. Brendan's Avenue (<10m)	84
Section B2	Residential and retail NSLs to east of the R336 (<10m)	84
Section B3	ESB Galway to east of Eyre Square (<10m)	84
Section B4	AIB Galway to east of Victoria Pl. (<10m)	84
Section B5	Eyre Square Hotel to east of Forster Street (<10m)	84
Section B6	Intreo Centre Galway south-east of junction, east of Fairgreen Road (<10m)	84
Section B7	SIPTU Galway to north-east of Bóthar Bhreandain Uí Eithir (<10m)	84
Section B8	Fairgreen house to west of Fairgreen Road (<10m)	84
Section C1	Residential NSLs to south of Forster Street (<10m)	84

Construction Section Reference	Nearest NSL to Edge of Works	Potential Total CNL at Stated Distance from Edge of Works (dB $L_{Aeq,T}$)
Section C2	Residential NSLs to west of College Road (<10m)	84
Section C3	Residential NSLs to east of College Road (<10m)	84
Section C4	Residential NSL north of junction, west of Wellpark Road (<10m)	84
Section C5	The g Hotel & Spa, Wellpark to north of Dublin Road (<20m)	78

As summarised in Table 9.20 above, road widening works are within 10 m to 30 m of the nearest NSLs. The highest potential cumulative CNL for these works at the closest NSL façades are between 74 to 84 $dBL_{Aeq,T}$ in the absence of any noise mitigation.

The potential noise impacts range between Negative, Slight to Significant and Temporary during the daytime period and Negative, Moderate to Very Significant, and Temporary during the evening and weekend periods in the absence of noise mitigation.

The calculations are based on six plant items operating simultaneously, in the absence of any noise mitigation along a given section of road. The plant noise levels have been calculated on the basis that plant will be operating at varying distances from a NSL at any one time. Reference to Table 9.16 indicates that highest noise levels will occur when breaking, excavators and road planers are operating near NSLs. During specific periods when this plant is operating immediately outside NSLs, higher noise levels will occur at these closest NSLs. These activities will only occur for intermittent periods at any one location.

Urban Realm Landscaping

This section assesses the indicative noise levels generated from urban realm landscaping, including repaving and excavation for planting of trees. As per Table 9.16, for plant typically associated with urban realm landscaping, including lorries, excavators and pavers, noise levels are typically in the range of 66 to 76 $dBL_{Aeq,T}$ at 10 m taking into account typical 'on-time'. Table 9.21 outlines the predicted CNL associated with the proposed works, assuming three items of plant.

Table 9.21: Indicative Urban Realm Landscaping Construction Noise Calculations at Varying Distances

Predicted CNL at Stated Distance from Edge of Works Based on % Plant On-Time and Three Plant Items Operating Simultaneously (dB $L_{Aeq,12hr}$ or $L_{Aeq,4hr}$)								
10m	**15m**	**20m**	**30m**	**50m**	**75m**	**100m**	**150m**	**250m**
79	76	73	69	65	61	59	55	51

During urban realm landscaping works, the daytime CNT value of 75 $dBL_{Aeq,12hr}$ Monday through Friday (07:00 to 19:00hrs) is likely to be exceeded at distances of up to 15 m from the works boundary in the absence of any noise mitigation.

The evening and weekend CNT value of 65 $dBL_{Aeq,T}$ would be exceeded at distances of up to 50 m in the absence of any mitigation. Noise mitigation will therefore be required to reduce CNLs from this activity, particularly during any evening and weekend works. The identified areas where this work will take place and calculated construction noise levels are presented in Table 9.22.

Table 9.22: Urban Realm Landscaping Construction Noise Calculations at Nearest NSLs

Construction Section Reference	Nearest NSL to Edge of Works	Predicted Total CNL at Stated Distance from Edge of Works (dB $L_{Aeq,T}$)
Section A2	Residential NSL and County Club to the east of the existing Goal Road carriageway, south-east of Galway Cathedral (<20m)	73
Section A4	Galway Courthouse to the east of the Waterside Road (<10m)	79
Section A5	San Antonio Guesthouse to the east of Headford Road, at junction corner that intersects Bothar na mBan (<10m)	79
Section A8	Residential NSL to east of Woodquay (<10m)	79
Section B2	Mapfre Assistance east of Prospect Hill (<10m)	79
Section B3	McInerney Solicitors to north of An Fhaiche Mhor - North of the Liam Mellows Statue (<10m)	79
Section C2	Residential NSL to west of existing junction College Road (<10m)	79

During urban realm landscaping works the nearest NSLs are within 10 m to 20 m of the proposed works. The highest potential cumulative noise levels for these works are in the range of 73 to 79 dBL_{Aeq} in the absence of any noise mitigation. The potential noise impacts range between Negative, Slight to Significant, and Temporary during the daytime period and Negative, Moderate to Very Significant, and Temporary during the evening and weekend periods in the absence of noise mitigation.

Construction Site Compounds

For Construction Compound areas (used for storage, offices, generators and material handling) a total CNL of 78 $dBL_{Aeq,T}$ at 10 m has been used for the purposes of indicative calculations. Table 9.23 outlines the potential CNLs associated with the proposed works for this element of the construction.

Given the variations of on-site activities and noise levels over any one day and considering that all activities will not operate simultaneously, the values noted above are considered robust for the purposes of assessing potential construction impacts.

Table 9.23: Indicative Construction Compound Construction Noise Calculations at Varying Distances

Predicted CNL at Stated Distance from Edge of Works Based on % Plant On-Time (dB $L_{Aeq,T}$)								
10m	**15m**	**20m**	**30m**	**50m**	**75m**	**100m**	**150m**	**250m**
78	75	72	68	64	60	58	54	50

The predicted values outlined in Table 9.23 indicate the daytime CNT value of 75 dB $L_{Aeq, 12hr}$ Monday through Friday (07:00 to 19:00hrs) is likely to be exceeded within 15 m of the construction compound. The evening and weekend CNT value of 65 dB $L_{Aeq,T}$ is also likely to be exceeded within 50 m of the construction compound.

The identified areas where this work will take place and calculated construction noise levels are presented in Table 9.24.

Table 9.24: Construction Site Compounds Construction Noise Calculations at Nearest NSLs

Construction Section Reference	Nearest NSL to Edge of Works	Predicted Total CNL at Stated Distance from Edge of Works (dB $L_{Aeq,T}$)
Section A2	SOTI Inc. to south-west of Gaol Road (<15m)	75
Galway Harbour Enterprise Park	Galway Bay Seafood Shop to north of New Docks Road (<150m)	54

9.4.2.3 Construction Vibration

The potential for elevated levels of vibration at sensitive locations during construction activities associated with the Proposed Scheme is typically associated with surface breaking activities and road widening.

During surface breaking activities, there is potential for vibration to be generated through the ground. Empirical data for this activity is not provided in BS5228-2, however, the likely levels of vibration from this activity will be significantly below any vibration criteria for building damage (based on experience from other sites).

Data from previous projects with similar activities shows that for breaker activities, a vibration level of between 1.5 and 0.25 mm/s PPV can be expected between 10 and 50 m away, respectively. These measurements are for a breaker working on a concrete slab. It is expected that for breakers working on road surfaces, the vibration levels will be less than these measured levels.

Widening and upgrading of existing footpaths and kerbs will involve careful deconstruction using controlled techniques. Vibration levels associated with this activity will be of similar or lower magnitude to breaking activities discussed above.

With reference to the vibration levels above and the significance ratings in Table 9.9, vibration impacts during ground-breaking activities have the potential to generate a moderate effect, with a moderate significance rating within 10m of the works. Beyond 50m, the effects are reduced to minor, with a not significant to slight significance rating for human perception. All construction activities will be temporary.

Vibration effects from vibratory rollers also have the potential to affect nearby sensitive receptors. It is expected that the vibration levels from the rollers will be similar to or lower than those from ground-breaking activities.

All construction works are orders of magnitude below limits values associated with any form or cosmetic or structural damage for structurally sound or protected or historical buildings or structures referred to in Table 9.8.

9.4.2.4 Construction Traffic Impact

The impact of construction traffic noise on the nearby NSLs has been considered.

During construction works, the major impact on traffic movements is rerouting due to road closures. The rerouted traffic will mirror traffic changes during the operational phase (in the "Do Something" scenario). As outlined in Chapter 6 (Traffic and Transport) (Section 6.5.6.2) of this EIAR, a maximum of 2-3 HGVs in the AM and PM hours are likely to be generated during the construction phase. The additional number of HGVs during the construction phase does not significantly impact the potential noise levels in the study area due to the projected low numbers relative to baseline traffic flow.

The noise impacts for this scenario have been assessed as part of the operational phase and are not assessed separately in this section.

9.4.2.5 Summary of Potential Construction Noise Impacts

It should be noted that the calculations set out in this section are indicative and are used for the purposes of comparison only with the adopted criteria. Where exceedance of the recommended criteria is expected, the use of noise mitigation measures will be used as part of the construction works. Further details of the noise mitigation measures are set out in Section 9.5.

The pre-mitigation construction noise significance ratings across the Proposed Scheme are summarised in Table 9.25. In line with Table 9.13, the significance ratings are defined taking into account the prevailing baseline noise environment and the potential CNL. The specific duration of construction activities at a NSL also influences the overall significance determination. In accordance with the DMRB Noise and Vibration (UKHA 2020), a significant effect occurs where a moderate or major magnitude of impact occurs for periods equal to or greater than 10 or more days in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months. As this assessment is based on the programme presented in Chapter 5 (Construction) of this EIAR, the pre-mitigation construction noise significance ratings discussed in Table 9.25 relate to activities

that are expected to occur over periods equal to or greater than the durations discussed above.

According to the programme presented in Chapter 5 (Construction) of this EIAR, only daytime works are expected to be undertaken. This is reflected in the assessment presented in Table 9.25.

For ease of reference, general road works and landscaping are discussed under one heading to reflect that the range of noise levels are comparable for the two scenarios.

Table 9.25: Summary of Potential Construction Phase Noise Impacts

Assessment Topic	Period over Which Criterion Applies	Potential Impact
General Road Works, and Urban Realm Landscaping	Monday to Friday: Daytime (07:00 – 19:00hrs)	• Negative, significant to very significant and temporary in the absence of noise mitigation at NSLs within 15 m of the works. • Negative, moderate to significant and temporary in the absence of noise mitigation at NSLs between 15 and 30 m of the works. • Slight – moderate and temporary in the absence of noise mitigation at NSLs between 30 and 150 m of the works. • Not significant at NSLs further than 150 m from the works All impacts noted above are in the absence of noise mitigation, including screening by intervening buildings. Refer to Section 9.5.1 for the range of noise mitigation measures which will be adopted at specific working areas to reduce noise impacts at NSLs. Particular emphasis is given to localised screening around high noise level plant items.
	Saturdays (08:00 – 16:30hrs)	• Negative, significant to very significant and temporary in the absence of noise mitigation at NSLs within 30 m of the works. • Negative, moderate to significant and temporary in the absence of noise mitigation at NSLs between 30 and 50 m of the works. • Slight – moderate and temporary in the absence of noise mitigation at NSLs between 50 and 250 m of the works. All impacts noted above are in the absence of noise mitigation, including screening by intervening buildings. Refer to Section 9.5.1 for the range of noise mitigation measures which will be

Assessment Topic	Period over Which Criterion Applies	Potential Impact
		adopted at specific working areas to reduce noise impacts at NSLs.
Road Widening / and Utility Diversion Works	Monday to Friday: Daytime (07:00 – 19:00hrs)	• Negative, significant to very significant and temporary in the absence of noise mitigation at NSLs within 30 m of the works. • Negative, moderate to significant and temporary in the absence of noise mitigation at NSLs between 30 and 50 m of the works. • Slight – moderate and temporary in the absence of noise mitigation at NSLs between 50 and 250 m of the works. All impacts noted above are in the absence of noise mitigation, including screening by intervening buildings. Refer to Section 9.5.1 for the range of noise mitigation measures which will be adopted at specific working areas to reduce noise impacts at NSLs. Particular emphasis is given to localised screening around high noise level plant items including breakers and excavators.
	Saturdays (08:00 – 16:30hrs)	• Negative, significant to very significant and temporary in the absence of noise mitigation at NSLs within 50 m of the works. • Negative, moderate to significant and temporary in the absence of noise mitigation at NSLs between 50 and 100 m of the works. • Slight – moderate and temporary in the absence of noise mitigation at NSLs between 100 and 250 m of the works All impacts noted above are in the absence of noise mitigation, including screening by intervening buildings. Refer to Section 9.5.1 for the range of noise mitigation measures which will be adopted at specific working areas to reduce noise impacts at NSLs.
Construction Compound	Monday to Friday: Daytime (07:00 – 19:00hrs)	• Slight – moderate and temporary in the absence of noise mitigation at NSLs within 30 m of the works. • Not significant at NSLs further than 30 m from the works All impacts noted above are in the absence of noise mitigation, including screening by intervening buildings. Refer to Section 9.5.1 for the range of noise mitigation measures which will be

Assessment Topic	Period over Which Criterion Applies	Potential Impact
		adopted at specific working areas to reduce noise impacts at NSLs. Particular emphasis will be given to positioning of crushers at a suitable set back distance from NSLs and localised screening around high noise level plant items, including crushers.
	Saturdays (08:00 – 16:30hrs)	• Negative, moderate to significant and temporary in the absence of noise mitigation at NSLs within 10 m of the works. • Slight – moderate and temporary in the absence of noise mitigation at NSLs between 10 and 200 m of the works. • Not significant at NSLs further than 200 m from the works All impacts noted above are in the absence of noise mitigation, including screening by intervening buildings.
Construction vibration from general road works & construction activities	All Construction work periods	• Negative, imperceptible to not significant and temporary
Construction vibration from ground-breaking and compacting activities within 10 m of occupied residential buildings	Ground-breaking during road widening and utility diversion works	• Negative, slight to moderate and temporary
Construction Traffic	As per operational assessment – see Section 9.4.3.2.	N/A

9.4.3 Operational Phase Noise

9.4.3.1 Calculation of Road Traffic Noise Levels

The key principle of the operational noise impact assessment associated with the Proposed Scheme is to determine and categorise potential changes in road traffic noise between the Do Minimum and Do Something Scenarios.

Traffic flows have been modelled over the study area across Galway City as part of the traffic assessment for the Proposed Scheme. The output of the traffic modelling has been used to undertake a detailed analysis of traffic noise level

changes. The noise impact assessment has focused on all modelled roads along the Proposed Scheme and roads affected by diverted traffic flows.

There are two key assessment zones within the study area, the Proposed Scheme and the surrounding road network extending out from the Proposed Scheme. Traffic noise impacts associated with the Proposed Scheme are 'direct' impacts, while traffic noise impacts associated with the surrounding network are 'indirect'.

In both instances, changes in traffic volumes and changes in fleet composition (car, bus, LGV, HGV) is a key consideration when determining the change to the traffic noise environment.

Traffic Flow Data

Detailed traffic data have been provided for each modelled road within the study area for the Proposed Scheme. For each road, traffic flows are provided in terms of Annual Average Daily Traffic (AADT) with a percentage breakdown of cars, buses, LGVs and HGVs for each road.

Traffic flow data was provided for 2023 (the year of opening) and 2038 (the design year). Review of traffic volumes associated with 2023 are determined to be higher than those associated with the design year of 2038 for the majority of roads within the study area. This is predominately due to the modal shift towards public transport and the restriction of traffic on bus routes within the red line boundary of the Proposed Scheme in 2038.

Only daytime traffic data was considered for the noise assessment, as the Proposed Scheme will not be operational during the night-time periods.

A summary of the key potential noise impacts associated with the Proposed Scheme are summarised in the following sections.

Potential Noise Impacts Along Proposed Scheme

Along the Proposed Scheme the key changes affecting the noise environment relate to:

- Increased bus usage and an associated reduction in private traffic;
- Alterations to the cross section of the road to include footpaths, cycle and bus lanes where none presently exist, and;
- Addition or relocation of bus stops.

Potential Noise Impacts Along Surrounding Road Network

Along the surrounding road network, potential changes to road traffic noise are associated with traffic redistribution onto local roads due to the introduction of bus priority measures, restricted turning movements, and bus lanes along the Proposed Scheme, where relevant. As noted in Section 9.2.2.1, redistributed traffic onto the surrounding road network is determined to occur during daytime periods only. During night-time periods, scheme related traffic redistribution is negligible.

Source Noise Levels

The approach adopted for the study area involves calculation of noise emission levels associated with the key fleet composition types along the road i.e., buses, cars, LGVs and HGVs. Noise levels are calculated using the Annual Average Daily Traffic (AADT), as discussed in Chapter 6 (Traffic and Transport) of this EIAR using the methodology outlined in Calculation of Road Traffic Noise (CRTN).

This produces the traffic noise level quantified as $L_{A10,18hr}$, which can be converted to L_{den} for comparison to the EU criteria using the following formula from the NRA Guidelines:

$L_{den} = 0.86L_{A10,18hr} + 9.86$

These calculations have been based on vehicles with internal combustion engines. The source noise levels therefore take account of the combustion noise associated with the vehicle engine noise and rolling noise from the tyre and road interface, both of which make up the total noise associated with road traffic vehicles. At speeds of up to approximately 30 km/h, noise from light internal combustion engine (ICE) vehicles is dominated by engine noise. The contribution from engine noise for light ICE vehicles reduces above this speed and rolling noise becomes the dominant contributor to overall noise levels. For heavy vehicles including buses, the contribution of the engine noise remains a significant contributor to overall noise levels at speeds typically encountered in an urban environment (between 30 to 60 km/h).

It is understood that the number of ICEs in the vehicle fleet (both light vehicles and heavier vehicles such as buses) will reduce over the next 15 years, and therefore the calculated noise levels included within this study are therefore worst case and reflect a full fleet of ICE vehicles, refer to Chapter 8 (Climate) of this EIAR for further details. Due to the absence of reliable published sound emission data relating to electric vehicles (EVs) and heavy electric vehicles (HEVs), the approach for this EIAR is to assume a full fleet of ICE. Given the same fleet type is assumed for both the Do Minimum and Do Something scenarios, the relative change in noise levels between these scenarios will remain unchanged regardless of the fleet type used. Further comment on specific noise levels is discussed in Section 9.4.4.

Proposed Scheme

Using the calculation approach discussed above, the $L_{A10,18hr}$ traffic noise level was calculated along each road modelled as part of the traffic impact assessment (refer to Chapter 6 Traffic and Transport) of this EIAR within the Proposed Scheme boundary for the Do Minimum and Do Something scenarios. All calculations are made at a reference distance of 5 m from the road edge. Where relevant, the calculations have taken account of changes to the alignment of bus lanes and general traffic lanes during the Do Something scenario, specifically where these were identified to be located closer to NSLs compared to the existing cross section. In these identified scenarios, the reference distance of the traffic source is accounted for in the calculations. The calculations also account for potential speed increase of buses using the dedicated bus lanes, consistent with the traffic model.

Surrounding Road Network

For each modelled road within the surrounding road network outside of the Proposed Scheme, the associated $L_{A10,18hr}$ traffic noise level was calculated for the Do Minimum and Do Something scenarios. For all roads, calculations are made at a reference distance of 5m from the road edge. No changes to the alignment cross section occurs outside of the Proposed Scheme boundary.

9.4.3.2 Traffic Noise Impacts

Opening Year 2023

For the purposes of assessing and describing potential noise impacts, opening year traffic is assumed to be representative for the 15-year period from 2023 to the design year. The 'short-term' magnitude of change ratings from the DMRB (UKHA 2020) are therefore used to assess potential noise impacts associated with the opening year up to the design year. In this instance, these impacts are described as short to medium term in duration in accordance the EPA Guidelines (EPA 2022).

The assessment of potential traffic noise impacts has been undertaken using the following approach:

- Traffic noise levels have been calculated along each road within the study area of the Proposed Scheme;
- Noise levels have been calculated for the Do Minimum (DM) scenario for the opening year, 2023;
- Noise levels have been calculated for the Do Something (DS) scenario for the opening year, 2023; and
- The change in traffic noise levels between the DM and DS scenarios for the year 2023 have been calculated and the associated magnitude of change (Table 9.10) and noise level ranges (Table 9.12) have been presented.

Along the Proposed Scheme, a direct, positive, imperceptible to slight, short to medium term impact is calculated for most roads, with the exception of Fairgreen Road and Woodquay. This is as a result of reduction in overall traffic volumes through the incorporation of bus priority signals and junctions, restricted turning movements for private vehicles and the incorporation of dedicated bus lanes. The overall direct impact is determined to be Positive, Imperceptible to Slight and Short to Medium-term.

Along the majority of roads off the Proposed Scheme within the study area, impacts as a result of traffic redistribution are determined to be indirect, Positive, Imperceptible to Slight, and Short to Medium-term to Negative, Slight to Moderate, and Short to Medium-term once the Proposed Scheme becomes operational.

There are a small number of roads in the overall study area where there are potential initial significant negative impacts. These are defined as roads with a

traffic noise level above a daytime noise level of 57 dBL_{den} and an increase in noise level greater than 3 dB.

Further analysis of these roads was undertaken as follows:

- For each identified road above the potential initial significance threshold, the location or presence of NSLs was identified and distance from the road confirmed;
- The corrected traffic noise level at the closest NSL façade was calculated;
- The overall significance rating was determined taking account of the change in noise level during the short-term period and the noise level range, taking account of any distance corrections.

In general, mitigation measures such as noise barriers are not feasible at the affected NSLs due to the proximity of the façade of the NSL to the road edge.

The specific operational noise impacts during the daytime period for these roads are summarised in Table 9.26. A full overview of the potential daytime operational phase impacts for the opening year for the Proposed Scheme is presented in Figure 9.3 in Volume 3 of this EIAR, and the associated data is presented in Appendix 9.2 in Volume 4 of this EIAR.

Table 9.26: Summary of Potential Daytime Operational Phase Impacts – Opening Year 2023

Road	Potential increase above DM Scenario at nearest NSL, dBA	DMRB short term magnitude impact	Potential DS road traffic noise at nearest NSL, dBL_{den}	Noise level rating	Overall significance rating	Potential impact
Presentation Road	8.2	Major	71	Medium – High	Significant	Indirect, Negative, Significant, Short to medium term
Mill Street	3.7	Moderate	71	Medium – High	Moderate – Significant	Indirect, Negative, Moderate – significant, Short to medium term
Moyola Park	4.3	Moderate	61	Low – medium	Slight – moderate	Indirect, Negative, Slight – moderate, Short to medium term

Road	Potential increase above DM Scenario at nearest NSL, dBA	DMRB short term magnitude impact	Potential DS road traffic noise at nearest NSL, dBL_{den}	Noise level rating	Overall significance rating	Potential impact
Lough Atalia Road	3.3	Moderate	76	High	Significant	Indirect, Negative, Significant, Short to medium term
University Road	3.1	Moderate	71	Medium – High	Moderate – Significant	Indirect, Negative, Moderate – significant, Short to medium term
Corrib Park	3.2	Moderate	66	Medium	Moderate	Indirect, Negative, Moderate, Short to medium term
Woodquay Street	3.9	Moderate	67	Medium	Moderate	Indirect, Negative, Moderate, Short to medium term
Cross Street Lower	5.3	Major	68	Medium – high	Significant	Indirect, Negative, Significant, Short to medium term

In the opening year of 2023, the highest daytime potential noise impacts are calculated along Lough Atalia Road. The change in predicted traffic noise level along Lough Atalia Road is moderate, at 3.3 dB. The overall impact will potentially be Negative, Significant, and Short to Medium-term.

The most significant adverse traffic noise impacts are potentially along Presentation Road, Lough Atalia Road and Cross Street Lower. The noise levels along Presentation Road and Cross Street Lower will potentially be Medium-high, and the change in noise level along both streets is predicted to be more than 5 dB. The overall impact will potentially be Negative, Significant and Short to Medium-term at NSLs located along both roads.

The measured baseline noise level along Lough Atalia Road is equivalent to 77 dBL_{den}. The existing noise environment along the road is high and NSLs along Lough Atalia Road will be accustomed to a high noise environment. Additionally,

the DS traffic noise level has been calculated for the worst case NSLs along Lough Atalia Road, which include two properties that have buildings along the boundary line with the pavement of Lough Atalia Road. Most of the 23 properties along Lough Atalia Road are set back from the pavement boundary line by at least 5 – 10 m, which will result in a noise level reduction of approximately 2.5 dB below the calculated DS traffic noise level at the property façade.

For all roads across the study area, the potential impacts are expected to be conservative and will reduce with the further inclusion of electric vehicles to the fleet, as discussed in Section 9.4.3.

For all other roads across the study area, impacts are defined as Positive (beneficial), Imperceptible and Short-term to Negative, Not Significant to Slight, and Short to Medium-term. The majority of roads within the Proposed Scheme will experience a decrease in traffic noise due to the change in mode of traffic associated with the Proposed Scheme.

A full suite of calculated noise levels along roads within the study area is included in Appendix 9.2 of Volume 4 of this EIAR.

Design Year 2038

For the design year, the assessment of potential traffic noise impacts has been undertaken using the following approach:

- Traffic noise levels have been calculated along each road within the study area of the Proposed Scheme;
- Noise levels have been calculated for the DM scenario for the opening year, 2038;
- Noise levels have been calculated for the DS scenario for the opening year, 2038; and
- The change in traffic noise level between the DM and DS scenarios for the year 2038 has been calculated and the associated magnitude of change (Table 9.11) and noise level range (Table 9.12) have been presented.

Along the Proposed Scheme, a direct, Positive, Imperceptible to Slight, Short to Medium-term impact is calculated for most roads, with the exception of Fairgreen Road. This is as a result of reduction in overall traffic volumes through the incorporation of bus priority signals and junctions, restricted turning movements for private vehicles and the incorporation of dedicated bus lanes. The overall direct impact is determined to be Positive, Imperceptible to Slight and Long-term.

There are a small number of roads in the overall study area where there are potential significant impacts. These are defined as roads with a traffic noise level above a daytime noise level of 57 dBL_{den} and an increase in noise level greater than or equal to 5 dB.

The overall significance ratings are lower for the design year compared to the year of opening due to the following reasons:

- The magnitude of change ratings for the long-term period relate to greater changes in noise level compared to the year of opening due to the recognised habituation to traffic noise over time.
- Overall traffic volumes forecast along the Proposed Scheme and surrounding road network are reduced during the design year compared to the opening year due to modal shift to public transport due to the Proposed Scheme.

For the roads where potential initial significant impacts were identified, the long-term operational daytime noise impacts are summarised in Table 9.27. A full overview of the potential daytime operational phase impacts for the Proposed Scheme for the design year is presented in Figure 9.4 in Volume 3 of this EIAR, and the associated data is presented in Appendix 9.2 in Volume 4 of this EIAR.

Table 9.27: Summary of Potential Daytime Operational Phase Impacts – Design Year 2038

Road	Increase above DM Scenario at worst-case NSL, dBA	DMRB long term magnitude impact	Potential road traffic noise at worst-case NSL, dBL_{den}	Noise level rating	Overall significance rating	Potential impact
Lough Atalia Road	4.7	Moderate	77	High	Significant	Indirect, Negative, Significant, long term
Riverside	5.7	Major	65	Medium	Moderate – significant	Indirect, Negative, Moderate – significant, long term

In the design year of 2038, the highest daytime potential noise impacts are calculated along Lough Atalia Road. The change in the potential traffic noise level along Lough Atalia Road is moderate, at 4.7 dB. The overall impact will potentially be Negative, Significant, and Long-term.

Riverside will also potentially experience a significant impact in the design year of 2038. The increase in noise level is predicted to be 5.7 dB, with a medium noise level of 65 dBL_{den}. The overall impact will potentially be Indirect, Negative, Moderate – Significant and Long-term.

For all other roads across the study area, traffic noise impacts are not potentially significant, and are defined as from Positive, Imperceptible to Slight, and Long-term to Negative, Not Significant to Slight, and Long-term.

Comment on Future Electric Vehicle Fleet

For the roads assessed in Table 9.26 and Table 9.27, the majority of the fleet type is comprised of cars and light goods vehicles. Given the same power type (ICE) has been assumed for both the Do Minimum and Do Something scenarios, the relative change in traffic noise remains the same for these roads, irrespective of the vehicle power.

The range of traffic noise levels calculated along these roads have the potential to be lower during the future year scenarios as a result of the conversion from ICE to EVs and HEVs, particularly along residential roads with speeds lower than 30 km/hr. In addition, an overall reduction in engine noise will occur at junctions and roundabouts. The calculated traffic noise level for these roads is therefore considered a robust, worst-case analysis.

Along the Proposed Scheme the fleet type is a mixture of buses, cars, LGVs with a portion of HGVs. The change in noise levels is determined to be Imperceptible to Significant along the Proposed Scheme for both year of opening and the design year due to reduced overall traffic volumes. Given the same fleet type (ICE) has been assumed for both the DM and DS scenarios, the relative change in traffic noise remains the same for these roads irrespective of the vehicle power type.

Notwithstanding, it is likely that a further reduction in overall noise level will occur along the Proposed Scheme due to the transition towards a full EV and HEV bus fleet, this reduction will occur irrespective of the Proposed Scheme. An overall reduction in engine noise from buses will occur at junctions, roundabouts and bus stops. The calculated traffic noise level assuming ICEs for all fleet is therefore considered a robust analysis and to be worst-case. The overall noise impact remains Positive, Imperceptible to Significant and Long term.

9.4.4 Operational Vibration

Once operational, buses will use the dedicated bus lanes for the Proposed Scheme. Analysis of traffic data for the Proposed Scheme, however, indicates a reduction in overall AADT traffic flows along the Proposed Scheme.

Reference to the source vibration levels confirm that vibration levels associated with passing buses and other vehicular traffic at distances of 2.5 to 10 m from the road edge are negligible in terms of human perception and building response. Vibration levels associated with a passing bus were recorded at 0.1mm/s PPV or less under the monitored scenarios. These values are below the normal range of perceptible human response to vibration and would not pose any significant impact.

A review of the traffic data for the Proposed Scheme indicates that the maximum number of buses travelling in-bound or outbound is 650 over the 16hr daytime period. Using this number and the highest VDV event measured on a similar project during a bus pass-by at a reference distance of 5 m from the road edge (0.0033 $m/s^{1.75}$), the daytime $VDV_{,b,day}$ value is calculated as 0.016 $m/s^{1.75}$. Reference to Table 9.14 confirms this value is below those associated with a low

probability of adverse comment. The overall impact is Positive, Imperceptible and Long term.

9.4.5 Bus Stops

Noise sources associated with bus stops relate to idling engines, acceleration and deceleration from the stop and air brakes.

At close distances to a stop, these activities are perceptible over normal passing road traffic, however the level of perceptibly is masked to a greater extent along heavily trafficked routes with higher road traffic noise levels.

The majority of bus stops will be retained in their current position as part of the Proposed Scheme with no change in noise environment as a result. Whilst a small number of bus stops will be removed, a number of new bus stops will be installed as part of the Proposed Scheme. All new bus stops along the Proposed Scheme are along the Malahide Road and the prevailing noise environment is dominated by road traffic from cars, buses, light and heavy goods vehicles.

A review of the proposed relocated bus stop locations indicates that there will be no significant noise impact on NSLs.

9.4.6 Road Maintenance

The Proposed Scheme is expected to have an operational life span of 60 years. Once operational, the Proposed Scheme will be subject to the same maintenance programme as the existing road infrastructure. This will involve upgrade and / or replacement of road surfaces over the life span of the project). These activities will occur along sections of the Proposed Scheme as required. Noise impacts associated with these activities will be of similar magnitude to those described in Section 9.4.2.

9.4.6.1 Summary of Potential Impacts

The Operational Phase noise impacts associated with the Proposed Scheme are summarised in Table 9.28.

Table 9.28: Summary of Potential Operational Phase Impacts on NSLs

Assessment Topic	Potential Impact
Opening year (2023) traffic noise – Proposed Scheme	Direct, Positive, Imperceptible to Slight, Short to Medium-term except for Woodquay Street, which has an indirect, Negative, Moderate, Short to Medium-term potential impact
Opening year (2023) traffic noise – Surrounding road network	Indirect, Positive, Imperceptible to Slight, Short to Medium-term to indirect, Negative, Significant, Short to Medium-term
Design year (2038) traffic noise – Proposed Scheme	Direct, Positive, Imperceptible to Slight, Long-term

Assessment Topic	Potential Impact
Design year (2038) traffic noise – Surrounding road network	Indirect, Imperceptible to Slight, Long-term, to indirect, Negative, Moderate, Long-term
Operational Phase Vibration	Neutral, Imperceptible, Long-term
Bus stops – existing locations	Neutral, Imperceptible, Long-term
Bus stops – new locations	Negative, Slight to Moderate, Short-term to Negative, Not Significant to Slight, Short-term.

9.5 Mitigation and Monitoring Measures

9.5.1 Construction Phase

9.5.1.1 Noise

The appointed contractor will be required to take specific noise abatement measures to the extent required to comply with the recommendations of BS 5228–1 (BSI 2014a) and European Communities Noise Emissions by Equipment for Use Outdoors (Amendment) Regulations 2006 (S.I. No 241/2006). The mitigation measures outlined below for the Construction Phase have also been included in the Construction and Environmental Management Plan (Appendix 5.1 in Volume 4 of this EIAR).

These measures will ensure that:

- During the Construction Phase, the appointed contractor will be required to manage the works to comply with the limits detailed in Section 9.2.4.1 using methods outlined in BS 5228–1 (BSI 2014a); and
- The best practicable means of working, including proper maintenance of plant and equipment, will be employed to minimise the noise produced by on site operations.

BS 5228–1 (BSI 2014a) includes guidance on several aspects of construction site practices, which include, but are not limited to:

- Selection of quiet plant;
- Control of noise sources;
- Screening;
- Hours of work;
- Liaison with the public; and
- Monitoring.

The contractor will put in place the most appropriate noise control measures depending on the level of noise reduction required at individual working areas i.e.,

based on the construction threshold values for noise and vibration set out in Table 9.5 and Table 9.8.

Reference to Table 9.25 indicates that intrusive works occurring within 70 m of NSLs will need specific noise control measures to reduce impacts depending on the time period over which they will occur, i.e., daytime or evening.

Selection of Quiet Plant

The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item of plant will be selected wherever practicable. Should a particular item of plant already on the site be found to generate unexpectedly high noise levels, the first action will be to identify whether or not the item can be replaced with a quieter alternative.

For static plant such as compressors and generators used at work areas such as Construction Compounds etc., the units will be supplied with manufacturers' proprietary acoustic enclosures where practicable.

The contractor will evaluate the choice of excavation, breaking or other working method taking into account various ground conditions and site constraints. Where possible, where alternative lower noise generating equipment are available that will provide structural / excavation / breaking results, these will be selected to minimise potential disturbance.

The decision regarding the type of excavation technique etc. to be used on a site will normally be governed by other engineering or environmental constraints. In these instances, it may not be possible for technical reasons to replace a noisy process by a quieter alternative. Even if it is possible, the adoption of a quieter method may prolong the overall process; the net result being that the overall disturbance to the community will not necessarily be reduced.

Noise Control at Source

The following measures will be implemented by the appointed contractor to control noise at source in order to remain below the threshold values for noise set out in Table 9.5, which relate to specific site considerations:

- For mobile plant items such as dump trucks, planers, excavators and loaders, the installation of an acoustic exhaust, utilising an acoustic canopy to replace the normal engine cover and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB;
- For percussive tools such as pneumatic concrete breakers and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensuring any leaks in the air lines are sealed;
- The Construction Compounds are necessarily located in close proximity to NSLs (refer to Table 9.24) and will therefore incorporate a strict noise control policy relating to materials handling. Noisy items of plant will be sited away from noise sensitive boundaries;
- Where compressors, generators and pumps are located in proximity to NSLs and have potential to exceed the construction noise thresholds, these will be

surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation; and

- Resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can be controlled by fixing resilient materials in between the surfaces in contact.

Screening

Screening is an effective method of reducing construction noise levels at a receiver location and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both the source and receiver. BS 5228–1 (BSI 2014a) states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier will be such that there are no gaps or openings at joints in the screen material.

Erection of localised demountable enclosures or screens will be used around breakers or drill bits, as required, when operating in proximity to NSLs with the potential to exceed the construction noise thresholds. Annex B of BS 5228–1 (BSI 2014a) (Figures B1, B2 and B3) provides typical details for temporary and mobile acoustic screens, sheds and enclosures that can be constructed on site from standard materials. A well placed and designed mobile temporary screen around a breaker or excavation can effectively reduce noise emissions by 10 dBA.

The appointed contractor will provide a site hoarding of 2.4 m height along noise sensitive boundaries, at a minimum, at the Construction Compounds. The length of the screen should in practice be at least five times the height, however, if shorter sections are necessary then the ends of the screen will be wrapped around the source.

In most practical situations the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the barrier itself. In practice, screens constructed of materials with a mass per unit of surface area greater than 10 kg/m^2 will give adequate sound insulation performance. The use of a standard 2.4 m high construction site hoarding, installed at a suitable position between the source and receiver, will provide a sufficient level of noise screening in most cases.

In addition, careful planning of the construction site layout will also be considered. Within the Construction Compounds, the placement of site buildings such as offices and stores between the site and sensitive locations can provide a good level of noise screening.

Hours of Work

It is generally envisaged that construction working hours will be between 07:00hrs and 19:00hrs on weekdays. Night-time, Saturday and Sunday working will be required during certain periods to minimise the impact on road traffic movements during the daytime, for example at busy road junctions and in commercial areas, and for such works as pavement / road surfacing.

Construction activities / plant items will be considered with respect to their potential to exceed construction noise thresholds at NSLs and will be scheduled according to their noise level, proximity to sensitive locations and possible options for noise control wherever practicable.

In situations where an activity with potential for exceedance of construction noise thresholds is scheduled (e.g., road widening and utility diversions or activities with similar noise levels identified in Table 9.25) other construction activities will be scheduled to not results in significant cumulative noise levels.

Liaison with the Public

For the Proposed Scheme, the major sources of noise are essentially mobile, and the noise received at any NSL will therefore vary from day to day as the work proceeds. The duration of excavation, breaking etc is usually short in relation to the length of construction work as a whole and the amount of time spent working near to sensitive areas can represent only a part of the overall period. GCC will establish clear forms of communication that will involve the contractor and NSLs in proximity to the works so that residents or building occupants are aware of the likely duration of activities likely to generate noise or vibration that are potentially significant as set out in Table 9.5 and Table 9.8.

Monitoring

During the Construction Phase noise monitoring will be undertaken at representative NSLs to evaluate and inform the requirement and/ or implementation of noise management measures. Noise monitoring will be conducted in accordance with ISO 1996–1 (ISO 2016) and ISO 1996–2 (ISO 2017). The selection of monitoring locations will be based on the nearest representative NSLs to the working area which will progress along the length of the Proposed Scheme.

9.5.1.2 Vibration

On review of the likely vibration levels associated with construction activities, it is considered that the construction of the Proposed Scheme is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or cosmetic damage to buildings.

Vibration from construction activities will be limited to the values set out in Table 9.8 to avoid any form of potential cosmetic damage to buildings and structures. Monitoring will be undertaken at identified sensitive buildings, where proposed works have the potential to be at or exceed the vibration limit values in Table 9.8.

In the case of vibration levels giving rise to human discomfort, to minimise such impacts, the following measures shall be implemented during the construction period:

- A clear communication programme will be established by GCC to inform adjacent building occupants in advance of any potential intrusive works which may give rise to vibration levels likely to result in significant effects as per

Table 9.9. The nature and duration of the works will be clearly set out in all communication circulars as necessary;

- Activities capable of generating significant vibration effects with respect to human response (as per Table 9.9) will be restricted to daytime hours only, as far as practicable; and
- Appropriate vibration isolation shall be applied to plant (such as resilient mounts to pumps and generators), where required and where feasible.

In the case of potentially vulnerable buildings, precondition surveys shall be carried out before any works commence.

9.5.1.3 Summary of Predicted Impacts

A reduction of 10 dB has been applied to construction noise calculations to account for the level of noise reduction available by applying the various noise mitigation measured outlined above.

At the closest properties impacted by the works (typically within 20m), the prevailing daytime baseline noise level is assumed as 67 dB $L_{Aeq,12hr}$ and evening baseline noise level is 65 dB $L_{Aeq,4hr}$. As discussed in Section 9.2.3.1, baseline noise levels measured as part of the baseline study are potentially 1 to 2 dB lower than those under normal conditions without restricted movements due to COVID-19. To allow for a conservative assessment, however, no correction has been made to these values when discussing the CNLs against the baseline noise environment.

Following mitigation, the highest predicted construction noise levels are between 67 to 73 dB$L_{Aeq,T}$ at the closest properties impacted by the most intrusive works. The higher impacts will be at those properties where the prevailing baseline is below the specific predicted construction works noise levels. Table 9.29 presents the predicted Construction Phase impacts pre and post the implementation of mitigation and monitoring measures and assumes that the construction activities have the potential to operate for periods equal to or greater than 10 or more days in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months at impacted NSLs.

The results are summarised based on the distance of a NSL to a working area. The closest identified NSL to the edge of the works, unscreened by intervening buildings are identified in the relevant impact tables in Section 9.4.3.

Table 9.29: Summary of Predicted Construction Phase Impacts Pre and Post Mitigation

Assessment Topic	Period over Which Criterion Applies	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post Mitigation and Monitoring)
General Road Works, and Urban Realm Landscaping	Monday to Friday: Daytime (07:00 – 19:00hrs)	• Negative, Significant to Very Significant and Temporary at NSLs within 15 m of the works. • Negative, Moderate to Significant and	• Negative, Moderate to Significant and Temporary at NSLs within 15 m of the works. • Negative, Slight to Moderate and

Assessment Topic	Period over Which Criterion Applies	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post Mitigation and Monitoring)
		Temporary at NSLs between 15 and 30 m of the works. • Negative, Slight – Moderate and Temporary at NSLs between 30 and 150 m of the works. • Negative, Not Significant at NSLs further than 150 m from the works	Temporary at NSLs between 15 and 50 m from the works. • Negative, Not significant and Temporary at NSLs further than 50 m from the works
	Saturdays (08:00 – 16:30hrs)	• Negative, Significant to Very Significant and Temporary at NSLs within 30 m of the works. • Negative, Moderate to Significant and Temporary at NSLs between 30 and 50 m of the works. • Negative, Slight – Moderate and Temporary at NSLs between 50 and 250 m of the works.	• Negative, Moderate to Significant and Temporary at NSLs within 15 m of the works. • Negative, Slight – Moderate and Temporary at NSLs between 15 and 150 m of the works. • Negative, Not Significant and Temporary at NSLs further than 150 m from the works.
Road Widening / and Utility Diversion Works	Monday to Friday: Daytime (07:00 – 19:00hrs)	• Negative, Significant to Very Significant and Temporary at NSLs within 30 m of the works. • Negative, Moderate to Significant and Temporary at NSLs between 30 and 50 m of the works. • Negative, Slight – Moderate and Temporary at NSLs between 50 and 250 m of the works.	• Negative, Significant to Very Significant and Temporary at NSLs within 10 m of the works. • Negative, Moderate to Significant and Temporary at NSLs between 10 and 15 m of the works. • Negative, Slight – Moderate and Temporary at NSLs between 15 and 75 m of the works. • Negative, Not Significant and Temporary at NSLs further than 75 m from the works.
	Saturdays (08:00 – 16:30hrs)	• Negative, Significant to Very Significant and Temporary at NSLs within 50 m of the works. • Negative, Moderate to Significant and	• Negative, Significant to Very Significant and Temporary at NSLs within 15 m of the works. • Negative, Moderate to Significant and

Assessment Topic	Period over Which Criterion Applies	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post Mitigation and Monitoring)
		Temporary at NSLs between 50 and 100 m of the works. • Negative, Slight – Moderate and Temporary at NSLs between 100 and 250 m of the works	Temporary at NSLs between 15 and 30 m of the works. • Negative, Slight – Moderate and Temporary at NSLs between 30 and 250 m of the works. • Negative, Not Significant, Temporary at NSLs further than 250 m from the works.
Construction Compound	Monday to Friday: Daytime (07:00 – 19:00hrs)	• Negative, Slight – Moderate and Temporary at NSLs within 30 m of the works. • Negative, Not Significant and Temporary at NSLs further than 30 m from the works	• Negative, Slight – Moderate and Temporary at NSLs within 10 m of the works. • Negative, Not Significant and Temporary at NSLs further than 10 m from the works
	Saturdays (08:00 – 16:30hrs)	• Negative, Moderate to Significant and Temporary at NSLs within 10 m of the works. • Negative, Slight – Moderate and Temporary at NSLs between 10 and 200 m of the works. • Negative, Not Significant and Temporary at NSLs further than 200 m from the works	• Negative, Slight – Moderate and Temporary at NSLs within 30 m of the works. • Negative, Not Significant and Temporary at NSLs further than 30 m from the works.
Construction vibration from general road works & construction activities	All Construction work periods	• Negative, Imperceptible to Not Significant and Temporary	• Negative, Imperceptible to Not Significant and Temporary
Construction vibration from ground breaking activities within 10m of occupied residential buildings	Ground breaking during road widening and utility diversion works	• Negative, Slight to Moderate and Temporary	• Negative, Slight to Moderate and Temporary

9.5.2 Operational Phase

Change in Road Traffic Noise

The impact assessment has determined that traffic noise impacts across the study area for the Proposed Scheme result in Positive, Imperceptible, Short and Long-term direct impacts along the Proposed Scheme and the majority of roads associated in the study area. A small number of roads are potentially going to experience Negative, Imperceptible to Significant, Short- and Long-term indirect impacts along the surrounding road network.

The range of noise level changes and overall noise levels calculated do not require any specific noise mitigation measures to be incorporated into the Proposed Scheme.

Bus Stops

The impact assessment has determined that noise impacts associated with relocated bus stops will have no significant impact on NSLs. No further noise mitigation measures are proposed.

Road Maintenance

Impacts associated with this activity will be controlled in line with best practice measures in line with regular road maintenance works across Galway City and County.

Impact Overview

The predicted Operational Phase impacts associated within the Proposed Scheme are summarised in Table 9.30.

Table 9.30: Summary of Predicted Operational Phase Impacts Following the Implementation of Mitigation and Monitoring Measures

Assessment Topic	Potential Impact (Pre-Mitigation and Monitoring)	Mitigation	Predicted Impact (Post Mitigation and Monitoring)
Opening year (2023) traffic noise – Proposed Scheme	Direct, Positive, Imperceptible to Slight, Short to Medium-term except for Woodquay Street, which has an indirect, Negative, Moderate, Short to Medium-term potential impact	No mitigation measures required due to range of impacts identified	Direct, Positive, Imperceptible to Slight, Short to Medium-term except for Woodquay Street, which has an indirect, Negative, Moderate, Short to Medium-term predicted impact
Opening year (2023) traffic noise – Surrounding road network	Indirect, Positive, Imperceptible to Slight, Short to Medium-term to indirect, Negative, Significant, Short to Medium-term	No mitigation measures required due to range of impacts identified	Indirect, Positive, Imperceptible to Slight, Short to Medium-term to Indirect, Negative, Significant, Short to Medium-term

Assessment Topic	Potential Impact (Pre-Mitigation and Monitoring)	Mitigation	Predicted Impact (Post Mitigation and Monitoring)
Design year (2038) traffic noise – Proposed Scheme	Direct, Positive, Imperceptible to Slight, Long-term	No mitigation measures required due to range of impacts identified	Direct, Positive, Imperceptible to Slight, Long-term
Design year (2038) traffic noise – Surrounding road network	Indirect, Negative, Imperceptible to Slight, Long-term, to indirect, Negative, Moderate, Long-term	No mitigation measures required due to range of impacts identified	Indirect, Negative, Imperceptible to Slight, Long-term, to indirect, Negative, Moderate and Long-term
Operational Phase Vibration	Neutral, Long-term	No mitigation measures required due to range of impacts identified	Neutral, Long-term
Bus stops – existing or relocated stops	Neutral, Long-term	No mitigation measures required due to range of impacts identified	Neutral, Long-term

9.6 Residual Impacts

9.6.1 Construction Phase

Given the linear nature of the works, noise emissions related to construction works will be of temporary impact at any one area as the works progress along the length of the Proposed Scheme. The application of the proposed noise thresholds and restricted hours of operation, along with implementation of appropriate noise control measures, will ensure that noise impact is controlled within acceptable limit values.

During the Construction Phase of the Proposed Scheme, noise levels at properties closest to working areas will be temporarily increased. Construction activities will, for the majority of activities, operate within 5 dB of the adopted noise thresholds at the nearest properties to the works once mitigation measures are incorporated. Given the linear nature of the works, the impact of construction works will be temporary in any one area as the works progress along the length of the Proposed Scheme. The most appropriate noise mitigation measures for each work area will be determined taking account of the various control measures included within Section 9.5, and the CEMP. The various mitigation measures will be selected in order to control CNLs to within the limit values included in Section 9.2.4.1 as far as practicable.

Once the various mitigation measures are put in place, noise impacts associated with the Construction Phase will be Negative, Not Significant to Significant, and Temporary during all key construction phases within 10 to 15m from the works during daytime construction periods.

As per DMRB Noise and Vibration (UKHA 2020) in cases of moderate to major magnitude of impacts, the duration of works determines the overall significance rating. As part of the mitigation measures, the durations advised in the DMRB Noise and Vibration (UKHA 2020) shall be followed, where feasible, to reduce overall significance effects (i.e., scheduling works to occur for periods of less than ten days over 15 consecutive periods and less than 40 days over six consecutive months where significant effects are identified). Once the CNL and duration of works is considered in line with the DMRB Noise and Vibration (UKHA 2020) all key Construction Phase residual noise levels are not significant.

The assessment has indicated that the use of standard construction activities can operate comfortably within the recommended vibration limits for standard residential and other light-framed buildings. With the adoption of best practice methodologies, vibration impacts at the most sensitive premises can be adequately mitigated to within acceptable levels relating to disturbance, whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

9.6.2 Operational Phase

Once operational, there will be a Positive to Neutral direct impact along the Proposed Scheme due to a reduction in traffic volumes during both the year of opening and the design year.

During the year of opening, there is expected to be an increase in traffic noise levels along a small number of roads adjacent to the Proposed Scheme as a result of traffic re-distribution during daytime periods. During this initial Short to Medium-term phase, residual indirect impacts are calculated as Negative, Slight to Moderate, with three roads predicted to have a Negative, Significant impact (Presentation Road, Cross Street Lower, and Lough Atalia Road). Along the remaining road network within the study area, a Positive, Imperceptible to Slight, Short to Medium-term impact to Negative, Slight to Moderate, Short to Medium-term impact is calculated. The overall prevailing Short to Medium-term impact associated with the Proposed Scheme is Positive to Negative, Moderate.

During the design year, increased traffic noise levels will occur along a small number of roads as a result of traffic re-distribution during daytime periods. During the Long-term phase, indirect impacts are calculated as Negative, Moderate to Significant, Long-term along Riverside, and Negative, Significant, Long-term along Presentation Road and Lough Atalia Road. Along the remaining road network within the study area, a Positive, Imperceptible to Slight, Long-term, indirect impact to Negative, Not Significant to Slight, Long-term, indirect impact is calculated. The overall prevailing Long-term impact associated with the Proposed Scheme is Positive to Negative and Slight.

The Proposed Scheme aligns with the policy objectives of the Galway City Council to reduce traffic noise exposure to populations across the city through the incorporation of improved public transport. The results of the noise assessment for the Operational Phase confirms that with the introduction of the various measures included as part of the Proposed Scheme, a reduction in traffic noise can be achieved along the majority of roads associated with the Proposed Scheme. The various design measures associated with the Proposed Scheme also align with the

various intervention measures recommended within the WHO Environmental Noise Guidelines (WHO 2018) to reduce traffic noise exposure across populations.

9.7 References

British Standard Institute (BSI) (1993) Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration (BS 7385 – 2)

British Standard Institute (BSI) (2008) Guide to evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (BS 6472–1)

British Standard Institute (BSI) (2014a) Practice for noise and vibration control of construction and open sites – Part 1: Noise (BS 5228-1)

British Standard Institute (BSI) (2014b) Practice for noise and vibration control of construction and open sites –Part 2: Vibration (BS 5228 – 2)

EPA (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports. May 2022.

Galway City Council (2019) Draft Noise Action Plan 2019-2023

Government of Ireland (2006) S.I. No. 241/2006 - European Communities (Noise Emission by Equipment for Use Outdoors) (Amendment) Regulations 2006

Government of Ireland (2018) S.I. No. 549/2018 - European Communities (Environmental Noise) Regulations 2018

Institute Of Acoustics (IAO) (2017) ProPG: Planning and Noise. Professional Practice Guidance on Planning and Noise. New Residential Development

ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation

ISO 1996-1:2016 Acoustics - Description, measurement, and assessment of environmental noise. Part 1: Basic quantities and assessment procedures

ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels

TII (previously National Roads Authority (NRA)) (2004) Guidelines for the Treatment of Noise and Vibration in National Road Schemes

TII (previously National Roads Authority (NRA)) (2014) Good Practice Guide for the Treatment of Noise during the Planning of National Road Schemes

UK Department of Transport (1998) Calculation of Road Traffic Noise (CRTN)

UKHA (2020) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability & Environmental Appraisal LA 111 Noise and Vibration Revision 2

World Health Organisation (2018) WHO Environmental Noise Guidelines for the European Region

Chapter 10
Population

Contents

10 Population

10.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) addresses the potential Population impacts associated with the Construction and Operational Phases of the Proposed Scheme.

This population assessment considers both social impacts on communities (community assessment) as well as economic impacts on commercial businesses (economic assessment).

The Proposed Scheme includes the reconfiguration of traffic movements to facilitate improved pedestrian, cyclist and bus accessibility and movement, infrastructural works at certain roads and junctions, and improvements to the public realm at a number of locations within the city centre, including Eyre Square North, Woodquay and in the vicinity of Galway Cathedral. It will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction). The Proposed Scheme which is described in Chapter 4 (Proposed Scheme Description) of this EIAR, has been designed to meet these objectives. Key objectives that are applicable to this assessment are to:

- Enhance the capacity and potential of the public transport system by improving bus speeds, reliability and punctuality through the provision of bus lanes and other measures to provide priority to bus movement over general traffic movements;
- Enhance the potential for cycling by providing safe infrastructure for cycling, segregated from general traffic wherever practicable; and
- Improve accessibility to jobs, education and other social and economic opportunities through the provision of improved sustainable connectivity and integration with other public transport services.

Other elements of the scheme that have potential to cause effects on other environmental factors which may also interact with Population are also relevant.

Assessments undertaken as part of the following EIAR chapters have been considered in this chapter:

- Air Quality (Chapter 7);
- Noise & Vibration (Chapter 9);
- Traffic & Transport (Chapter 6); and
- Landscape (Townscape) & Visual (Chapter 16).

This Chapter is also supported by Figure 10.1 in Volume 3 of this EIAR and Appendix 10.1 Schedule of Commercial Businesses in Volume 4 of this EIAR.

10.2 Methodology

This Section presents the study area and appraisal method for the assessment of impacts on Population.

10.2.1 Study Area

The population assessment requires potential impacts to be considered and assessed for a wide range of receptors, comprising community facilities, recreational resources, tourism assets, residential properties, and commercial businesses. To capture how these receptors are likely to be impacted by the Proposed Scheme, the population assessment has been split into two sub-assessments. The two sub-assessments are:

- Community Assessment: An assessment to capture impacts from the Proposed Scheme on the local population; residents and communities; and
- Economic Assessment: An assessment to capture impacts from the Proposed Scheme on commercial receptors, including commercial business viability.

The study areas for both assessments are described in Section 10.2.1.1 and Section 10.2.1.2.

10.2.1.1 Community Assessment

The community assessment considers potential impacts on individual population receptors, including community facilities and recreational resources, as well as individual residential properties and land parcels being acquired on a temporary and permanent basis to accommodate the Proposed Scheme. As such, the community assessment comprises of the following assessment topics:

- Community amenity; and
- Community land use and accessibility.

The study area for the assessment of impacts on community amenity consists of 'community areas', which are informed by the Central Statistics Office (CSO) 2016 Census electoral division boundaries (CSO2016a). Community areas that will either be intersected by or experience an increase in displaced traffic as a result of the Proposed Scheme are included in the study area, and consist of the following:

- Claddagh;
- Eyre Square;
- Lough Atalia;
- Nuns Island;
- Shantalla;
- St. Nicholas; and
- Wellpark.

These community areas are presented in Figure 10.1 in Volume 3 of this EIAR.

10.2.1.2 Economic Assessment

The economic assessment considers potential impacts on individual commercial businesses within the Proposed Scheme boundary, as well as any commercial receptors that would experience negative impacts from displaced traffic during the Construction or Operational Phase of the Proposed Scheme. To consider and assess these impacts, the economic assessment has been divided into the following two assessment topics:

- Commercial amenity; and
- Commercial land use and accessibility.

The study areas for these two assessment topics are the same as those outlined in Section 10.2.1.1.

10.2.2 Relevant Guidelines, Policy and Legislation

Guidelines, policy and legislation specifically relevant to the population assessment are outlined in Table 10.1.

Table 10.1: Relevant Guidelines, Policies and Legislation

Guidance	Description	Relevance to Assessment
Environmental Protection Agency (EPA) Guidelines on the information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022)	This document outlines EPA guidance for conducting Environmental Impact Assessments (EIAs) / EIARs and provides the fundamental requirements of the EIAR.	This guidance has been used to inform the significance of effect for the all topics in the population assessment.
Design Manual for Roads and Bridges (DMRB) LA 112 Population and human health (hereafter referred to as the DMRB Guidance) (Highways England 2020)	The DMRB Guidance provides guidance on the assessment of land use and accessibility within an EIA.	This DMRB Guidance has been used to inform sensitivity and magnitude for the following assessment topics: Community land take; and Commercial land take.

10.2.3 Data Collection and Collation

Baseline data has been collected through carrying out a desk study, availing of the most up-to-date available data, at the time of writing. This comprises, the following sources:

- Census (Central Statistics Office (CSO) 2016) - Demographic, residential, and employment statistics;
- Population scoping reports and impacts assessments for other major linear infrastructure projects

- Google maps (Google 2022);
- Ordnance Survey Ireland (OSI) Prime 2 dataset (OSI 2020);
- Geodirectory data (Geodirectory 2019);
- National Public Transport Access Nodes (NaPTAN) (NTA 2020).
- Proposed Scheme Design Drawings; and
- Other reports and documents relating to the receiving environment, including other chapters of the EIAR.

The baseline assessment seeks to establish a full list of population receptors, including local educational, community, recreational and healthcare facilities, as well as commercial receptors (see Section 10.3.2). This is informed by the latest available census data (currently 2016) from the CSO and the OSI Prime 2 dataset.

10.2.4 Appraisal Method for the Assessment of Impacts

This Section sets out how each assessment topic has been undertaken and highlights where input from other environmental disciplines has been included within the Population assessment.

The Population assessment has been carried out in accordance with appropriate guidance, including the EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022). The EPA significance of impacts matrix has been used to determine the significance of impact (Table 10.2).

Table 10.2: EPA Significance Matrix

Significance		**Sensitivity**				
		Very Low	**Low**	**Medium**	**High**	**Very High**
Magnitude	Very Low	Imperceptible	Not significant	Slight	Slight	Slight
	Low	Not significant	Slight	Moderate	Moderate	Moderate
	Medium	Slight	Moderate	Moderate	Significant	Significant
	High	Slight	Moderate	Significant	Very significant	Profound
	Very High	Slight	Moderate	Significant	Profound	Profound

There is no prescribed method for determining the significance of effects on receptors as a result of a change in amenity.

The methodology for this assessment topic is therefore informed by existing best practice and experience on other infrastructure projects.

In addition to the EPA Guidelines, the assessment of land use and accessibility impacts has been informed by the Design Manual for Roads and Bridges (DMRB) LA 112 Population and human health (land use and accessibility) (hereafter referred to as the DMRB Guidance) (Highways England 2020). The DMRB Guidance has been used to determine the sensitivity and magnitude of impact for land use and accessibility receptors.

The assessment methodologies were applied to assess both the potential impacts during the Construction Phase and the potential impacts during the Operational Phase of the Proposed Scheme, unless otherwise stated.

10.2.4.1 Community Assessment

The methodology for the assessment of community impacts is outlined in this Section.

Community Amenity

Community amenity describes the perceived character or attractiveness of an area. This community amenity assessment has assessed the potential for people to change how they perceive their communities or how they use community facilities and recreational resources as a result of the Proposed Scheme.

The community amenity assessment considers the in-combination impact of the following environmental effects which are typically expected to contribute to a change in amenity:

- Air quality;
- Visual;
- Traffic and transport; and
- Noise and vibration.

Where there is a combination of at least two direct environmental effects on a receptor, or group of receptors, this is classified as an 'in-combination' impact on community amenity. For example, where there are both visual and air quality impacts on a receptor, or a group of receptors, the assessed receptor(s) would be impacted 'in-combination'. All residual impacts are considered from Imperceptible / Not Significant to Significant / Profound.

The assessment has considered the residual effect reported for each of the environmental effects under consideration. Therefore, specific sensitivity and magnitude criteria are not required for community amenity. The level of significance from each environmental effect was determined by the individual environmental assessments presented in the following chapters:

- Chapter 6 (Traffic & Transport);
- Chapter 7 (Air Quality);
- Chapter 9 (Noise & Vibration); and
- Chapter 16 (Landscape (Townscape) & Visual).

Aligning Receptors

To determine the impact on community amenity, there needs to be an alignment of receptors across the different contributing environmental assessments. For the assessment of air quality, the residual impact on human receptors identified in in Chapter 7 (Air Quality) of this EIAR, were used for all receptors along and within 200m of the Proposed Scheme for construction and operation. Construction dust has been excluded from the amenity assessment as it is considered to be sufficiently mitigated during construction, that it will not result in a significant residual air quality impact.

For the assessment of visual impacts, common receptors were identified for both construction and operation. In Chapter 16 (Landscape (Townscape) & Visual) of this EIAR, the assessment of townscape and streetscape has assigned an impact to specific viewpoints, as they relate to certain roads within the boundary of the Proposed Scheme. This has been used to align a visual residual impact to all receptors along those roads along the Proposed Scheme.

Chapter 9 (Noise and Vibration) of this EIAR assesses the impact on noise sensitive locations (NSL) which include: residential dwellings, schools and other educational establishments, hospitals and nursing homes, hotels and other short-term accommodation buildings, buildings of religious sensitivity, recreational and noise sensitive amenity areas and offices. During the Construction Phase, noise impacts at NSLs can occur from a variety of activities including road widening, utility diversion, urban realm landscaping and Construction Compounds. In an instance where a NSL is impacted by more than one noise source, the worst impact has been considered in the amenity assessment. During the Operational Phase, two assessment topics are considered in the noise and vibration assessment, namely, traffic noise along the Proposed Scheme and traffic noise on the surrounding road network. The residual impacts reported in respect to these two assessment topics are aligned to community and commercial receptors depending on whether they are situated along the Proposed Scheme or in the surrounding road network.

Chapter 6 (Traffic and Transport) of this EIAR assesses the impacts on ‘general traffic’ along the Proposed Scheme. Although other traffic impacts such as modal shift may affect amenity, the impact on general traffic has been considered as having the greatest potential to create a wider impact on community amenity, when combined with other environmental effects. For ease of assessment, the amenity assessment has only considered residual impacts on general traffic. During construction, the amenity assessment considers the restrictions to general traffic along the Proposed Scheme as well as the residual impact that is predicted to arise from additional construction traffic flows on the surrounding road network. During operation, the amenity assessment has considered the reduction in general traffic along the Proposed Scheme and the redistributed general traffic along the surrounding road network.

The residual impact on general traffic along the Proposed Scheme is assigned to all receptors located along the Proposed Scheme, while the impact from construction traffic flows (Construction Phase) or redistributed traffic (Operational Phase) is assigned to all receptors on the surrounding road network.

Beneficial impacts on community amenity during the Construction Phase are considered highly unlikely due to the nature of construction activities. Therefore, only negative impacts were assessed. However, beneficial and negative impacts are both assessed during the Operational Phase given the nature of activities of the Proposed Scheme during this period.

Determining Significance of Effect

Following alignment of the environmental effects, an in-combination assessment matrix has been used to determine the significance of localized impacts on individual receptors (see Table 10.3).

For the purposes of the amenity assessment, the term 'Significant' includes the EPA terms 'Profound', 'Very Significant' and 'Significant' while, the term 'Not Significant' includes the EPA terms 'Not Significant' and 'Imperceptible' as outlined in the EPA Guidelines (EPA 2022). This is used for either all negative or positive impacts, but not a combination of both. Where both negative and positive impacts occur, professional judgement has been used to assign the overall impact on amenity.

Whilst the community amenity assessment imposes no duration criteria of its own, where a 'Significant' impact on amenity is identified, the temporal aspects of the environmental effects were examined to determine whether the impacts are likely to occur simultaneously and result in a 'Significant' in-combination impact.

With this determination, the nature, significance and duration of effects for each community area has been reported in line with the EPA Guidelines (EPA 2022). Amenity impacts that arise on individual receptors have only been stated separately in the Potential Impacts (Section 10.4) for Moderate, Moderate/Significant and Significant amenity impacts. Amenity impacts on individual receptors that are assessed as less than Moderate (Slight, Not Significant and Imperceptible) are not discussed in the amenity assessment. Only individual receptors that are expected to experience a Moderate/Significant or Significant amenity impact are listed in the Residual Impact tables (Section 10.6).

Table 10.3: In-Combination Amenity Significance Matrix (Construction and Operational Phases)

Environmental Effect 1	Environmental Effect 2	Environmental Effect 3	Environmental Effect 4	Combined Impact
Significant	Significant	Significant	Significant	Significant
Significant	Significant	Significant	Moderate	Significant
Significant	Significant	Significant	Slight	Significant
Significant	Significant	Significant	Not Significant	Significant
Significant	Significant	Moderate	Moderate	Significant
Significant	Significant	Moderate	Slight	Moderate / Significant
Significant	Significant	Moderate	Not Significant	Moderate / Significant
Significant	Significant	Slight	Slight	Moderate

Environmental Effect 1	Environmental Effect 2	Environmental Effect 3	Environmental Effect 4	Combined Impact
Significant	Significant	Slight	Not Significant	Moderate
Significant	Significant	Not Significant	Not Significant	Moderate
Significant	Moderate	Moderate	Moderate	Moderate / Significant
Significant	Moderate	Moderate	Slight	Moderate
Significant	Moderate	Moderate	Not Significant	Moderate
Significant	Moderate	Slight	Slight	Moderate
Significant	Moderate	Slight	Not Significant	Moderate
Significant	Moderate	Not Significant	Not Significant	Moderate
Significant	Slight	Slight	Slight	Slight / Moderate
Significant	Slight	Slight	Not Significant	Slight / Moderate
Significant	Slight	Not Significant	Not Significant	Slight
Significant	Not Significant	Not Significant	Not Significant	Not Significant / Potential direct impact on amenity*
Moderate	Moderate	Moderate	Moderate	Moderate / Significant
Moderate	Moderate	Moderate	Slight	Moderate / Significant
Moderate	Moderate	Moderate	Not Significant	Moderate
Moderate	Moderate	Slight	Slight	Moderate
Moderate	Moderate	Slight	Not Significant	Moderate
Moderate	Moderate	Not Significant	Not Significant	Moderate
Moderate	Slight	Slight	Slight	Slight / Moderate
Moderate	Slight	Slight	Not Significant	Slight / Moderate
Moderate	Slight	Not Significant	Not Significant	Slight
Moderate	Not Significant	Not Significant	Not Significant	Not Significant
Slight	Slight	Slight	Slight	Slight / Moderate
Slight	Slight	Slight	Not Significant	Slight / Moderate
Slight	Slight	Not Significant	Not Significant	Slight
Slight	Not Significant	Not Significant	Not Significant	Not Significant
Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

*Potential direct impacts on amenity for commercial businesses is discussed in Section 10.1.

Community Land Use & Accessibility – Land Take

This assessment considers both temporary and permanent direct land take impacts on community receptors (e.g. parks and residential land, including gardens, paths and driveways) within the Proposed Scheme boundary. Direct land take impacts can lead to a temporary or permanent restriction in the ability of a user to use a property or a community facility.

Following the DMRB Guidance (Highways England 2020), residential land has been assigned a high sensitivity. The sensitivity of community facilities varies, and therefore, specific aspects were considered to assess the sensitivity of these receptors, such as:

- Availability of viable alternatives;
- Frequency of use; and
- Number of users on an average visit.

Some other examples of different sensitivities include:

- A hospital would be assigned a very high sensitivity;
- A nature reserve that attracts visitors from across Galway City with no alternatives would be assigned a high sensitivity;
- Playing grounds, frequented daily, with no immediate alternative would be assigned a medium sensitivity;
- A small local park, with no extra amenities or features would be assigned a low sensitivity; and
- Derelict land or unoccupied buildings would be assigned a very low sensitivity.

The magnitude of impact of land take has been determined by the degree of loss of the resource including acquisition of gardens and private landings / driveways, as set out in DMRB Guidance and supported by professional judgement. In general, direct acquisition has been categorised with a high or very high magnitude. A medium magnitude would be assigned where there will be changes to access or the acquisition of land, but the changes overall will not compromise the overall viability of a property. A low magnitude has been assigned where there will be a minor loss of land, or where severance will be introduced but adequate accessibility will be maintained throughout the Construction Phase or provided during the Operational Phase. The nature, significance, and duration of effect for each receptor has been assigned using the EPA Guidelines (EPA 2022).

Accessibility

Community accessibility relates to the ability of users to access community facilities, recreational resources and residential properties. Change in access to facilities can significantly affect users, particularly if these are important facilities (e.g. hospitals), or if there are a lack of alternative facilities available.

Changes in traffic flow, parking provision, public transport services and walking and cycling provision can also impact the ability of users to access certain community facilities.

During the Construction Phase, temporary diversions and temporary road closures will be required for short periods of time with diversions in place and local access accommodated, as required. Lane closures may be required during different Construction Phases which will reduce traffic capacity. Chapter 6 (Traffic & Transport) of this EIAR has qualitatively assessed the potential impacts on pedestrians, cyclists, bus users and parking and loading as a result of construction activity. The residual effects assigned to each user type within Chapter 6 Traffic & Transport) of this EIAR informs the qualitative accessibility assessment in this Chapter. As such, the impact on access to community receptors during construction has been reported by each user type and for each community area, in line with EPA Guidelines (EPA 2022).

Changes in access to community receptors as a result of the operation of the Proposed Scheme were considered in respect to the outcomes of a changed walking environment for pedestrians, cycling provision for cyclists and bus infrastructure for bus users. A parking assessment has been undertaken in Chapter 6 (Traffic & Transport) of this EIAR and therefore is not considered further in this Population assessment unless a negative, significant impact is identified at any point along the Proposed Scheme. The impact on private landings, which can be used for a variety of reasons by businesses, has been considered in the land take assessment.

The community accessibility assessment has drawn on the outcomes of the qualitative assessment metrics identified in Chapter 6 (Traffic & Transport) of this EIAR. These qualitative assessments were considered collectively in order to assess the significance of impacts on access for each community area during the Operational Phase. The assessment has been reported by community area and by different user types (bus users, cyclists, pedestrians and private vehicles). However, where a significant change in access is expected on a road, this has been reported individually, alongside the community receptors that are likely to be impacted as a result. The nature, significance and duration of effect for each receptor has been assigned using the EPA Guidelines.

10.2.4.2 Economic Assessment

This Section outlines the methodology for the assessment of economic impacts.

Commercial Amenity

The commercial amenity assessment has included consideration of ‘direct’ and ‘in-combination’ impacts on commercial amenity. An in-combination impact on the commercial amenity of commercial receptors has been assessed using the same method as for community amenity (Table 10.3).

In some cases, a single (direct) environmental effect in isolation can result in an impact on commercial amenity where a business has a particular sensitivity. For example, certain activities can be sensitive to noise and vibration effects (i.e. performing arts, advanced manufacturing, and sound recording facilities). The assessment has therefore included an assessment of direct impacts on amenity for commercial receptors.

Appendix 10.1 Schedule of Commercial Businesses in Volume 4 of this EIAR provides a list of all commercial businesses along the Proposed Scheme and has been referred to in the assessment section, where appropriate.

The following approach has been taken for the assessment of direct amenity:

- The sensitivity of each commercial receptor has been considered from the perspective of the following environmental effects:
  - Air quality;
  - Visual;
  - Noise and vibration; and
  - Traffic.
- The following specific questions were posed to assess the sensitivity of commercial receptors:
  - Is this business providing support to vulnerable people or people with disabilities who may be sensitive to noise disturbance?
  - Does the operation of the business rely on the visual landscape to attract trade (e.g. a restaurant, hotel or tourism asset)?
  - Is this an outdoor asset and therefore more reliant on the quality of the environment, e.g. a sports stadium?
  - Are the customers or visitors to the commercial receptor particularly sensitive to environment effects, e.g. office workers sensitive to noise?

Professional judgement will be applied to determine if a single significant residual environmental effect is likely to create a direct amenity effect on the business such that the viability of the business could be comprised.

In general, a 'High' sensitivity would only be applied where the nature and function of the operation could mean that business viability would be put at risk. The magnitude of impact on each commercial receptor has been informed by the residual significance of effects identified within each environmental assessment.

Commercial Land Use & Accessibility – Land Take

This assessment considers direct land take on commercial properties / land and designated car parking. This assessment has only considered commercial properties within the Proposed Scheme boundary that would be expected to experience direct land take. This assessment has followed the same approach as set out for community land take (Section 10.1).

Large areas of commercial land, such as a business park or shopping centre, were assigned a high sensitivity. Derelict land or unoccupied buildings were assigned a low sensitivity. The magnitude of impact on commercial land has been determined by the degree of loss of the resource. Where there will be substantial permanent land take from a commercial land holding, a high magnitude has been assigned. A low magnitude would be assigned where there will be minimal disruption to non-operational land or a car park.

The nature, significance and duration of effect for each receptor has been assigned using the EPA Guidelines (EPA 2022).

Accessibility

Commercial accessibility relates to the ability of users and employees to access commercial businesses. Changes in access to commercial business (i.e. changes in traffic flow, public transport services and walking and cycling provision) can significantly affect the level of usage experienced by commercial receptors, which may affect business viability. The accessibility assessment has considered the commercial properties along the Proposed Scheme as well as those areas that are expected to experience positive and negative changes in traffic flows in the adjacent road network. Appendix 10.1 Schedule of Commercial Businesses in Volume 4 of this EIAR provides a list of all commercial businesses along the Proposed Scheme and has been referred to in the assessment section, where appropriate.

During the Construction Phase, temporary diversions may be required for short periods of time and local access accommodated as required. Lane closures will be required during different Construction Phases which will reduce traffic capacity. Chapter 6 (Traffic & Transport) of this EIAR has qualitatively assessed the potential impacts on pedestrians, cyclists and bus users as a result of construction activity. The residual effects assigned to each user type within Chapter 6 (Traffic & Transport) of this EIAR informs the accessibility assessment in this Chapter. As such, the impact on access to community receptors during construction has been reported by each user type and for each community area, in line with EPA Guidelines (EPA 2022).

Changes in access to commercial receptors as a result of the operation of the Proposed Scheme were considered in respect to the outcomes of a changed walking environment for pedestrians, cycling provision for cyclists and bus infrastructure for bus users. The community accessibility assessment has therefore drawn on the outcomes of the qualitative assessment metrics identified in the Chapter 6 (Traffic & Transport) of this EIAR. These qualitative assessments were considered collectively in order to assess the significance of impacts on access during the Operational Phase. The assessment has been reported by community area and by different user types (bus users, cyclists, pedestrians and private vehicles). However, where a significant change in access or change to business viability is expected on a specific commercial receptor, this has been reported individually. The nature, significance and duration of effect for each receptor (where appropriate) and community area has been assigned using EPA Guidelines.

The assessment considers localised effects on individual receptors, including community facilities and recreational resources, as well as considering effects on individual residential land parcels. The significance of effects on these receptors are then reported for each community affected by the Proposed Scheme. Similarly, the assessment will consider the significance of effects on accessibility to employment by looking at commuting patterns and transport accessibility within each community.

For economic effects, the assessment considers the significance of localised effects on individual commercial receptors and land parcels affected by the

Proposed Scheme (could include commercial receptors outside of the footprint of the Proposed Scheme that could experience effects).

10.3 Baseline Environment

This Section presents the baseline environment for the community and economic assessments. The baseline assessment includes a brief description of the community areas the Proposed Scheme will pass through, details about the different types of community and commercial receptors in the study area and any notable features along the Proposed Scheme.

10.3.1 Overview

The following gives an overview of the urban and built environment. Along the Proposed Scheme, there are a number of potentially sensitive receptors. A list of these is provided in Table 10.4.

Table 10.4: Examples of Different Types of Sensitive Receptors Along the Proposed Scheme

Type of Receptor	Examples Along the Proposed Scheme
Residential	Residences along route
Commercial	Eyre Square and Corbett Court Shopping Centre, Corrib Shopping Centre
Education	NUI Galway, Saint Patrick's Primary School, Saint Nicholas Parochial School, Yeat's College, Our Lady's College Galway
Community facilities	Galway Court House, Bus Éireann bus depot and Irish Rail stations (Galway Ceannt train station), Galway Coach Station (Fairgreen Road), Galway General Post Office, County Hall, City Hall.
Recreational resources	Millennium Children's Park, Town Hall Theatre, Eyre Square, Connaught Rugby Pitches and greyhound track, Lough Atalia Park
Religious	Galway Cathedral, Poor Clares Convent, St Francis the Abbey, United Methodist Presbyterian Church, St Patrick's Church
Tourism assets	Galway Cathedral, Salmon Weir Bridge, roads infrastructure and transportation hubs (as above), Williamsgate Street, Eyre Square, Hotels and other accommodation along route
Medical / Healthcare	University Hospital Galway (UHG)

The Proposed Scheme will intersect six community areas which have an approximate total population of 12,466 according to the 2016 census (Central Statistics Office (CSO) 2016).

The Proposed Scheme begins in the community areas of Shantalla and Nun's Island adjacent to Galway University Hospital. These areas consist of a mixture of residential, commercial, educational and health uses with the immediate proximity of the NUI Galway Campus and Galway University Hospital dominating large tracts of land within both community areas. Once past the Galway Cathedral, the Proposed Scheme begins to pass through the city centre core, entering the community area of Paróiste San Nicoláis. It continues through the city centre core into Eyre Square, which acts as a main focal point in the city and includes a variety of existing uses. From there, it continues south-east onto College Road past Galway City Council offices and Yeats College, where it merges onto Lough Atalia Road. As the route continues onto Lough Atalia Road and the Dublin Road, the surrounding area becomes more open on one side and characterised by commercial uses on the other. The route also spurs off towards the harbour area, to accommodate construction traffic utilising the proposed temporary construction compound. This area is characterised by commercial and port uses.

The study area for the Proposed Scheme consists of seven community areas which have an approximate total population of 15,059 according to the 2016 Census (CSO 2016a).

For more details on the extent of the Proposed Scheme in the areas outlined above, please see Chapter 4 (Proposed Scheme Description).

10.3.2 Community Baseline

10.3.2.1 Community Facilities and Recreational Receptors

The Proposed Scheme passes a number of community and recreational receptors, the number and type of receptor are presented by community area in Table 10.5.

Table 10.5: Community Receptor Type by Community Area (OSI 2020)

Community and Recreation Receptors	Place of Worship	Hospital / Health Centre	Schools	Recreation
Claddagh	1	-	2	2
Eyre Square	3	-	1	4
Lough Atalia	-	-	-	-
Nuns Island	3	-	6	1
Shantalla	-	1	1	-
St. Nicholas	-	-	4	6
Wellpark	-	-	2	-
Study Area Total	7	1	16	13

Table 10.5 demonstrates that there is a high concentration of schools in Nuns Island and St. Nicholas compared with the other community areas, and a high concentration of recreational receptors in Eyre Square and Nuns Island compared with other community areas.

In terms of hospitals and health centres, there is only one receptor located in the study area, namely, Galway University Hospital. Places of worship are also sparsely dispersed across the study area, chiefly within the community areas of Claddagh, Eyre Square and Nuns Island. Examples of community receptors along the Proposed Scheme which may attract a large number of users are detailed in Table 10.4.

Within the study area there appear to be a large number of schools and recreational facilities along the Proposed Scheme which attract large number of residents from local communities during peak times of the day, with the National University of Ireland, Galway attracting students from a larger catchment.

10.3.2.2 Residential and Community Land

There are approximately 3,375 residential properties and 2,222 apartments within the community study area (OSI 2020).

10.3.2.3 Commute to Work

There are approximately 6,523 commuters across the Proposed Scheme community study area and 11% of these commuters travel by public transport (bus or train) (CSO 2016b). The method of travel to work by community area is presented in Table 10.6. On average, nearly half of commuters in the study area travel by foot or by bike to work (49%), while slightly less commuters choose to take a car or van to work (40%), with travel by bus, minibus or coach being the next most popular form of transport (10%). The urban character of the study area is reflected by the fact that nearly half of all commuters travel to work by foot or by bike.

Table 10.6: Method of Travel to Work for Bus, Train, Car and Foot / Bike (%) (CSO 2016b)

Community Area	Travel by Bus / Minibus or Coach	Travel by Car / Van	Travel by Train	Travel by Foot / Bike	Other
Claddagh	7%	43%	0%	49%	0%
Eyre Square	12%	32%	1%	55%	1%
Lough Atalia	8%	68%	1%	23%	0%
Nuns Island	7%	32%	0%	60%	0%
Shantalla	6%	46%	0%	47%	1%
St. Nicholas	11%	33%	1%	55%	0%
Wellpark	12%	55%	1%	32%	0%

Study Area Average	10%	40%	1%	49%	1%

NaPTAN data published by the NTA (NTA 2020) identifies the access points for bus stops, rail stations, airports, and tram stops, providing an indication of the level of availability of public transport within community areas. There are a total of 193 public transport access points across the study area, as shown in Table 10.7. Eyre Square has the largest proportion of public transport stops, making up 32% of the stops in the study area. This is reflected by the fact that Eyre Square represents the centre of Galway City, and acts as a multi-modal destination and access point.

Table 10.7: Number of Public Transport Access Points Across the Study Area

Community Areas	Number of Public Transport Access Points	Percent of Stops Across the Study Area
Claddagh	11	6%
Eyre Square	62	32%
Lough Atalia	10	5%
Nuns Island	24	12%
Shantalla	26	13%
St. Nicholas	30	16%
Wellpark	30	16%
Study Area Total	193	

10.3.3 Economic Baseline

10.3.3.1 Commercial Receptors

The Proposed Scheme will pass Eyre Square, a central meeting place in Galway City, and a number of small shopping centres and leisure complexes. The number of commercial receptors in the study area are presented in Table 10.8 (Geodirectory 2019). Appendix 10.1 Schedule of Commercial Businesses in Volume 4 of this EIAR provides a list of all commercial businesses along the Proposed Scheme, and 319 businesses have been identified along the Proposed Scheme, which is 32.2% of businesses in the study area.

Table 10.8: Commercial Receptors within Each Community Area (Geodirectory 2019)

Community Area	Commercial Receptors*
Claddagh	99
Eyre Square	395
Lough Atalia	10
Nuns Island	295

Community Area	Commercial Receptors*
Shantalla	18
St. Nicholas	87
Wellpark	86
Study Area Total	990

*Geodirectory data can count commercial businesses that are in the same location e.g. a shopping centre, as one commercial business, which may skew the commercial receptor count.

Table 10.8 shows the largest number of commercial receptors are located in Eyre Square, Nuns Island and Claddagh and the smallest number of commercial receptors are in the Shantalla and Lough Atalia community areas.

10.3.3.2 Employment

Within the study area there are approximately 7,242 people in employment (48% of the total study area population). Of the working age population, over 838 people are unemployed. This equates to approximately 6% of the total study area population and this is much less than the unemployment rate for Galway as a whole (11.7%) (CSO 2016a).

Key centres of employment within the study area include:

- Galway City Council;
- Galway County Council;
- Galway University Hospital;
- National University of Ireland, Galway;
- Galway Harbour; and
- Eyre Square and surrounding shopping areas.

Diagram 10.1 presents a breakdown of employment across the study area. The largest sectors of employment across the study area are commerce and trade (28%), professional services (24%) and other (31%) (CSO 2016c).

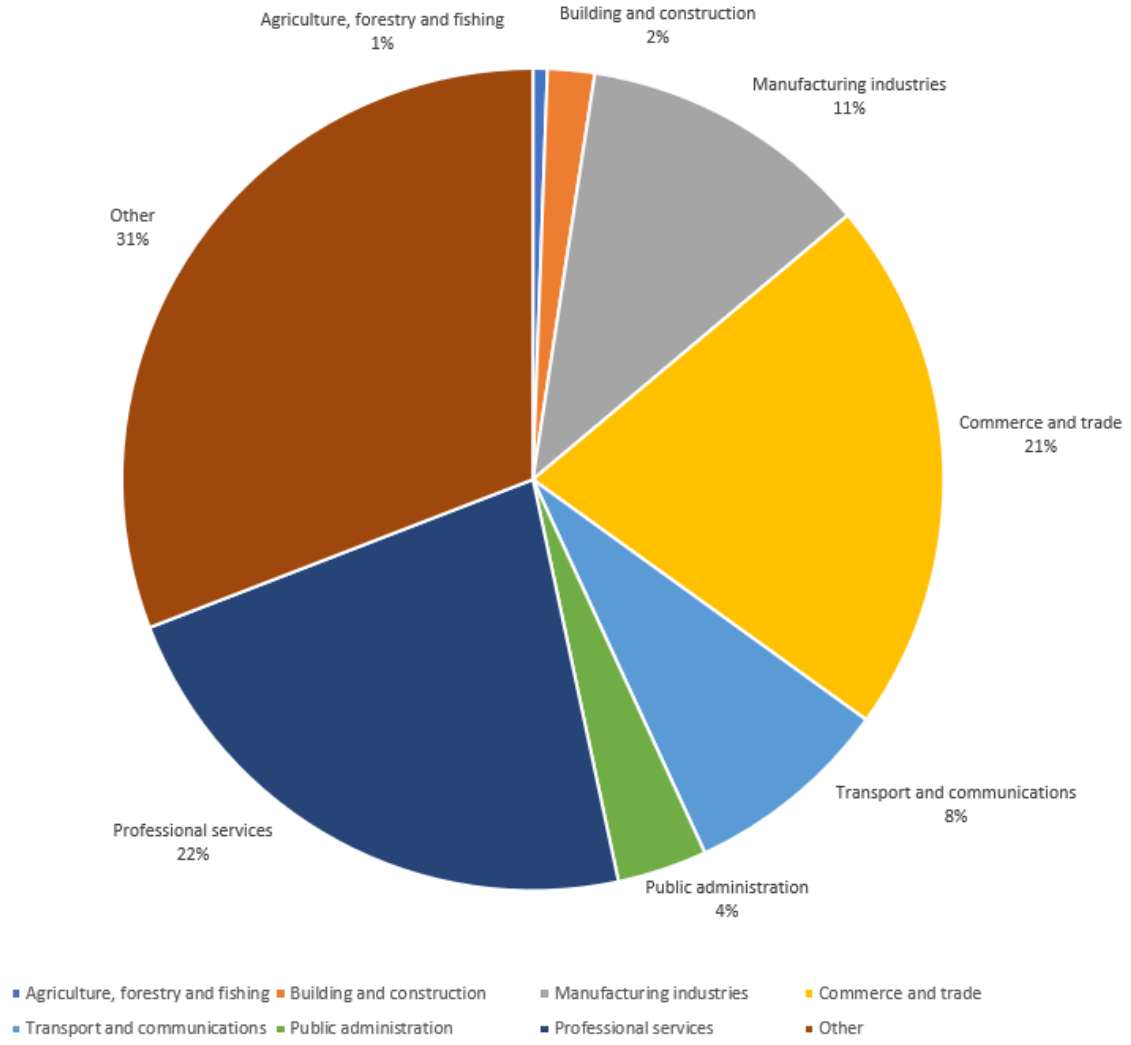


Diagram 10.1: Employment by Industry within the Study Area (%)

10.4 Potential Impacts

10.4.1 Characteristics of the Proposed Scheme

The Proposed Scheme will be approximately 6.7km (kilometres) long and will include approximately 1.2km of new cycling infrastructure and 2.5km of bus only lanes and gates. The Proposed Scheme will form a central route for public transport, cyclists and pedestrians along an east-west corridor through the city centre. Land take along the Proposed Scheme will be required from three residential properties, amenity land from two housing estates, three commercial facilities (Circle K, The Huntsman Inn and Bayview B&B), a charity services facility (Brothers of Charity Services Galway), Dyke Road car park and a local authority facility (Galway County Council offices). A small amount of parking will be relocated at a number of residential and commercial facilities impacted by land take. All permanent land acquisition will be required to facilitate the widening of the carriageway and allow for the provision of improved bus, pedestrian and cycle infrastructure.

As per Chapter 5 (Construction) of this EIAR, during the Construction Phase, the anticipated site staff numbers working on the Proposed Scheme will be 70 to 80, rising to 100 workers at peak construction. This level of employment will provide a positive economic impact to the economy in terms of associated spending from construction works, although a proportion will already reside locally.

There will be a projected increase in bus passenger numbers as a result of the Proposed Scheme through the realisation of faster journey times and better reliability, which will be coupled with the opportunity to increase capacity through more frequent services if required. In addition, the provision of enhanced cycling facilities should also increase the number of cyclists utilising the infrastructure. The increased passenger and cyclist numbers may result in a benefit to commercial businesses from an increase in passing trade.

The Proposed Scheme will utilise three construction compounds, two main compounds located at Galway Harbour Enterprise Park, within Galway Docks, and a satellite compound at Galway Cathedral car park

10.4.2 Do Nothing Scenario

In the Do Nothing scenario the Proposed Scheme would not be implemented and therefore there would be no changes to pedestrian, cycling or bus amenity and access, and no change to land use as a result of the Proposed Scheme. Therefore, there would be a Neutral impact on land use and potential Negative impacts on amenity and accessibility under the 'Do Nothing' scenario.

10.4.3 Construction Phase

10.4.3.1 Community Assessment

Community Amenity

Community amenity impacts arise from a combination of traffic, air quality, noise and visual impacts as discussed in Section 10.1.

Chapter 7 (Air Quality) of this EIAR identifies residual road traffic impacts on local human receptors to be slight, negative and short-term during construction.

Chapter 9 (Noise & Vibration) of this EIAR identifies noise impacts associated with the Construction Phase to be of negative, not significant to slight, temporary impact during general road works, urban realm and quiet street treatment works at distances greater than 15m from the works. During this period, noise impacts associated road widening and utility diversion works will be of negative, moderate to significant, temporary impact at distances between 15m to 20m from the works. At distances within 10m of road widening / utility diversion works, the noise impact is negative, significant to very significant and temporary**.** However, once the Construction Noise Locations (CNLs) and duration of works are aligned with the DMRB Noise and Vibration (UKHA 2020), all key Construction Phase residual noise levels are not significant, whilst meeting the scheme objectives.

Chapter 16 (Landscape (Townscape) & Visual) of this EIAR identifies the loss of 59 early mature and mature trees during construction works as a negative, significant, and short-term townscape and visual effect. However, the planting of 186 new street trees will give rise to positive and long-term effects.

Chapter 6 (Traffic & Transport) of this EIAR identified a residual Negligible and Short-term impact on general traffic along the Proposed Scheme and a Negative, Slight and Temporary impact from additional construction traffic flows in the surrounding road network.

Community Land Use & Accessibility – Land Take

The assessment of community land take during the Construction Phase assesses the temporary land take acquired to accommodate construction works and the potential impacts this will have on community facilities and residential properties.

A total of five community receptors (residential properties) are impacted by temporary land take as a result of the construction works for the Proposed Scheme. Table 10.9 summarises the findings of the community land take assessment for residential properties along the Proposed Scheme during the Construction Phase.

Table 10.9: Land Take Impacts on Residential Properties during the Construction Phase

Community Area	Nature of Effect / Number of Residential Properties Affected			
	Imperceptible / Not Significant	Slight	Moderate	Significant
St Nicholas	0	0	0	2
Eyre Square	0	0	1	2
Total	0	0	1	4

- Table 10.9 shows that residential properties that will be impacted by temporary land take are located in the St. Nicholas and Eyre Square community areas. Within each community area the following residential land take impacts are expected:
- St. Nicholas: Negative, Significant and Short-Term land take impacts at 5/6 Headford Road and 20 Brendan's Avenue are predicted, based on the proposed permanent acquisition and demolition of these properties to allow for a widened street width and changes to areas of landscape and hard surfacing. Both properties are two storey, end of terrace, properties with boundary walls and gardens.
- Eyre Square: Moneenageisha Court, 139 College Road, Gleann Noinin will all be impacted by temporary land take as a result of construction works for the Proposed Scheme. Moneenageisha Court and 139 College Road are both predicted to experience Negative, Significant and Short-Term temporary land take impacts that will result in loss of amenity area and increased visual exposure from the carriageway. Gleann Noinin will experience Negative, Moderate and Short-Term land take impacts due to the loss of a small portion of land at the entrance to the estate.

During the Construction Phase, access to residential properties and community facilities will be maintained, as far as reasonably practicable (see Chapter 5 (Construction) of this EIAR).

Local arrangements will be made on a case-by-case basis to maintain continued access to homes and businesses affected by the works, at all times, where practicable. Details regarding temporary access provisions will be discussed with homes and businesses prior to construction starting in the area. The duration of the works will vary from property to property, but access and egress will be maintained at all times.

In terms of land take impacts on community facilities during the construction phase, there is an identified impact on Galway Cathedral in the Nuns Island community area. This community facility is expected to experience Negative, Significant and Short-Term land take impacts due to the location of a construction compound within the parking area to the south of the Cathedral.

Overall, the impact of landtake across the impacted community areas (St. Nicholas, Nuns Island and Eyre Square) as a whole is considered Negative, Slight and Short-Term during the Construction Phase.

Accessibility

Community accessibility relates to the ability of users to access community facilities, recreational resources and residential properties. The nature of the Proposed Scheme means accessibility impacts will differ based on the mode of travel used. The assessment has therefore separately assessed accessibility impacts on pedestrians and cyclists, bus users and private vehicles.

Pedestrians, Cyclists and Bus Users

Pedestrian and cyclist safety measures are discussed in Chapter 5(Construction) of this EIAR. These safety measures are intended to allow the safe continuation of access along the route of the Proposed Scheme during the Construction Phase. It is expected that, as roads, cycle lanes and footpaths are being upgraded, that there will be some level of disruption to users and the subsequent ability to access community facilities. It is important to note that as the Construction Phase will be undertaken in sections, construction impacts would be limited to where the work is being undertaken and for a limited duration. As outlined in Section 5.5 of Chapter 5 (Construction) of this EIAR, measures will be undertaken by the appointed contractor to ensure that access and parking are maintained during construction, wherever possible, to reduce the impact on accessibility along the Proposed Scheme.

Chapter 6 (Traffic & Transport) of this EIAR has identified a residual Negative, Slight and Temporary impact on walking and a Negative, Moderate and Temporary impact on cycling along the Proposed Scheme during construction. Taking into consideration the measures presented in Chapter 5 (Construction) of this EIAR, it is expected that access to community receptors along the Proposed Scheme will be maintained throughout the construction period.

As discussed in Chapter 5 (Construction) of this EIAR, existing bus routes will be maintained during the Construction Phase. Bus stop locations may need to be temporarily relocated to accommodate the works. It is expected that use of buses to access community facilities will continue throughout construction, albeit there may be a change in the distance required to walk between the temporary bus stops and the facilities.

Chapter 6 (Traffic & Transport) of this EIAR has identified a residual Negative, Slight and Temporary impact on bus users along the Proposed Scheme. Taking into consideration the measures in Chapter 5 (Construction) of this EIAR, it is expected that the impact on access to community receptors along the Proposed Scheme will be Negative, Slight and Short-Term for bus users during construction.

Private Vehicles

Chapter 5 (Construction) of this EIAR outlines temporary traffic management measures which may impact accessibility along certain parts of the Proposed Scheme to parking provision and community facilities, particularly where road closures or diversions will be required. Road diversions will be temporary and may result in an increase in the time taken to get to a community facility via private vehicle, but that overall access to that facility will not be prohibited. The impact on specific parking and loading provision is discussed in Chapter 6 (Traffic & Transport) of this EIAR.

Chapter 6 (Traffic & Transport) of this EIAR has identified a residual Negative, Moderate and Temporary impact for general traffic travelling along the Proposed Scheme. Taking into consideration the measures in Chapter 5 (Construction) of this EIAR, it is expected that the impact on access to community receptors from private vehicles along the Proposed Scheme will be Negative, Moderate and Short-Term during construction. Additional construction traffic flows upon the surrounding road network are expected to result in a Negative, Slight and Temporary impact on general traffic. This will not include the impact of construction access vehicles which are considered in Chapter 6 (Traffic and Transport). Private vehicles may therefore be negatively affected on the surrounding road network although this is only expected to be Negative, Slight and Short-Term during construction.

The impacts identified above are expected to be experienced by community areas located predominately along the length of the Proposed Scheme where construction activity, road diversions and closures are expected. It is acknowledged that users will travel between community areas to access community facilities within other community areas. However, the impact of construction activity will be experienced where the facility is located. The community areas that are expected to experience a Negative, Slight and Short-Term impact (pedestrians and bus users) and a Negative, Moderate and Short-Term impact (cyclists and private vehicles) as a result in changes to access are Lough Atalia, Eyre Square, St Nicholas and Nuns Island. Pedestrians, cyclists and bus users in all other community areas (i.e. Shantalla, Wellpark and Claddagh) are expected to experience a Negative, Not Significant and Short-Term impact as a result of changes to access, while private vehicles will experience a Negative,

Slight and Short-Term impact as a result of changes to access during the construction of the Proposed Scheme.

10.4.3.2 Economic Assessment

Commercial Amenity

As outlined above in Section 10.1, commercial amenity impacts can arise from a combination of traffic, air quality, noise and visual impacts, or directly where a single environmental impact is significant enough to affect the viability of a commercial business.

Chapter 7 (Air Quality) of this EIAR identified residual road traffic impacts on local human receptors to be Slight, Negative and Short-Term during construction.

Chapter 9 (Noise & Vibration) of this EIAR identified noise impacts associated with the Construction Phase to be of negative, not significant to slight, temporary impact during general road works, urban realm and quiet street treatment works at distances greater than 15m from the works. During this period, noise impacts associated road widening and utility diversion works will be of negative, moderate to significant, temporary impact at distances between 15m to 20m from the works. At distances within 10m of road widening / utility diversion works, the noise impact is negative, significant to very significant and temporary**.** However, once the Construction Noise Locations (CNLs) and duration of works are aligned with the DMRB Noise and Vibration (UKHA 2020), all key Construction Phase residual noise levels are not significant, whilst meeting the scheme objectives.

Chapter 16 (Landscape (Townscape) & Visual) of this EIAR identified he loss of 59 early mature and mature trees during construction works as a significant, negative and short-term townscape and visual effect. However, the planting of 186 new street trees will give rise to positive and long-term effects.

Chapter 6 (Traffic & Transport) of this EIAR identified a residual Negligible and Short-term impact on general traffic along the Proposed Scheme and a Negative, Slight and Temporary impact from additional construction traffic flows in the surrounding road network.

Commercial Land Use & Accessibility – Land Take

The assessment of commercial land take during the Construction Phase assesses the temporary land take acquired and the potential impacts this has on commercial businesses.

Table 10.10 summarises the findings of the commercial land take assessment for commercial facilities along the Proposed Scheme during the Construction Phase.

Table 10.10: Land Take Impacts on Commercial Facilities during the Construction Phase

Community Area	Nature of Effect / Number of Community Facilities Affected			
	Imperceptible / Not Significant	Slight	Moderate	Significant
St. Nicholas	0	2	0	0
Eyre Square	0	0	1	1
Lough Atalia	0	2	0	0
Total	0	4	1	1

A total of six commercial receptors located within the St. Nicholas, Eyre Square and Lough Atalia community areas are expected to be impacted by land take during the construction phase of the Proposed Scheme. Four commercial receptors, namely The Huntsman Inn, Brothers of Charity, Galway County Council and Dyke Road Car Park are expected to experience Negative, Slight and Short-Term land take impacts during the construction phase. This is due to the acquisition of non-operational lands and minimal disruption to car parks within the aforementioned commercial receptors. Whereas the Bayview B&B situated in the Eyre Square community area is expected to experience Negative, Moderate and Short-Term land take impacts during the construction phase due to the greater impact this will have on its car parking area.

The temporary acquisition of the full Circle K site located within the Eyre Square community area is considered to be Negative, Significant and Short-Term as it will require the business to be shutdown for a period of time which will result in loss of investment and job losses.

The temporary acquisition of part of Eyre Square has the potential to impact on traders that temporarily use the area as a market place. These traders are considered mobile, the impact on their business will be temporal and relocation will be subject to the agreement of GCC.

Accessibility

Commercial accessibility relates to the ability of users to access commercial businesses as customers or employees. The nature of the Proposed Scheme means that accessibility impacts will differ based on the mode of travel used. The assessment, similar to the community accessibility assessment, has separately assessed accessibility impacts on pedestrians and cyclists, bus users and private vehicles. As the Construction Phase mitigation measures presented in Chapter 5 (Construction) and the residual effects presented in Chapter 6 (Traffic & Transport) of this EIAR are the same for each mode of travel, the impacts on commercial accessibility are the same as those reported for community accessibility.

A parking assessment has been undertaken in Chapter 6 (Traffic & Transport) of this EIAR. No significant impacts on parking along the Proposed Scheme route were identified.

10.4.4 Operational Phase

10.4.4.1 Community Assessment

Community amenity impacts arise from a combination of traffic, air quality, noise and visual impacts, as discussed in Section 10.1.

Chapter 7 (Air Quality) of this EIAR identified a Neutral and Long-Term residual impact on human receptors during the Operational Phase.

Chapter 9 (Noise & Vibration) of this EIAR identified Positive to Neutral Direct impact along the Proposed Scheme due to a reduction in traffic volumes during both the year of opening and the design year. There are some significant residual Operational Phase noise or vibration impacts associated with the Proposed Scheme during the initial short to medium term phase and the long-term phase.

Chapter 16 (Landscape (Townscape) & Visual) of this EIAR identified that the Proposed Scheme, once operational, will have a Permanent and Significant effect on this sensitive urban townscape setting in Galway City.
The improved connectivity and accessibility for pedestrians and cyclists linking the Galway City Centre to western and eastern city environs will improve people's experience of moving through this part of the city.

Chapter 6 (Traffic & Transport) of this EIAR identifies effects on general traffic and transport to be generally positive. These include positive effects on modal share, positive, very significant and long-term impact in terms of People Movement by sustainable mode with significantly reduced bus journey times. Long term effects of redistributed traffic on junctions are predicted to be imperceptible/negligible to insignificant at the majority of junctions and to range from slight to moderate at 13 out of 77 junctions assessed in the AM peak period and at 10 out of 58 junctions assessed in the PM peak period.

Community Land Use & Accessibility – Land Take
The assessment of community land take during the Operational Phase assesses the impact of permanent land take acquisition on community facilities and residential properties.

A total of five community receptors (five residential properties) will require permanent land take as a result of the Proposed Scheme. Table 10.11 summarises the findings of the community land take assessment for residential properties along the Proposed Scheme during the Operational Phase.

Table 10.11: Land Take Impacts on Residential Properties during the Operational Phase

Community Area	Nature of Effect / Number of Residential Properties Affected			
	Imperceptible/ Not Significant	Slight	Moderate	Significant
St Nicholas	0	0	0	2
Eyre Square	0	1	2	0
Total	0	1	2	2

Table 10.11 shows that the five residential properties that will be impacted by permanent land take are located in St. Nicholas and Eyre Square community areas. Within each community area the following land take impacts are expected:

- St. Nicholas: Negative, Significant and Long-Term land take impacts at 5/6 Headford Road and 20 Brendan's Avenue are predicted, based on the proposed permanent acquisition and demolition of these properties to allow for a widened street width and changes to areas of landscape and hard surfacing. Both properties are two storey, end of terrace, properties with boundary walls and gardens.
- Eyre Square: Moneenageisha Court, 139 College Road, Gleann Noinin will all be impacted by permanent land take as a result of the operation of the Proposed Scheme. Moneenageisha Court and 139 College Road are both predicted to experience Negative, Moderate and Long-Term permanent land take impacts that will result in loss of amenity area and increased visual exposure from the carriageway. However, this is mitigated by the landscaped area included as part of the Proposed Scheme. Gleann Noinin will experience Negative, Slight and Short-Term land take impacts due to the loss of a small portion of non-operational land at the entrance to the estate.

No community facilities will be affected by permanent land take during the operational phase of the Proposed Scheme.
Overall, the impact of landtake across the impacted community areas (St. Nicholas and Eyre Square) is considered Negative, Moderate and Long-Term during the Operation Phase. No other community areas are impacted by land take during the Operational Phase.

Accessibility
Community accessibility relates to the ability of users to access community facilities, recreational resources and residential properties. The nature of the Proposed Scheme means that accessibility impacts will differ based on the mode of travel used. The assessment has therefore separately assessed accessibility impacts on pedestrians, cyclists, bus users and private vehicles.

The significant improvement to the walking, cycling and bus facilities included within the Proposed Scheme are anticipated to encourage sustainable modes of transport, therefore reducing the demand for private vehicles / parking along the Proposed Scheme.

Pedestrians, Cyclists and Bus Users

The Proposed Scheme will include approximately 5.8km of new cycle tracks, a Quiet Street treatment, the provision of additional lengths of bus lane and pedestrian facilities will be upgraded and additional signalised crossings will be provided.

Chapter 6 (Traffic & Transport) of this EIAR identified a significant residual Positive, Very Significant and Long-Term impact on sustainable transport modes along the Proposed Scheme. The beneficial impacts on walking, cycling and bus infrastructure is expected to lead to improvements in access to community facilities along the Proposed Scheme for those choosing to walk, cycle or get the bus as there will be increased provision for these modes of travel. Full bus priority is proposed along the entire length of the Proposed Scheme.

The impacts to pedestrians, cyclists and bus users is anticipated to be experienced by community areas located predominately along the length of the Proposed Scheme and where there will be Quiet Street Treatment, as these will be the locations of the improved footpaths and cycle paths. The community areas that are expected to experience Positive, Very Significant and Long-Term impacts as a result of changes to access, are Lough Atalia, Eyre Square, St Nicholas and Nuns Island. The community areas of Wellpark, Shantalla and Claddagh are expected to experience a Positive, Not Significant and Long-Term impact on pedestrians, cyclists and bus users because of changes in access during the Operational Phase of the Proposed Scheme.

Private Vehicles

Chapter 6 (Traffic & Transport) of this EIAR identified a Positive and Long-Term impact from the reduction in general traffic along the Proposed Scheme and Long term, imperceptible/negligible to insignificant effects on redistributed traffic.

The predicted impact on access to community facilities along the Proposed Scheme for private vehicles is Positive, Moderate and Long-Term along the Proposed Scheme. The community areas that are expected to experience a Positive, Moderate and Long-Term impact as a result of changes to access, are Lough Atalia, Eyre Square, St Nicholas and Nuns Island. The other community areas (Wellpark, Shantalla and Claddagh) are expected to experience a Negative, Moderate and Long-Term impact as a result of changes to access to community facilities due to the negative impacts of the redistributed traffic which will make the surrounding road network more congested and increase journey times to community facilities at the AM/PM peak periods.

10.4.4.2 Economic Assessment

Commercial Amenity

Commercial amenity impacts arise from a combination of traffic, air quality, noise and visual impacts as discussed in Section 10.1.

Chapter 7 (Air Quality) of this EIAR identified residual road traffic impacts on local human receptors to be Neutral and Long-Term during operation.

Chapter 9 (Noise & Vibration) of this EIAR identified Positive to Neutral Direct impact along the Proposed Scheme due to a reduction in traffic volumes during both the year of opening and the design year. There are some significant residual Operational Phase noise or vibration impacts associated with the Proposed Scheme during the initial short to medium term phase and the long-term phase.

Chapter 16 (Landscape (Townscape) & Visual) of this EIAR identified that the Proposed Scheme, once operational, will have a Permanent and Significant effect on this sensitive urban townscape setting in Galway City. The improved connectivity and accessibility for pedestrians and cyclists linking the Galway City Centre to western and eastern city environs will improve people's experience of moving through this part of the city.

Chapter 6 (Traffic & Transport) of this EIAR identifies effects on general traffic and transport to be generally positive. These include positive effects on modal share, positive, very significant and long-term impact in terms of People Movement by sustainable mode with significantly reduced bus journey times. Long term effects of redistributed traffic on junctions are predicted to be imperceptible/negligible to insignificant at the majority of junctions and to range from slight to moderate at 13 out of 77 junctions assessed in the AM peak period and at 10 out of 58 junctions assessed in the PM peak period.

Commercial Land Use & Accessibility – Land Take

The assessment of commercial land take during the Operational Phase assesses the permanent land take acquired and the potential impacts this has on commercial businesses.

A total of 6 commercial receptors located within the St. Nicholas, Eyre Square and Lough Atalia community areas are expected to be impacted by land take during the operational phase of the Proposed Scheme.

Five commercial receptors, namely The Huntsman Inn, Brothers of Charity, Galway County Council and Dyke Road Car Park are expected to experience Negative, Slight and Long-Term land take impacts during the operational phase. This is due to the acquisition of non-operational lands and minimal disruption to car parks within the aforementioned commercial receptors. Bayview B&B situated in the Eyre Square community area is also expected to experience Negative, Slight and Long-Term land take impacts during the operational phase as the car parking area will be reconfigured as part of the operation of the Proposed Scheme.

The temporary acquisition of the Circle K site located within the Eyre Square community area is considered to be Negative, Moderate and Long-Term as it will require the business to be shutdown for a period of time, resulting in job and investment losses. In the long-term, the site area will be decreased and it will be less accessible to private vehicles due to the provisions of the Proposed Scheme. However, these losses will be mitigated, to an extent, by the fact that the operation of the Proposed Scheme will allow for increased accessibility to the city centre via

active travel modes, therefore creating greater footfall within the city centre due to the positive impact of the Proposed Scheme on pedestrian infrastructure (see Chapter 6 (Traffic &Transport) of this EIAR. Notwithstanding this, the implementation of the Proposed Scheme will reduce accessibility for private vehicles to the site, therefore effecting its future viability as a filling station.

Overall, the impact on the St. Nicholas, Eyre Square and Lough Atalia community areas is considered Negative, Slight and Long-Term as a result of the Proposed Scheme during the operational phase. No other community areas are impacted by land take during the Operational Phase.

Accessibility

Commercial accessibility relates to the ability of users and employees to access commercial businesses. The nature of the Proposed Scheme means that accessibility impacts will differ based on the mode of travel used. The assessment has therefore separately assessed accessibility impacts on pedestrians, cyclists, bus users and private vehicles.

The results of the commercial accessibility assessment are the same as the community accessibility assessment, with the only difference being the consideration of access to commercial businesses rather than community facilities. Chapter 6 (Traffic and Transport) of this EIAR assessed that pedestrian movement would significantly increase along the Proposed Scheme. It is therefore anticipated that all businesses along the Proposed Scheme will, to some extent, benefit from the increase in passing trade. Commercial businesses located along the Proposed Scheme are listed in Appendix A10.1 Schedule of Commercial Businesses in Volume 4 of this EIAR

The impacts to pedestrians, cyclists and bus users is anticipated to be experienced by community areas located predominately along the length of the Proposed Scheme and where there will be Quiet Street Treatment, as these will be the locations of the improved footpaths and cycle paths. The community areas that are expected to experience Positive, Very Significant and Long-Term impacts as a result of changes to access, are Lough Atalia, Eyre Square, St Nicholas and Nuns Island. The community areas of Wellpark, Shantalla and Claddagh are expected to experience a Positive, Not Significant and Long-Term impact on pedestrians, cyclists and bus users because of changes in access during the Operational Phase of the Proposed Scheme.

The predicted impact on access to community facilities along the Proposed Scheme for private vehicles is Positive, Moderate and Long-Term. The community areas that are expected to experience a Positive, Moderate and Long-Term impact as a result of changes to access, are Lough Atalia, Eyre Square, St Nicholas and Nuns Island. The other community areas (Wellpark, Shantalla and Claddagh) are expected to experience a Negative, Moderate and Long-Term impact as a result of changes to access to commercial facilities due to the negative impacts of the redistributed traffic which will make the surrounding road network more congested and increase journey times to community facilities at the AM/PM peak periods.

10.5 Mitigation and Monitoring Measures

This assessment takes account of the embedded mitigation measures that were identified during the design development iterative process resulting in the Proposed Scheme outlined in Chapter 4 (Proposed Scheme Description) of this EIAR. These measures include relevant statutory provisions for the acquisition of properties to facilitate the provision of public infrastructure projects.

The assessment has been informed by the residual impacts reported in Chapter 6 (Traffic & Transport), Chapter 7 (Air Quality), Chapter 9 (Noise & Vibration) and Chapter 16 (Landscape (Townscape) & Vibration) of this EIAR. The reported residual impacts take into account embedded mitigation and good practice measures, as well as any additional topic-specific additional mitigation identified within the respective chapters.

In most cases the impacts reported in this Chapter already have sufficient mitigation in place to reduce residual population effects to be Not Significant (in the case of adverse impacts). No significant residual adverse impacts have been identified on amenity, land take and accessibility, and therefore, no additional mitigation measures (and no monitoring measures) are proposed for this assessment.

10.6 Residual Impacts

No additional mitigation measures have been proposed for this population assessment; therefore, the residual impacts are the same as the predicted impacts detailed in Section 10.4 whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

10.7 References

Central Statistics Office (CSO) (2016) Census electoral division boundaries (CSO2016 a and b).

Design Manual for Roads and Bridges (DMRB) LA 112 Population and human health (Highways England 2020).

EPA (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports. May 2022.

Geodirectory data (Geodirectory 2019)

Google maps (Google 2022)

Highways England (2020) Design Manual for Roads and Bridges (DMRB) LA 112 Population and human health
NTA (2020) National Public Transport Access Nodes (NaPTAN)

Ordnance Survey Ireland (OSI) (2020) Prime 2 dataset

Chapter 11
Human Health

Contents

11 Human Health

11.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) considers the potential human health impacts associated with the Construction and Operational Phases of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) (hereafter referred to as the Proposed Scheme).

The objectives of the Proposed Scheme are described in Chapter 1 (Introduction) of this EIAR. A detailed description of the Proposed Scheme is provided in Chapter 4 (Proposed Scheme Description) followed by a description of the construction stage in Chapter 5 (Construction) of this EIAR.

At a high-level, the Proposed Scheme will form a central route for public transport, cyclists and pedestrians along an east-west corridor through the city centre. It will facilitate increased level of service provision for existing and planned future bus services approaching from the east and west of the city centre. The city bus network routes will be altered to coalesce along this high-quality corridor, providing high-frequency services with journey time reliability and opportunities for interchange.

The corridor will ensure that public transport services can access key areas such as the retail and recreational centre of the city; public transport hubs at the rail and bus stations; City and County Halls; along with the city centre hotels and bed & breakfasts on College Road to the east of the city and key areas such as University Hospital Galway, NUI Galway and the Galway Cathedral.

The Proposed Scheme includes reconfiguration of traffic movements to facilitate improved pedestrian, cyclist and bus accessibility and movement, infrastructural works at certain roads and junctions, and improvements to the public realm at a number of locations within the city centre, including Eyre Square North, Woodquay and in the vicinity of Galway Cathedral.

Key objectives that are relevant to this Chapter are to:

- Enhance the potential for cycling by providing safe infrastructure for cycling, segregated from general traffic wherever practicable; and
- Improve accessibility to jobs, education and other social and economic opportunities through the provision of improved sustainable connectivity and integration with other public transport services.

11.2 Methodology

11.2.1 Relevant Guidelines, Policy and Legislation

The Guidelines on the Information to be contained in Environmental Impact Assessment Reports, EPA, 2022 state that in an EIAR, the assessment of impacts on human health:

> *should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc.*

and:

> *The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment.*

In accordance with this guidance, the assessment impacts on human health is based on the assessment of the impacts on those factors under which human health effects might occur, as addressed elsewhere in the EIAR. Accordingly, this Chapter draws together material presented in, and should be read in conjunction with, the Chapters listed in Table 11.1, particularly the assessments of Air Quality and Noise & Vibration which are the principal vectors through which the scheme has potential to cause likely and significant effects on human health. It also refers to the other topics that are related to human health for the reasons outlined in the table.

Table 11.1: Relationships of EIAR Topics to Human Health

Chapter	Relevance
6. Traffic & Transport	Traffic generates noise and air quality emissions which can directly affect Human Health. Changes in emissions due to changes in traffic flows are assessed under the headings of Air Quality and Noise & Vibration as discussed above. Changes to the quality and availability of walking and cycling infrastructure can affect human health by encouragement of physical activity. Reductions in bus journey times improve access to a variety of resources important to health and social inclusion, including travelling to work or school, visiting family and friends, accessing health services, and shopping and leisure.
7. Air Quality	Air quality emissions standards set conformance requirements which determine whether anticipated environmental and associated health effects are likely to be acceptable or not.
8. Climate	Climatic conditions have potential to affect human health, through changes in weather patterns, for example.
9. Noise &	Standards for exposure to noise and vibration set conformance

Chapter	Relevance
Vibration	requirements which determine whether anticipated environmental and associated health effects are likely to be acceptable or not.
10. Population	Effects on accessibility to jobs, education, healthcare, social and economic opportunities can affect human health directly and/or indirectly.
13. Water	Water quality and water supply can affect human health through effects on quality and supply of on drinking waters and bathing waters. Standards for quality of drinking water, groundwater and of bathing waters set conformance requirements which determine whether anticipated environmental and associated health effects are likely to be acceptable or not.
14. Land, Soils, Geology & Hydrogeology	Effects on land, soils, geology & hydrogeology can affect human health indirectly through effects on air quality due to dust or effects on water quality, including groundwater, as a result of mobilisation of sediments or disruption water courses.
16. Landscape (Townscape) & Visual	Effects on landscape including the quality of the public realm can affect human health through encouragement of use of outdoor spaces for regular physical activity.
19. Risk of Major Accidents and/or Disasters	Accidents or disasters can directly affect human health through potential for direct effects on human health through, for example, road accidents and indirectly through release of pollutants into the air or water.

The main objective of the human health assessment is to:

- Confirm that all pathways relevant to human health have been identified within the specialist assessments;
- Confirm that appropriate consideration of the inter relationships of human health impacts is presented in the EIAR; and
- Confirm that the assessments have appropriately considered the need for key mitigation measures.

The main elements of the human health assessment include:

- Gathering of the main statements relevant to human health from the relevant EIAR Chapters and any other separate assessments into one coherent section so that it can be easily read and understood by the public and stakeholders;
- Consideration of issues relating to human health including noise, public realm and cyclist and pedestrian safety, as raised during the consultation process that was carried out in relation to the Proposed Scheme (refer to Section 1.6 of Chapter 1 (Introduction) of this EIAR); and

This approach follows the requirements of the EIA Directive and transposing legislation, as discussed in Chapter 1 (Introduction) of this EIAR.

11.2.2 Traffic, Travel Behaviour and Health

The health benefits of regular physical activity are well researched and widely accepted. For most people, the easiest forms of physical activity are those that can be built into daily life, for example, by using walking or cycling as an alternative to motorised transport for everyday journeys such as commuting to work or school. Active forms of travel, such as walking and cycling, are associated with a range of health benefits (Bassett et al., 2008, British Medical Association, 2012 and Irish Government Economic and Evaluation Service, 2021.

There has been growing concern over increasing levels of obesity in Ireland, with the percentage of people in Ireland who are overweight or obese rose from 31% in 1998 (Kavanagh et al. 2005) to 62% in 2017 (CSO 2019b).

Physical inactivity is a key risk factor for obesity and switching from active modes of travel (walking and cycling) to car use has helped to fuel physical inactivity.

There is concern that promotion of active travel modes might lead to greater increases in casualties among pedestrians and cyclists. However, evidence suggests that there is 'safety in numbers' for walkers and cyclists. One key study into this concept was reported by Jacobsen (Jacobsen 2003). Jacobsen provided evidence based on analysis of national data from 14 European countries on walking and cycling, as well as data for 47 towns in Denmark, and 68 towns in California. The author concluded that:

- *'there is a relationship between motor vehicle collisions with pedestrians and or cyclists and numbers of pedestrians and or cyclists. For example, in a community where walking doubles it can be expected that there will be a 32% increase in pedestrian injuries, where cycling doubles it can be expected that there will be a 34% increase in cyclist injuries';*
- *'motorists appear to adjust their behaviour in the presence of people walking and cycling which largely controls the likelihood of collisions; as a result'; and*
- *'the relationship between pedestrians or cyclists' exposure and casualties is not linear, that is, there is safety in numbers for these mode users'.*

A number of other studies have provided further evidence to support the safety in numbers principle (Robinson, 2005; Bonham et al., 2007; Pucher and Dijkstra, 2003).

This information provides a human health context to the assessment of the effects of the Proposed Scheme on transport usage as provided in Chapters 6 (Traffic & Transport) and 10 (Population).

11.2.3 Access to Healthcare, Employment and Education

Transport is required for access to a variety of resources important to health and social inclusion, including traveling to work or school, visiting family and friends, accessing health services, and shopping and leisure. Poor access to transport results in barriers to these important health resources and can contribute to health inequalities and social exclusion. Key issues for transport are affordability, availability and accessibility.

11.2.4 Study Area

As effects on human health are assessed by reference to the assessments of impacts on those environmental factors under which human health effects might occur, the study area for the purposes of Human Health is the amalgamation of the study areas defined in the chapters listed above, particularly Chapter 6 (Traffic and Transport), Chapter 7 (Air Quality) and Chapter 9 (Noise & Vibration) of this EIAR.

11.3 Baseline Environment

The information presented in this section is drawn from the chapters listed in Table 11.1. The relationships between the following topics and human health are as outlined in Sections 11.2.1- 11.2.3.

11.3.1 Traffic & Transport

The baseline information presented in Chapter 6 (Traffic &Transport) of this EIAR shows that along the whole corridor, based on existing average mode share across a 24hr period, car is the most common form of transport at 59% of the mode share. Pedestrian is the second most common form of transport at 29% and public transport accounts for 9%. Cyclists only make up 3% of the total mode share. The baseline information on the operation of the traffic and transportation network presented hereunder provides a high-level overview of the operation of the network in relation to its operational capacity and journey times, both of which are related to human health for the reasons given in Sections 11.2.1 - 11.2.3.

An analysis of capacities of junctions has been carried out. This covers junctions in the study area and junctions outside the direct study area which may be impacted through the addition of the Proposed Scheme, due to the redistribution of general traffic. It focuses on junctions operating with above an 85% volume over capacity (V/C) ratio. It shows that that, during the AM Peak Hour, seven junctions are currently operating over theoretical capacity (>100% V/C ratio). 10 junctions are operating with a V/C ratio of between 85% and 100%. During the PM Peak Hour, nine junctions are currently operating over theoretical capacity (>100% V/C ratio). 12 junctions are operating between 85% and 100% theoretical capacity.

Journey time information has been obtained from Automatic Vehicle Location (AVL) system data. These systems are required for service control of buses, communications with drivers, and the current generation of real-time information for on-street displays, websites, and mobile apps.

The information recorded by AVL is also central to the tracking of operational performance by following metrics on routes such as punctuality (journey times) and stops serviced. Therefore, by taking a sample of this AVL dataset, a picture can be formed of the average journey times for various services including their reliability.

A sample of AVL data was taken for the 404 bus route in the month of November in 2019 between two stops which correspond to the start and end points of the Proposed Scheme as shown in Diagram 11.1 (to the west on University Road, near the junction with Newcastle Road and to the east on the Dublin Road via the Lakeview School).

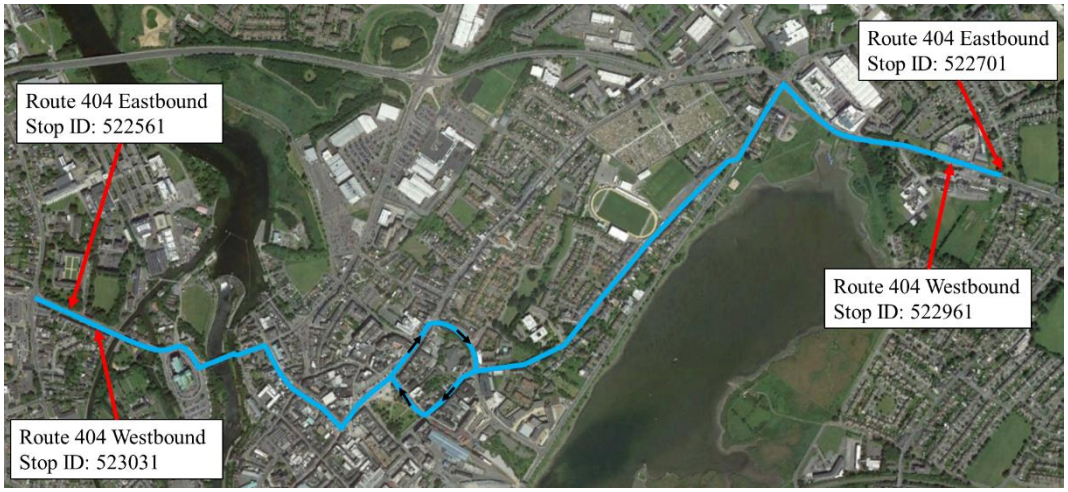


Diagram 11.1: 404 Bus Route covered by AVL Data

The data was analysed for the average weekday in November 2019 for both eastbound and westbound services and a profile across the 7:00 – 19:00 period was generated. Summaries of this information for the eastbound and westbound directions is given in Diagram 11.2 and Diagram 11.3.

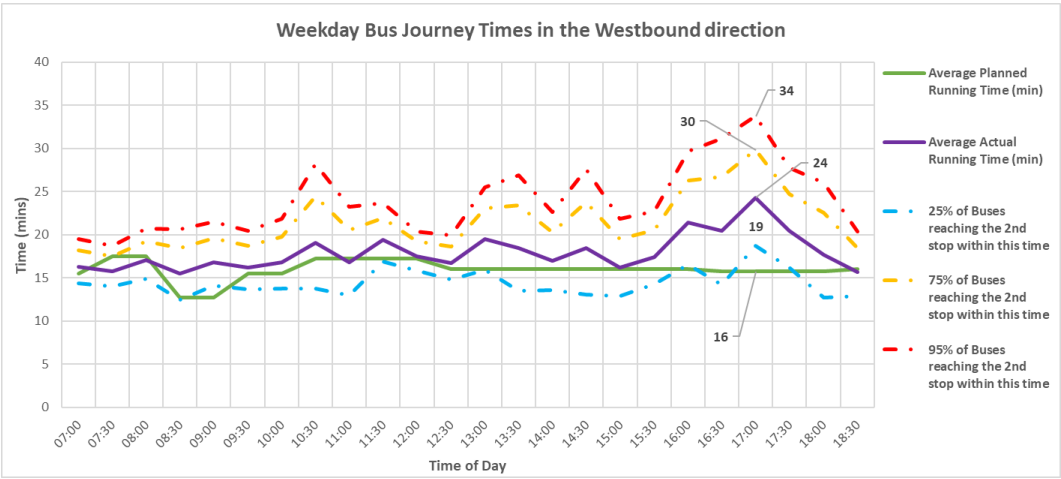


Diagram 11.2: Average Weekday Bus Journey Time Profile (Westbound Services)

For the westbound services, the AVL data shows a high degree of variability in journey times across the entire day with the worst periods occurring around 10:30 A.M. and from midday onwards with the peak occurring in the evening peak hour around 17:00 P.M. At this time, we see the average running time is expected to be 16 minutes between the two stops (on the Dublin Road and on University Road) but the average is actually 24 minutes (a 54% increase), with 75% of buses reaching the 2nd stop within 30 minutes (89% increase) and 95% of buses reaching the 2nd stop within 34 minutes (114% increase).

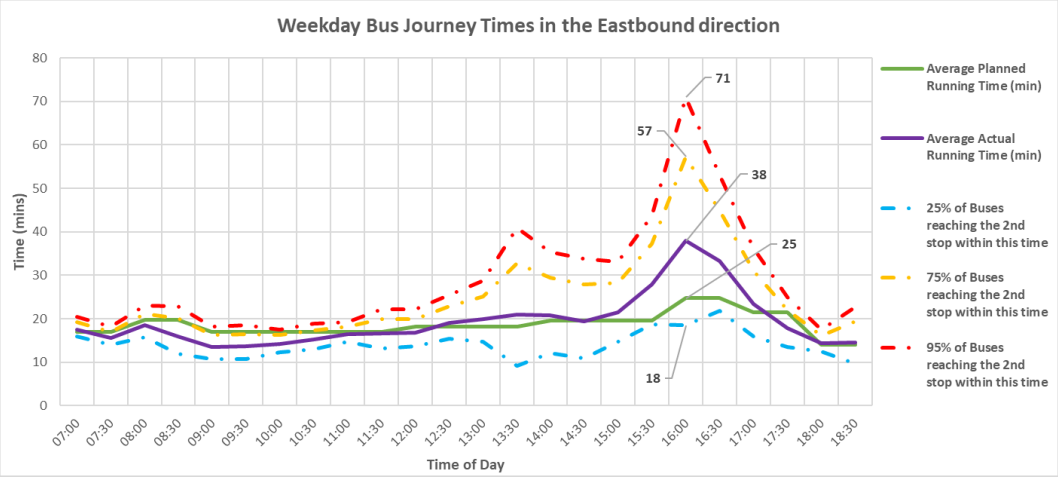


Diagram 11.3: Average Weekday Bus Journey Time Profile (Eastbound Services)

For the eastbound services, the AVL data shows a high degree of variability in journey times from midday onwards with the peak occurring in the evening around 16:00 P.M. At this time, we see the average running time is expected to be 25 minutes between the two stops (on University Road and on the Dublin Road) but the average is actually 38 minutes (a 53% increase), with 75% of buses reaching the 2nd stop within 57 minutes (131% increase) and 95% of buses reaching the 2nd stop within 71 minutes (187% increase).

11.3.2 Air Quality

Galway City is located within air quality Zone C (cities and towns with population greater than 15,000 per Air Quality in Ireland Reports, EPA). The average concentrations of air pollutants measured in Zone C were all below the annual mean limits under the Air Quality Standards in 2020 (the year of the most recent report available at time of preparation of this EIAR). The data covers NO_2, $PM_{2.5}$ and PM_{10}.

Site specific NO_2 monitoring also found that concentrations were below the applicable standards (refer to Section 7.3 of Chapter 7 Air Quality of this EIAR).

Nitrogen oxides – or NO_X – are the gases nitric oxide (N_O) and nitrogen dioxide (NO_2). Both pollutants are emitted during high temperature combustion processes. However, NO_2 is more important from an ambient air quality perspective due to its increased impact on health… In terms of

ambient air quality, the main source of NO_2 in our towns and cities is road transport. (*Air Quality in Ireland 2020*, EPA, 2021)

Particulate matter (PM) consists of very small particles which can be solid or liquid. Some of these particles occur naturally, and many are man-made. The EPA monitors two types of PM and compares levels to limit values in the CAFE (Cleaner Air for Europe) Directive and WHO guidelines. These are PM_{10} and $PM_{2.5}$. … In Ireland the main source – especially of the smaller and more impactful PM2.5 particles – is solid fuel burning for home heating. PM10 can be made up of several sources, many of which can be natural sources such as pollen, or wind-blown sea salt and others are man-made sources such as pollution from road transport or construction activities. (*Air Quality in Ireland 2020*, EPA, 2021).

Section 7.3 of Chapter 7 (Air Quality) of this EIAR provides further air quality baseline details.

11.3.3 Climate

The region where the Proposed Scheme will be located has a temperate, oceanic climate, resulting in mild winters and cool summers. The recent weather patterns and extreme weather events recorded by Met Éireann have been reviewed. A noticeable feature of the recent weather has been an increase in the frequency and severity of storms with notable events including Storm Darwin in February 2014, Storm Emma in March 2018, and Storm Ophelia in October 2018. Heavier historical rainfall events have also been recorded in recent years including heavy rainfall and pluvial.

The transport sector accounts for approximately 20% of Ireland's total GHG emissions, which is the second largest contribution after the agricultural sector. In relation to transport GHG emissions, the dominant source is road transportation. In terms of modal split, private cars accounted for 73.7% of all road trips in 2019 whilst public transport accounted for 6.5% (DOT 2020). Compared to 2018, there was a 3% increase in the number of public transport passenger journeys in 2019 whilst the total kilometres driven by private cars reduced by 1.5% (DOT 2020). Private cars also remain the largest source of GHG emissions in the transport sector accounting for 50.4% of total transport emissions.

Section 8.3 of Chapter 8 (Climate) of this EIAR provides more details of the climate baseline.

11.3.4 Noise & Vibration

Section 9.3 of Chapter 9 (Noise & Vibration) of this EIAR sets out baseline noise levels as recorded during survey work for the Proposed Scheme. The typical measured daytime baseline noise levels are from 58 to 77 dB $L_{Aeq,T}$ at distances within 1 m to 20 m of the road edge (refer to Table 9.15 in Chapter 9 (Noise & Vibration) of this EIAR). At the closest properties impacted by the Construction Phase (typically between 1 m and 30 m of construction activities), the average daytime baseline noise level is 67 dB $L_{Aeq,T}$. Based on review of baseline survey results, the average evening noise level is 2 dB lower than the daytime noise level.

This information is used as the baseline against which predicted changes in noise are assessed. It is notable that there are parts of the existing network along the Proposed Scheme area which already experience high noise levels due to the existing traffic in the area and general urban sources. Criteria used for rating of significance of changes in noise and vibration levels during construction and operation of the Proposed Scheme are described in Section 9.2.4 of Chapter 9 (Noise & Vibration) of this EIAR.

11.3.5 Population

Information presented in Chapter 10 (Population) of this EIAR shows that there is a range of different types of receptor types along the Proposed Scheme. These include residential areas, shopping centres, numerous schools and NUI Galway, transportation hubs, recreational facilities, places of worship, tourism assets and University Hospital Galway.

Nearly half of commuters in the study area travel by foot or by bike to work (49%), while slightly fewer commuters choose to take a car or van to work (40%), with travel by bus, minibus or coach being the next most popular form of transport (10%). The urban character of the study area is reflected by the fact that nearly half of all commuters travel to work by foot or by bike.

11.3.6 Water Quality

Drinking Water Supply

There are no Geological Survey Ireland (GSI) Public Supply Source Protection Areas or National Federation of Group Water Schemes (NFGWS) Source Protection Areas within the study area. None of the river segments within the study area are designated as a Drinking Water River (refer to Section 13.3 of Chapter 13 (Water) of this EIAR).

Bathing Waters

As described in Chapter 13 (Water) of this EIAR, there are four designated bathing water locations within the jurisdiction of Galway City Council. The bathing water quality classifications are given in Table 11.2. These locations are all downstream of and hydraulically connected to the area of the Proposed Scheme however, none of them are within the study area defined for the purposes of the assessment of effects on water quality. This area extends 500 m from the boundary of the Proposed Scheme (refer to Chapter 13 (Water) of this EIAR).

Table 11.2: Bathing Water Classification (EPA, 2021)

Identified Bathing Water	Bathing Water Classification			
	2017	2018	2019	2020
Ballyloughane Beach	Poor	Sufficient	Poor	Sufficient
Grattan Road Beach	Good	Sufficient	Sufficient	Sufficient
Salthill Beach	Excellent	Excellent	Excellent	Excellent
Silverstrand Beach	Excellent	Excellent	Excellent	Excellent

11.3.7 Land, Soils, Geology & Hydrogeology

Groundwater

Based on available data sources from the GSI there are no Public Water Supply or National Federation of Group Water Scheme groundwater source protection areas within the regional study area.

According to the GSI database, there is one groundwater well record within the study area. This is a group water supply scheme abstraction well located 50 m North East of the Proposed Scheme. It is classed of medium importance using standard NRA guidance (refer to Chapter 14 (Land, Soil Geology and Hydrogeology) of this EIAR for further details).

Contaminated Land

The information contained in Chapter 14 (Land, Soil Geology and Hydrogeology) of this EIAR shows that there are seven potential sources of existing contamination relevant to the Proposed Scheme of which six are classed as being of medium importance (classified as per NRA Guidelines).

11.3.8 Landscape (Townscape) & Visual

The baseline section of Chapter 16 (Landscape (Townscape) & Visual) of this EIAR refers to the current availability of recreational infrastructure. It notes that there is a network of well used pedestrian walkways along the embankment between the lower River Corrib and waterways, amenity and park spaces including Millennium Park, Waterside, Dyke Road, Eyre Square, the Sportsground on College Road and Lough Atalia.

It further states that Galway City Centre is negatively influenced by busy vehicular traffic, with congestion affecting the character of the urban environment, impacting on quality of life of residents and the safety of all roads. In places, there is an overdominance of vehicular traffic and parking, with narrow footpaths for pedestrians and limited space for cyclists.

11.3.9 Risk of Major Accidents and/or Disasters

There is no baseline *per se* in relation to this topic (refer to Chapter 19 Major Accidents and Disasters) of this EIAR.

11.4 Potential Impacts

The information presented in this section is drawn from the chapters listed in Table 11.1, particularly from the residual impacts sections as these are the most relevant for purposes of the assessment of the overall human health effects on the Proposed Scheme. Those chapters should be consulted for further information on any topic.

11.4.1 Characteristics of the Proposed Scheme

A detailed description of the Proposed Scheme and the construction strategy is provided in Chapter 4 (Proposed Scheme Description) and Chapter 5 (Construction) of this EIAR, respectively.

The characteristics that have potential relevance to human health are described both in Chapters 4 (Proposed Scheme Description) and Chapter 5 (Construction) of this EIAR and in the chapters that are directly or indirectly related to human health (refer to Table 11.1).

11.4.2 Do Nothing Scenario

The 'do nothing' scenario for each of the topics that relate to human health is described in the chapters listed in Table 11.1. In general, it is anticipated that there will be no significant changes in effects in this scenario, that is, if the Proposed Scheme were not to be implemented, except in relation to Traffic and Transport and Noise. Key findings in relation to these two topics are:

- The streetscape would continue to be based around the movement and parking requirements of private cars instead of people. Traffic congestion could be expected to remain the same or to worsen, discouraging pedestrian and cyclist activity.
- Congestion and journey time reliability issues for buses would also be expected to continue, and potentially be exacerbated over time as traffic congestion increases in line with travel demand growth.
- Noise levels in the do-nothing scenario are predicted to vary in response to changes in traffic levels and modal shifts, taking account of a range of committed developments and transport plans within the study area for the year of opening (2023) and the design year (2038) (refer to Section 9.4.2 of Chapter 9 (Noise & Vibration)) of this EIAR.

11.4.3 Construction Phase

11.4.3.1 Traffic & Transport

The effect of the Construction Phase on traffic and transportation is predicted in Section 6.5.6.2 of Chapter 6 (Traffic & Transport) of this EIAR to be Negligible and Short-term.

11.4.3.2 Air Quality

With the implementation of the mitigation measures outlined in Section 7.6 of Chapter 7 (Air Quality) of this EIAR, no significant adverse residual effects on air quality are envisaged during the construction phase of the Proposed Scheme. Overall, it is considered that the residual effects as a result of the Proposed Scheme's construction are negative, slight, and short-term.

11.4.3.3 Climate

When the Construction Phase GHG mitigation measures detailed in Section 8.6 of Chapter 8 (Climate) of this EIAR are implemented, GHG emissions from the Proposed Scheme are predicted to be negligible and long-term. This impact rating aligns with IEMA guidance on the basis that the Proposed Scheme replaces existing development that has a higher GHG profile, and that the significance of a project's emissions should be based on its net impact over its lifetime, refer to Section 8.3 of Chapter 8 (Climate) of this EIAR for further details.

11.4.3.4 Noise & Vibration

Once the various mitigation measures are put in place, noise impacts associated with the Construction Phase will be of negative, not significant to slight, temporary impact during all key construction phases, with the exception of road widening and utility works which are negative, slight to moderate and temporary within 15m distance to the works during daytime periods.

During evening periods, noise impacts associated with the Construction Phase will be of negative, not significant to slight, temporary impact during general road works, urban realm and quiet street treatment works at distances greater than 15m from the works. During this period, noise impacts associated road widening and utility diversion works will be of negative, moderate to significant, temporary impact at distances between 15m to 20m from the works. At distances within 10m of road widening / utility diversion works, the noise impact is negative, significant to very significant and temporary. As per DMRB Noise and Vibration (UKHA 2020) in cases of moderate to major magnitude of impacts, the duration of works determines the overall significance rating.

As part of the mitigation measures, the durations advised in the DMRB Noise and Vibration (UKHA 2020) will be followed, where feasible, to reduce overall significance effects (i.e. scheduling works to occur for periods of less than ten days/nights over 15 consecutive day/night periods and less than 40 days over six consecutive months where significant effects are identified). Once the CNL and duration of works is considered in line with the DMRB Noise and Vibration (UKHA 2020) all key Construction Phase residual noise levels are not significant, whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

The assessment has indicated that the use of standard construction activities can operate comfortably within the recommended vibration limits for standard residential and other light-framed buildings. With the adoption of best practice methodologies, vibration impacts at the most sensitive premises can be adequately mitigated to within acceptable levels relating to disturbance, whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

11.4.3.5 Population

The most relevant construction phase effects on population that have potential to affect human health are effects on vectors through which human health may be affected, as mainly addressed under the headings of Noise and Air Quality. Effects on accessibility including access to places of employment, healthcare, education etc are mainly as assessed under the heading of Traffic and Transport. These effects are summarised elsewhere in this chapter.

11.4.3.6 Water Quality

Following implementation of the mitigation measures outlined in Section 13.5.1 of Chapter 13 (Water) of this EIAR and the SWMP within the CEMP (refer to Appendix 5.1 of Volume 4 of this EIAR), no significant impacts are anticipated on any of the receptors in the study area.

11.4.3.7 Land, Soils, Geology & Hydrogeology

With the effective implementation of the proposed mitigation measures, there will be no significant residual impacts on land, soils, geology or hydrogeology as a result of the construction of the Proposed Scheme.

11.4.3.8 Landscape

The loss of 59 early mature and mature trees during construction works will give rise to localised negative, significant and short-term townscape and visual effects. The planting of 186 new street trees will give rise to positive, significant, and long-term effects.

11.4.3.9 Risk of Major Accidents and/or Disasters

There are no identified incidents and / or major accidents and / or disasters risk events that present a sufficient combination of risk and consequence that would lead to significant residual environmental impacts.

11.4.4 Operational Phase

11.4.4.1 Traffic & Transport

Modal Shares

The predicted mode shares in 2023 and 2038 are presented in Diagram 11.4 and Diagram 11.5 below. In general, car use is expected to decrease from 55% to 51% between 2023 and 2038. Pedestrian, cyclist and public transport trips are all expected to increase.

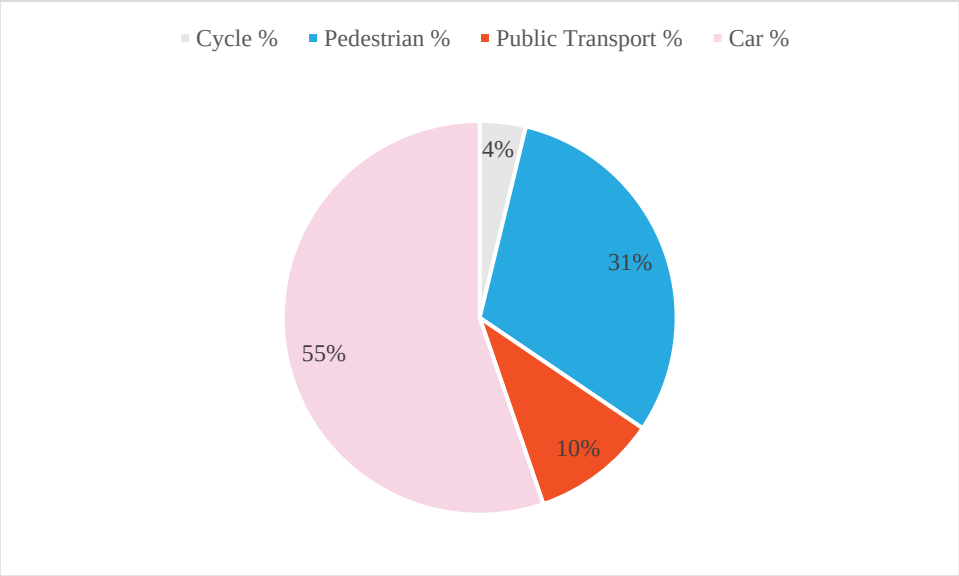


Diagram 11.4 Predicted 2023 Mode Share

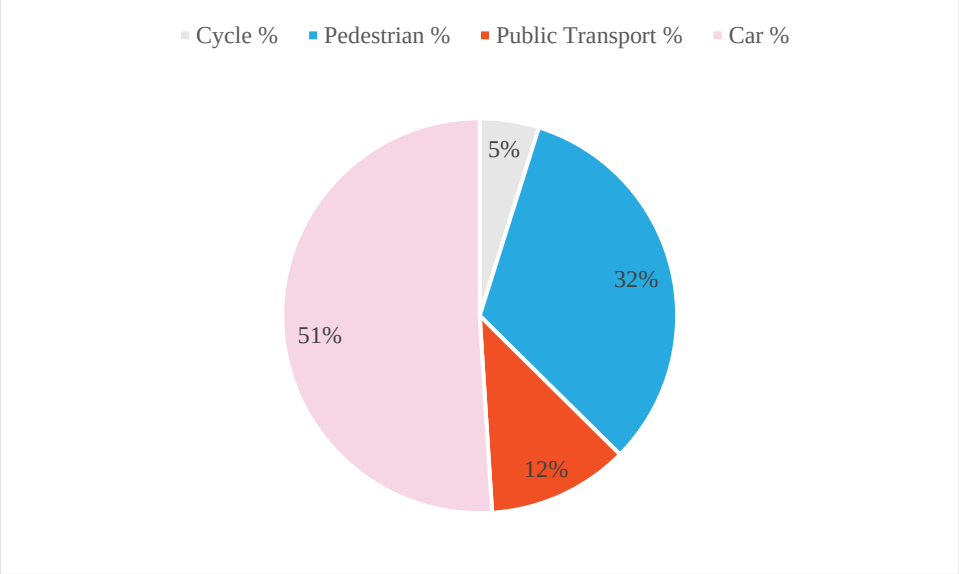


Diagram 11.5: Predicted 2038 Mode Share

People Movement Assessment

A People Movement Assessment has been undertaken comparing the Do Minimum and Do Something peak hour scenarios for the years 2023 and 2038. This People Movement Assessment takes account of traffic modelling outputs and the following metrics:

- The average number of people moved by each transport mode (i.e., Car, Bus, Walking and Cycling) along the corridor in the eastbound and westbound direction. This metric is compared for the Do Minimum and Do Something scenarios in the AM and PM peak hours for each forecast year (2023, 2038). This metric provides an estimate of the modal share changes along the route as a result of the Proposed Scheme measures; and
- People movement by bus:

- AM and PM peak hour Bus Passenger Loadings along the Proposed Scheme for each forecast year (2023, 2038); and
- Total Passengers Boarding Buses on bus routes that use any part of the Proposed Scheme for each forecast year (2023, 2038).

In summary, the People Movement Assessment predicts increases in sustainable modes in both 2023 and 2038 as a result of the Proposed Scheme. Despite general growth in traffic levels between 2023 and 2038, general traffic along the corridor is predicted as either reducing or increasing at marginal levels. Sustainable modes on the other hand are predicted to experience significant increases between 2023 and 2038. This predicts that car trips – unlike public transport, walking and cycling - will not grow in line with population. Therefore, the Proposed Scheme is predicted to provide a substantial opportunity for growth of sustainable modes whilst it discourages car usage along the corridor.

The Proposed Scheme will potentially deliver a positive, very significant and long-term impact in terms of People Movement by sustainable modes, particularly by bus.

Bus Journey Times

Effects of the Proposed Scheme on bus journey times is summarised in Diagram 11.6 to Diagram 11.9 below which shows the predicted Do Minimum (DM) and Do Something (DS) peak hour bus journey times along the full length of the Proposed Scheme in each direction. The Min, Max and Average journey times are represented as a dot in the graphs for buses in each scenario. A larger range of journey times are an indication of lower levels of reliability in a given scenario. Refer to Chapter 6 (Traffic & Transport) of this EIAR for discussion of the significance of the predicted changes in bus journey times.

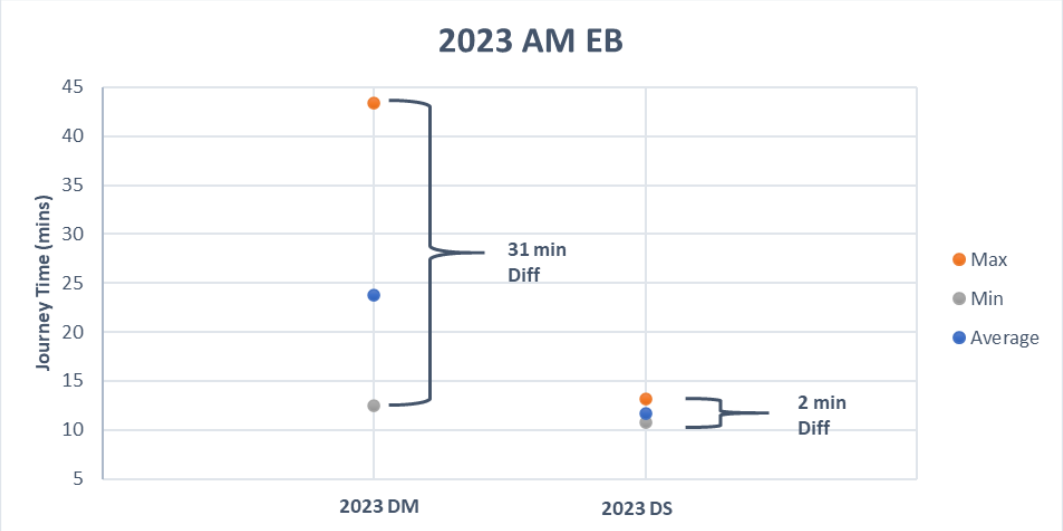


Diagram 11.6: AM Bus Journey Times (Eastbound Services)

Diagram 11.7: PM Bus Journey Times (Eastbound Services)

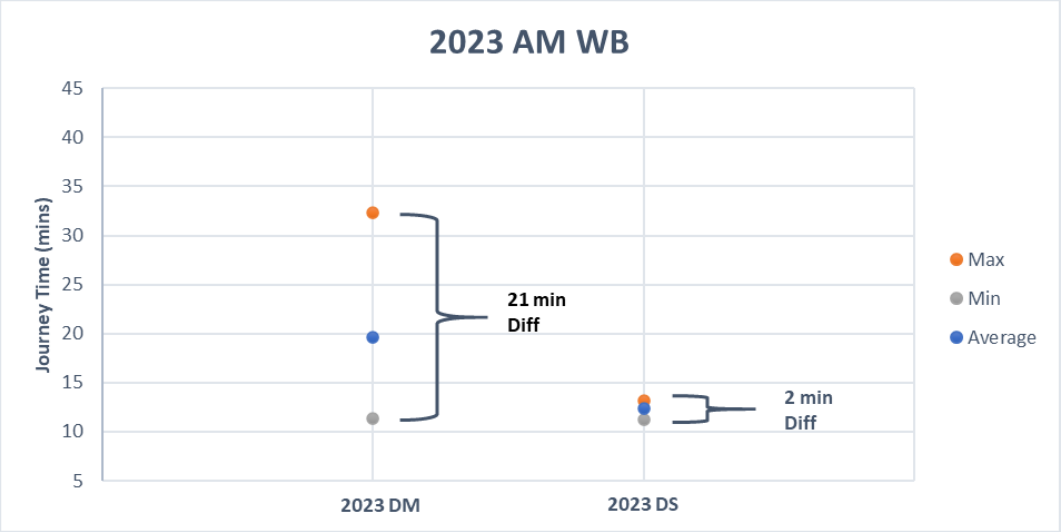


Diagram 11.8: AM Bus Journey Times (Westbound Services)

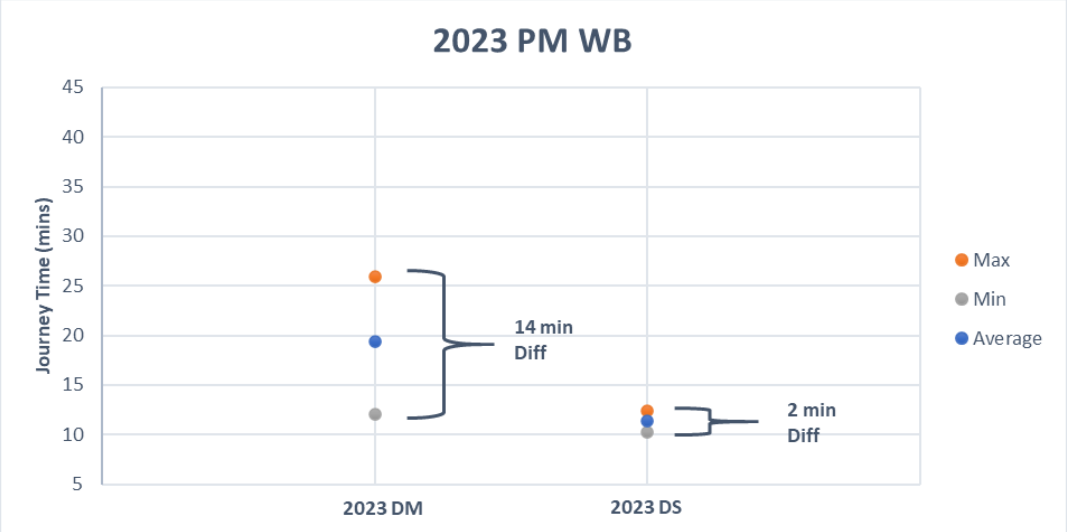


Diagram 11.9: PM Bus Journey Times (Westbound Services)

General Traffic Impact Assessment

AM Peak Period, 2038

Overall, redistributed traffic associated with the Proposed Scheme in is expected to result in a negligible impact at 59 out of 77 junctions assessed and the effect is deemed Not Significant and Long-term. Five junctions will potentially experience Imperceptible and Long-term effects. A Negative, Slight and Long-term effect will potentially be at four junctions, with a Negative, Moderate and Long-term effect at nine junctions.

PM Peak Period, 2038

Overall, redistributed traffic associated with the Proposed Scheme in is expected to result in a negligible impact at 55 out of 68 junctions assessed and the effect is deemed Not Significant and Long-term. Three junctions will potentially experience Imperceptible and Long-term effects A Negative, Moderate and Long-term effect will potentially be experience at six junctions. A Negative, Slight and Long-term effect will potentially be experience at four junctions.

11.4.4.2 Air Quality

The air dispersion modelling assessment has found that all receptors will be in compliance with ambient air quality standards for the Do Something (and Do Minimum) scenario. There are no substantial or moderate adverse effects expected as a result of the operational phase of the Proposed Scheme.

Therefore, it is considered that the residual effects as a result of the Proposed Scheme's operation are neutral and long-term (refer Section 7.6.2 in Chapter 7 (Air Quality) of this EIAR).

11.4.4.3 Climate

The operational traffic GHG emissions associated with the operational phase of the Proposed Scheme will potentially be neutral and long-term.

Thus, the residual impact from operational phase traffic as a result of the Proposed Scheme will be neutral, long-term.

The proposed infrastructural works will also support the delivery of government strategies, outlined in Section 8.1.6 of Chapter 8 (Climate) of this EIAR, by enabling sustainable mobility and delivering a sustainable transport system. Its aim is to provide enhanced walking, cycling and bus infrastructure on key access corridors in Galway City. This will subsequently enable and deliver an integrated sustainable transport movement along these corridors. The proposed infrastructural works will provide connectivity and integration with other public transport services leading to more people availing of public transport.

By creating a resilient, accessible public transport network, the proposed infrastructural works will provide an attractive alternative to private car travel, encouraging more passenger travel by more sustainable modes.

As a result, a greater share of the demand will be by sustainable modes (public transport, walking and cycling), which aligns with the project objectives.

11.4.4.4 Noise & Vibration

Once operational, there will be a positive to neutral direct impact along the Proposed Scheme due to a reduction in traffic volumes during both the year of opening and the design year.

During the year of opening 2023, there is expected to be an increase in traffic noise levels along a small number of roads adjacent to the Proposed Scheme as a result of traffic re-distribution during daytime periods. During this initial short to medium-term phase, residual indirect impacts are calculated as negative, slight to moderate, with three roads predicted to have a negative, significant impact (Presentation Road, Cross Street Lower, and Lough Atalia Road). Along the remaining road network within the study area, a positive, imperceptible to slight, short to medium-term impact to negative, slight to moderate, short to medium-term impact is calculated. The overall prevailing short to medium-term impact associated with the Proposed Scheme is positive to negative, moderate.

During the design year, 2038, increased traffic noise levels will occur along a small number of roads as a result of traffic re-distribution during daytime periods. During the long-term phase, indirect impacts are calculated as negative, moderate to significant, long-term along Riverside, and negative, significant, long-term along Presentation Road and Lough Atalia Road. Along the remaining road network within the study area, a positive, imperceptible to slight, long-term, indirect impact to negative, not significant to slight, long-term, indirect impact is calculated. The overall prevailing long-term impact associated with the Proposed Scheme is positive to negative and slight.

The results of the noise assessment for the Operational Phase confirms that with the introduction of the various measures included as part of the Proposed Scheme, a reduction in traffic noise can be achieved along the Proposed Scheme where highest existing traffic noise levels are experienced. The various design measures associated with the Proposed Scheme also align with the various intervention measures recommended within the WHO Environmental Noise Guidelines (WHO 2018) to reduce traffic noise exposure across populations.

11.4.4.5 Population

The most relevant operational phase effects on population that have potential to affect human health are effects on vectors through which human health may be affected, as mainly addressed under the headings of Noise and Air Quality. Effects on accessibility including access to places of employment, healthcare, education etc are mainly as assessed under the heading of Traffic and Transport. These effects are summarised elsewhere in this chapter.

11.4.4.6 Water Quality

No operational residual significant impacts are anticipated for any waterbody in the study area.

11.4.4.7 Land, Soils, Geology & Hydrogeology

It is expected that there will be no significant residual impacts on land, soils, geology and hydrogeology as a result of the operation of the Proposed Scheme.

11.4.4.8 Landscape (Townscape) & Visual

Once operational the Proposed Development will have a Positive, Significant and Permanent effect on this sensitive urban townscape setting in Galway City. The improved connectivity and accessibility for pedestrians and cyclists linking the Galway City Centre to western and eastern city environs will improve people's experience of moving through this part of the city.

11.4.4.9 Risk of Major Accidents and/or Disasters

There are no identified incidents and / or major accidents and / or disasters risk events that present a sufficient combination of risk and consequence that would lead to Negative and significant residual environmental impacts.

11.5 Mitigation and Monitoring Measures

Any mitigation or monitoring requirements in relation to effects on human health are properly addressed by the measures set out in the chapters which assess effects on the vectors through which the scheme has potential to cause likely and significant effects on human health. These mitigation and monitoring measures are described in the chapters listed in Table 11.1.

11.6 Residual Impacts

Overall effects on traffic and transport are predicted to be generally positive. As detailed above and in Chapter 6 (Traffic & Transport) of this EIAR, these include positive effects on modal share, positive, very significant and long-term impact in terms of People Movement by sustainable mode with significantly reduced bus journey times. Long term effects on junctions are predicted to be imperceptible/negligible to insignificant at the majority of junctions and to range from slight to moderate at 13 out of 77 junctions assessed in the AM peak period and at 10 out of 58 junctions assessed in the PM peak period.

During the initial short to medium term phase, the overall noise effects of the Proposed Scheme are predicted to range from positive to negative moderate. The long-term noise effects are predicted to range from positive to negative slight.

Effects on air quality are predicted to be neutral and long term.

Long-term landscape effects on the urban townscape of the scheme area are predicted to range from significant and negative in the short-term to positive, permanent and significant in the long-term.

The Proposed Scheme will improve opportunities and convenience for walking and cycling, which will support people in the area in achieving recommended levels of weekly physical activity, for example as part of an active travel commute to work or education. It will also increase safety and the perception of safety for pedestrians and cyclists.

The significant positive impacts which are expected to arise in the operational phase align with the relevant objectives of the Proposed Scheme as set out in Chapter 1 (Introduction) of this EIAR.

As no mitigation or monitoring measures are proposed as a result of this assessment of effects on human health, no further assessment of residual effects on human health is required.

Table 11.3: Summary of Significant Residual Effects

Item	Residual effect
Increases in physical activity due to improvements in walking and cycling provisions	Positive and Significant, Long-term
Landscape effects on urban townscape	Positive and Significant, Long-term
Improvements in People Movement by sustainable mode	Positive, Very Significant, Long-term

On the basis of the above (Table 11.3) it can be seen that overall, the significant residual Long-term effects of the Proposed Scheme on human health can be expected to be Positive and Significant to Very Significant.

11.7 References

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Chapter 12
Biodiversity

Contents

12 Biodiversity

12.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) presents the output of the biodiversity assessment and contains information regarding, *inter alia*, the biodiversity baseline scenario, the potential impacts on biodiversity, the mitigation measures and the predicted residual effects of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) Scheme (hereafter referred to as the Proposed Scheme).

The likely significant effects of the Proposed Scheme on biodiversity is addressed during both the Construction Phase, including impacts on air and water quality, on habitats, and on flora and fauna from construction activities such as utility diversions, road resurfacing, and road realignments in addition to impacts associated with the operation of the Proposed Scheme and routine maintenance. The assessment undertaken for the Proposed Scheme identified numerous key ecological receptors within the study area that could potentially be impacted by the Proposed Scheme.

The methodologies used to collate information on the baseline biodiversity environment and assess the likely significant impacts of the Proposed Scheme are detailed in the following sections.

The aim of the Proposed Scheme, when in operation, is to provide enhanced walking, cycling and bus infrastructure in Galway City, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the city. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction) of this EIAR. The Proposed Scheme, which is described in Chapter 4 (Proposed Scheme Description) of this EIAR has been designed to meet these objectives.

The aspects of the Proposed Scheme that are of particular relevance to biodiversity are:

- Potential effects on water quality in terms of direct association with the adjacent River Corrib and aquatic habitats leading to the river and the aquatic adjacent habitats of Galway and also connectivity with the European sites located in the potential zone of influence;
- Potential effects on species associated with the aquatic ecology of the River Corrib and Galway Bay, particularly on Annexed species including Sea Lamprey, Salmonids, Otters and Birds;
- Potential effects on bats and birds in the existing buildings to be demolished and/or mature trees to be removed.

The Appropriate Assessment (AA) process was commenced by Moore Group for the Proposed Scheme and a Report for AA Screening and Natura Impact

Statement (NIS) are presented as separate documents as part of the Planning application.

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme (see Section 1.6 in Chapter 1 (Introduction) of this EIAR) undertaken throughout the option selection and design development process have been incorporated, where appropriate.

12.2 Assessment Methodology

12.2.1 General

In accordance with the requirements of Directive 2014/52/EU amending Directive 2011/92/EU (hereafter referred to as the EIA Directive), this Chapter of the EIAR identifies, describes and assesses the likely direct and indirect significant effects of the Proposed Scheme on biodiversity, with particular attention to species and habitats protected under Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (hereafter referred to as the Habitats Directive) and Council Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (hereafter referred to as the Birds Directives).

In addition, this Chapter of the EIAR also identifies, describes and assesses the likely direct and indirect significant - impacts of the Proposed Scheme on species protected pursuant to the Wildlife Acts 1976 to 2021 (hereafter referred to as the Wildlife Acts).

This assessment concentrates on ecological features within the development area of particular significance, primarily designated habitats and species. This includes habitats/species listed in Annex I, II and IV of the Habitats Directive, birds listed in Annex 1 of the Birds Directive, rare plants listed in the Flora Protection Order and other semi-natural habitats of conservation value.

The European Habitats Directive 92/43/EEC[1] (Article 6) indicates the need for plans and projects to be subject to Habitats Directive Assessment (also known as Appropriate Assessment) if the plan or project is not directly connected with or necessary to the management of a Natura 2000 site, which includes but which has the potential to have implications on a site's conservation objectives. These implications can be significant effects, either individually or in combination with other plans or projects.

To this end, this Chapter also refers to the AA Screening Report and the NIS which were prepared as stand-alone documents to accompany this application in

[1] European Council (1992) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

relation to Natura 2000 network of sites (hereafter referred to as European sites), in accordance with Article 6(3) of the Habitats Directive.

12.2.2 Guidance and Legislation

12.2.2.1 Habitats Directive

The Habitats Directive) is the main legislative instrument for the protection and conservation of biodiversity within the European Union. The Habitats Directive provides for the designation, conservation and protection of sites comprising Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), collectively forming the Natura 2000 network of 'European sites'. Article 3 of the Habitats Directive obliges Member States to designate as SACs sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II of the Habitats Directive. Article 10 of the Habitats Directive requires that Member States endeavour to improve the ecological coherence of the Natura 2000 network to manage and conserve features of the landscape which are of major importance for wild fauna and flora, for example ecological corridors or stepping-stones which are important for the migration, dispersal and genetic exchange of species.

Article 6(2) obliges Member States to take the necessary measures to avoid the deterioration of an SAC, or disturbance of a species for which the site is designated. Article 6(3) sets out the requirement for an "Appropriate Assessment", to ensure that a proposed plan or project will not have an adverse effect on the integrity of a SAC. Article 7 applies the requirements of Article 6(2) and 6(3) of the Habitats Directive to SPAs designated under the Birds Directive.

In addition, and separate to the Appropriate Assessment requirements, Article 12 of the Habitats Directive obliges Member States to establish a regime of strict protection for certain species listed in Annex IV of the Directive, wherever they occur within their natural range. The protection for species under Article 12 of the Habitats Directive is not confined to the boundary of SACs. Species listed in Annex IV include the otter and certain species of bat.

12.2.2.2 Birds Directive

The *Birds Directive*[2]) confers legal protection to all naturally occurring wild birds within the EU territory. Member States are obliged to adopt the necessary measures to maintain the population of bird species, and that includes, in accordance with Article 3, an obligation to create, maintain and manage habitats for birds, and specifically for the species of Bird listed in Annex I of the Directive, Article 4 requires Member States to create SPAs which, by virtue of Article 7 of the Habitats Directive, form part of the Natura 2000 network of European sites and are subject to the Appropriate Assessment requirements under Article 6(3) of the Habitats Directive.

[2] European Council (2009) Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

Additionally, Article 5 of the Birds Directive requires that Member States establish a general system of protection for all naturally occurring wild birds within the EU territory, similar to the system of strict protection required for Annex IV species under the Habitats Directive.

12.2.2.3 Wildlife Acts (1976 - 2021)[3]

The primary domestic legislation providing for the protection of wildlife in general, and wild birds in particular, and the control of some activities adversely impacting upon wildlife is the *Wildlife Act of 1976, as amended*. The aims of the Wildlife Act, according to the National Parks and Wildlife Service (NPWS) are *"... to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims."* All wild bird species are protected under the Act. The European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) made significant amendments to the Wildlife Acts to ensure consistency with the Habitats and Birds Directives.

12.2.3 Study Area

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

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

While the main focus of biodiversity was on the Proposed Scheme site within the red line boundary, the surrounding environment was taken into account in terms of biological and hydrological connectivity, particularly in relation to European sites. Guidance on Appropriate Assessment (2009) recommends an assessment of European sites within a potential Zone of Influence, the precise extent of which will depend on the nature of the proposed project and the receiving environment.

The ecological surveys were designed based upon the characteristics of the Proposed Scheme and its likely significant impacts on the baseline environment during construction and/or operation. The study areas are described as follows:

Habitats

[3] Wildlife Act 1976, as amended. Administrative consolidation of the Wildlife Act 1976, Law Reform Commission (2021)

The area within or immediately adjacent to the Proposed Scheme footprint where habitats could be directly or indirectly affected during construction/operation.

Rare and/or Protected Flora

The area within or immediately adjacent to the Proposed Scheme footprint where rare and/or protected flora could be directly or indirectly affected during construction/operation.

Fauna species other than those listed below (includes badger, otter, other protected mammal species, amphibians, and reptiles)

The area within or immediately adjacent to the Proposed Scheme footprint where fauna species could be directly or indirectly affected during construction/operation.

Bats

The area suitable for roosting, foraging and/or commuting bats (e.g. bridges, hedgerows, treelines, woodland and/or watercourses) within or immediately adjacent to the Proposed Scheme footprint where bats could be directly or indirectly affected during construction/operation.

Breeding Birds

All wild birds, and their nests and eggs, are protected under the Wildlife Acts. Some bird species are also listed on Annex I of the Birds Directive, and / or as a Site of Community Importance (SCIs) within designated European sites.

Species considered to be Key Ecological Receptors of the Proposed Scheme include the following:

- SCIs for a breeding population, of SPAs;
- Species listed under Annex I of the Birds Directive; and
- Red and Amber Birds of Conservation Concern in Ireland (BoCCI) (Gilbert *et al.* 2021)[4] species listed for their breeding populations.

Wintering Birds

The area suitable for wintering birds within or immediately adjacent to the Proposed Scheme footprint where wintering birds could be directly affected during construction/operation.

The study area of this assessment included the footprint of the existing urban and suburban areas of Galway City in three main Sections as detailed below and shown on Diagram 12.1:

- Section A – University Road to Eyre Square, Woodquay and Headford Road;
- Section B – Eyre Square, Forster St, Dock Road, Bothar na Mban, Bothar Ui hEithir and Fairgreen Road;
- Section C – College Road to Dublin Road.

[4] Gilbert, G., Stanbury, A., Lewis, L. (2021). Birds of Conservation Concern in Ireland 4: 2020–2026. Irish Birds 9: 523-544.

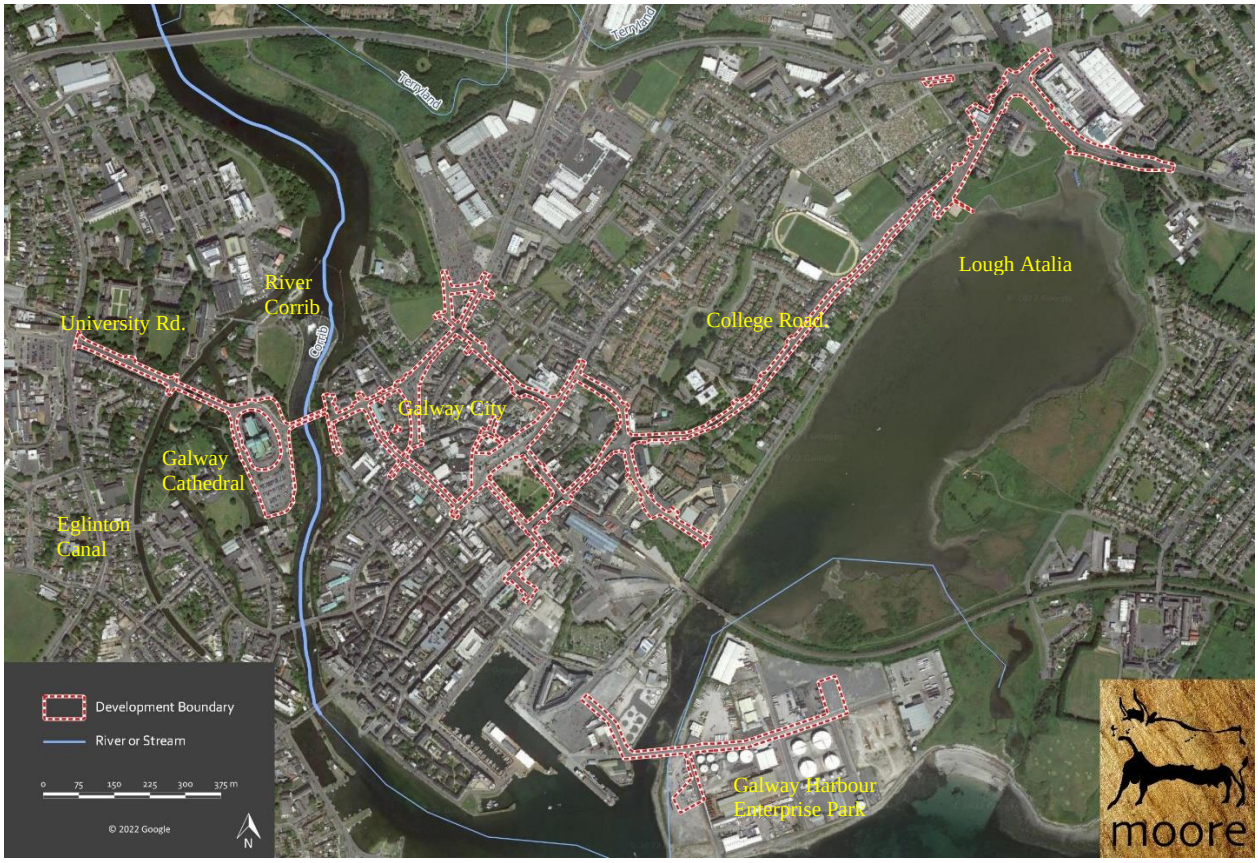

Diagram 12.1: Showing the Project Location and General Survey Areas in Galway City.

12.2.4 Ecology Surveys

12.2.4.1 Habitat Surveys

Habitat surveys including targeted breeding birds and otter surveys were carried out on repeated dates per the following Table 12.1.

Table 12.1: Habitat Surveys Dates

Survey Date	Description
17 July 2019	Habitats and breeding birds including a nighttime bat detector survey of buildings to be removed and city centre habitats.
8 August 2019	Focusing on habitats at Lough Atalia
6 March 2020	Habitats at the Eglinton Canal
7 April 2020	Habitats and breeding birds

13 May 2020	Habitats and breeding birds
13 September 2020	Habitats at the Dublin Rd and Lough Atalia
10 & 26 October 2020	Repeating targeted site visits at the Eglinton Canal and Lough Atalia
1 May & 12 July 2021	Habitats at the Eglinton Canal at Lough Atalia
30 September 2021 & 28 October 2021	Habitats at Lough Atalia and Galway Harbour Enterprise Park
24 November 2021, 20-24 January 2022, 1 March 2022, 20 May 2022 and 8 August 2022	Additional surveys at the point of discharge of a proposed outfall at Lough Atalia adjacent to Lough Atalia Playground including Ground Level Surveys of trees to be removed for Potential Roost Features (PRFs) and Trail Cam survey of discharge point. Detailed surveys of the mud dock/bay area if inner Lough Atalia opposite the Eye Cinema were surveyed in August 2022.

Surveys were undertaken by conducting study area walkover covering the main ecological areas identified in the desktop assessment and by targeting specific areas where connectivity to European sites occurs, e.g. in proximity to the River Corrib and at Lough Atalia. The survey dates are within the optimal botanical survey period where applicable. A photographic record was made of features of interest.

12.2.4.2 Mammals (Excluding Bats)

Signs of mammals such as otters were searched for while surveying the study area noting any sights, signs or any activity in the vicinity especially along adjacent boundaries. Water levels in the Eglinton Canal and the Claddagh Basin were coincidentally lowered by the City Council in October 2020 which provided an opportunity to survey these areas for otters and suspected holts below the normal waterline.

A Trailcam survey of the proposed outfall at Lough Atalia Playground was undertaken on 20-24 January 2022 by erecting a ‘Bushnell E3 HD Trophy Cam’ opposite the proposed outfall location set to auto trigger.

12.2.4.3 Bats

Walked Transects

There are two buildings to be removed to facilitate widening the junction of the Headford Road and St. Brendan’s Avenue; 20 St. Brendan’s Avenue. is an end of terrace 2 storey with a modern rear extension which backs on to a shared lane

with the rear of 'San Antonio' 5/6 Headford Road, a well maintained recently reroofed 2 storey fronting onto the Headford Road. Both have limited potential for bat roosting and it was determined that a preliminary exterior examination and dusk survey would be adequate to assess the potential for bat activity in this well-lit urban area of Galway City.

A preliminary dusk mobile detector survey was carried out on 17 July 2019 completing walked transects of the site of the two buildings to be removed during the dusk period to survey for commuting, feeding and potential roost sites. The survey commenced at 20:00 and continued for four hours ceasing when no bats were recorded.

The survey undertaken followed the Bat Conservation Ireland 'Bat Survey Guidelines' (Aughney *et al*., 2008)[5] and was in line with recommendations of the Bat Conservation Trust 'Good Practice Guidelines, 3rd edition, 2016' (BCT Guidelines 2016)[6] and the Irish Wildlife Manual No. 25 (Kelleher, C. & Marnell, F. 2006)[7]. These guidelines allow discretion on behalf of the surveyor to tailor the survey to the environment/habitat to be surveyed which was employed in this case being an urban setting with low bat commuting or roosting potential (*Section 5.7 – 'It is for the person planning the survey to decide what level of effort is required, according to the objective of the survey and local conditions'*).

The bat detector used during the walked surveys was a Pettersson D230 bat detector.

A contact describes a bat observed by the surveyor. This contact can range from a commuter passing quickly to a foraging bat circling a feature lasting for several minutes. Some observations contain multiple bats. When several bats of the same species are encountered together, they are recorded under the one contact. A separate contact is recorded for each species. A contact finishes when the recorder assumes the bat is no longer present. It is likely that the same bat is recorded in several contacts throughout the night. This survey type cannot estimate abundance of bats, rather activity; the amount of use bats make of an area/feature.

Sunset on the 17 July 2019 occurred at 21:54. Cloud cover ranged from 40% to 60%. The air temperature varied during the evening of the survey between 18.0 degrees at 20:00 to 16.0 degrees Celsius at 24:00. No rain occurred during the surveys with overall conditions being good for bat survey work.

Tree Surveys

A comprehensive assessment of trees was undertaken by the project Arborist and detailed in that report which is attached as Appendix 16.1 in Volume 4 of this EIAR.

[5] Aughney, T., Kelleher, C. & Mullen, D. (2008) Bat Survey Guidelines: Traditional Farm Buildings Scheme. The Heritage Council, Áras na hOidhreachta, Church Lane, Kilkenny.
[6] Collins, J. (Ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). The Bat Conservation Trust, London.
[7] Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

The report records that there are 59 trees to be removed and 153 trees that were surveyed are to be retained. Scattered trees in the urban areas of the City include a Poplar (*Populus* spp.) adjacent to the Gaol River and the Cathedral car park, an immature Hornbeam (*Carpinus* spp.) and an immature Small-leaved lime (*Tilia cordata*) in the car park.

Three additional trees are either compromised; a leaning Rowan (*Sorbus domestica*) at Walsh's Terrace, Woodquay, a Cypress oak (*Quercus rubor fastigiate*) beside the Liam Mellows Statue in Eyre Square and a dead Ash on the eastern side of the Square. There are two Maple (*Acer plantoides*) and one Plum (*Prunus* spp.) on College Road opposite the entrance to City Hall.

The locations where trees are proposed to be removed where the Scheme overlaps with designated areas and seminatural areas are presented in Diagrams 12.6 to 12.9. These include:

- A Sycamore adjacent to the old Clifden Railway embankment on the Dyke Road;
- At the green area at the junction of Lough Atalia Road and College Road where one Maple and five semi-mature Rowan trees are to be removed;
- Further along this road leading to Moneenageisha Junction at the entrance to Gleann Nóinín where four semi-mature Sycamore (*A. pseudoplatanus*) and one semi-mature Japanese cherry (*Prunus serrulata*) are to be removed; within the grounds of Moneenageisha Court adjacent to the Project where a line of 27 Poplar along the road and four at the corner adjacent to the Circle K site are to be removed. These trees were pruned in 2009 and the regrowth since has produce a new upper/crown section. Inside this treeline, there is a semi-mature Crab Apple (*Malus sylvestris*) and a juvenile Japanese Cherry to be removed. Additionally, at the northern entrance to this estate where one semi-mature Sycamore and one semi-mature Japanese cherry are to be removed;
- At the verge to the front of the G Hotel where a mix of remaining semi-mature and juvenile trees from previous clearance are to be removed, including six semi-mature Alder (*Alnus glutinosa*), five immature Birch (*Betula pendula*)and two immature Holly (*Ilex aquifolium*);
- At the north-western corner of the Brothers of Charity Woodlands Campus adjacent to the Dublin Road Where two Sycamore are to be removed.

Trees located within the footprint of the Proposed Scheme to be removed were assessed for their potential to support roosting bats (i.e. Potential Roost Features (PRFs)) as part of the multidisciplinary walkover surveys carried out in March 2022.

These trees were examined from ground level for the potential to support roosting bats. They were assessed based on the presence of features commonly used by bats. Examples of such features include:

- Natural holes;
- Cracks / splits in major limbs;
- Loose bark; and
- Hollows / cavities.

The categorisation of trees for bat roost potential was carried out according to the Bat Conservation Trust (2ed.) methodology (Hundt *et al.*, 2012)[8] per the following Table 12.2.

Table 12.2: Categorisation of trees

Tree Category	Description
1	Trees with multiple, highly suitable features capable of supporting larger roosts.
2	Trees with definite bat potential but supporting features suitable for use by singleton bats.
3	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features that have limited potential to support bats.
4	Trees have no potential.

12.2.4.4 Birds

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

A desk study was carried out to identify any potential suitable inland feeding and / or roosting sites for winter birds located within or directly adjacent to the Proposed Scheme areas.

The approach for wintering bird surveys was a 'look-see' methodology (based on Gilbert et al. 1998)[9]. All birds present within a site were identified with reference to the Collins Bird Guide (Svensson *et al.*, 2021)[10] to confirm identification (where necessary). The estimated flock size of birds present, their general location within the site and any activity exhibited were also recorded.

Field surveys carried out in the urban and suburban areas of the Proposed Scheme deemed the lands to be unsuitable feeding and/or roosting sites for wintering birds, due to habitat conditions being dominated by mosaics of bare ground and/or subject to high levels of disturbance. As such it was not deemed necessary to carry out detailed wintering bird surveys in these areas. The results of the desk-based study have informed the assessment of potential impacts on wintering bird species arising from the Proposed Scheme.

The footprint area of a proposed outfall to Lough Atalia at Lough Atalia Playground was deemed suitable for wintering birds and surveyed in November 2021, January 2022 and March 2022.

[8] Hundt , L. (2012) Bat Surveys: Good Practice Guidelines, 2nd edition. Bat Conservation Trust ISBN-13: 9781872745985.
[9] Gilbert, G., Gibbons, D. W. & Evans, J. (1998). Bird Monitoring Methods. RSPB, Sandy.
[10] Svensson, L., Mullarney, K. and D. Zetterstrom (2021) Collins Bird Guide, App edition.

12.2.5 Consultation

Consultation with the Development Applications Unit of the Department of Housing (NPWS) and Inland Fisheries Ireland was commenced by Galway City Council.

12.2.6 Categorisation of the Baseline Environment

The habitat survey was carried out firstly through desktop research to determine existing records in relation to habitats and species present in the study areas. This included research on the National Parks and Wildlife Services (NPWS) metadata website, and the National Biodiversity Data Centre (NBDC) database.

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

- The following mapping and Geographical Information Systems (GIS) data sources, as required:
  - National Parks & Wildlife (NPWS) protected site boundary data;
  - Ordnance Survey of Ireland (OSI) mapping and aerial photography;
  - OSI/Environmental Protection Agency (EPA) rivers and streams, and catchments;
  - Open Street Maps;
  - Digital Elevation Model over Europe (EU-DEM);
  - Google Earth and Bing aerial photography 1995-2022;
- Online data available on Natura 2000 sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie including:
  - Natura 2000 – Standard Data Form;
  - Conservation Objectives;
  - Site Synopses;
- National Biodiversity Data Centre records:
  - Online database of rare, threatened and protected species;
  - Publicly accessible biodiversity datasets.
- Status of EU Protected Habitats in Ireland. (National Parks & Wildlife Service, 2019)[11]; and
- Relevant Development Plans in neighbouring areas:
  - Galway City Development Plan 2017-2023[12]
  - Galway County Development Plan 2022-2028[13].

The second phase of the survey involved a site visit to establish the existing environment in the footprint of the Proposed Scheme area. Areas which were highlighted during desktop assessment were investigated in closer detail

[11] NPWS (2019) The Status of EU Protected Habitats and Species in Ireland. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin
[12] Galway City Council (2017) Galway City Development Plan 2017-2023.
[13] Galway County Council (2022) Galway City Development Plan 2022-2028.

according to the *Heritage Council Best Practice Guidance for Habitat Survey and Mapping* (Smith et al., 2011)[14].

Habitats in the Proposed Scheme area were classified according to the Heritage Council publication *A Guide to Habitats in Ireland* (Fossitt, 2000)[15]. This publication sets out a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. This form of classification uses codes to classify different habitats based on the plant species present. Species recorded in this report are given in both their Latin and English names. Latin names for plant species follow the nomenclature of *An Irish Flora* (Parnell & Curtis, 2012)[16].

The key ecological receptors were determined from desktop review of draft plans to be potential effects on roosting bats, and potential effects on the water quality of the River Corrib and associated Annexed species including sea lamprey, otters and salmon. The consideration of Lough Atalia as a priority habitat listed as a Coastal Lagoon and implications for water quality and previously recorded sign of otters were noted as key ecological receptors.

12.2.7 Assessment Methodology

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

- Assessment of plans and projects significantly affecting Natura 2000 sites (EC, 2002)[17];
- Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2007)[18];
- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG, December 2009, Rev 2010)[19];
- Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (EC, 2018)[20];
- Guidance document on the strict protection of animal species of Community interest under the Habitats Directive (EC, 2021)[21];

[14] Smith, G.F., O'Donoghue, P., O'Hora, K. and E. Delaney (2011) Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council
[15] Fossitt, J. (2000) A Guide to Habitats in Ireland. The Heritage Council
[16] Parnell, J. and T. Curtis (2012) Webb's An Irish Flora. Cork University Press
[17] EC (2002) 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 92/43EEC. European Commission, Brussels
[18] EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive '92/43/EEC: Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interests, compensatory measures, overall coherence and opinion of the Commission. European Commission, Brussels
[19] Department of the Environment, Heritage and Local Government (2009) Guidance on Appropriate Assessment of Plans and Projects in Ireland (as amended February 2010)
[20] EC (2018) Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC
[21] European Commission (2021) Guidance document on the strict protection of animal species of Community interest under the Habitats Directive, Brussels 12.10.21

- Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC, 2021)[22];
- Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011);
- Ecological Surveying Techniques for Protected Flora & Fauna (NRA, 2008)[23]
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)[24]
- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2019)[25].
- EPA Guidelines on Information to be contained in an EIAR (EPA, 2022)[26];

12.3 Baseline Conditions

12.3.1 Zone of Influence (ZoI)

The ZoI, or distance over which a likely significant effect may occur will differ across the subject ecological receptors, depending on the predicted impacts and the potential impact pathway(s). The results of both the desk study and the suite of ecological field surveys undertaken have established the habitats and species present along the Proposed Scheme. The ZoI is then informed and defined by the sensitivities of each of the ecological receptors present, in conjunction with the nature and potential impacts associated with the Proposed Scheme. In some instances, the ZoI extends beyond the study area (e.g. surface water quality effects of a sufficient magnitude can extend, and affect, receptors at significant distances downstream).

The ZoI of the Proposed Scheme in relation to terrestrial habitats is generally limited to the footprint of the Proposed Scheme, and the immediate environs (to take account of shading or other indirect impacts, such as air quality). Hydrogeological / hydrological linkages (e.g. rivers or groundwater flows) between impact sources and wetland / aquatic habitats can often result in impacts occurring at significant distances.

The unmitigated hydrogeological ZoI for the Proposed Scheme is variable depending on the nature of the proposed works at specific locations and the receiving environment ground conditions, this is deemed to extend beyond the Proposed Scheme boundary and is discussed with reference to specific

[22] European Commission (2021) 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, Brussels 28.9.21
[23] NRA (2008) Ecological Surveying Techniques for Protected Flora & Fauna. Available at: http://www.nra.ie/Environment/
[24] NRA (2009) Guidelines for Assessment of Ecological Impacts of National Road Schemes. Dublin: National Roads Authority. Available at: http://www.nra.ie/Environment/
[25] CIEEM (2019) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.
[26] EPA (2022) EPA Guidelines on Information to be contained in an EIAR; EPA, May 2022

construction activities in Chapter 14 (Land, Soils, Geology & Hydrogeology) of this EIAR.

The ZoI of air quality effects is generally local to the Proposed Scheme and not greater than a distance of 50m from the Proposed Scheme boundary, and 500m from Construction Compound during the Construction Phase, and up to 200m the Proposed Scheme boundary during the Operational Phase (refer to Chapter 7 (Air Quality) of this EIAR for more detail).

With regards to hydrological impacts, the distances over which water-borne pollutants are likely to remain in sufficient concentrations to have a likely significant effect on receiving waters and associated wetland / terrestrial habitat is highly site-specific and related to the predicted magnitude of any potential pollution event. Evidently, it will depend on volumes of discharged waters, concentrations and types of pollutants (in this case sediment and/or hydrocarbons), volumes of receiving waters, and the ecological sensitivity of the receiving waters. In the case of the Proposed Scheme, this includes: all coastal habitats downstream of where the Proposed Scheme will drain to or cross water bodies listed and the marine environment of Galway Bay including the Coastal Lagoon of Lough Atalia.

The ZoI for impacts to aquatic fauna species, such as Sea Lamprey and Salmonids, is limited to those water courses that will be crossed by the Proposed Scheme or water bodies to which runoff from the Proposed Scheme could drain to during construction, refer to Section 12.3.2.

The ZoI of potential effects to bat roosts would not be expected to exceed approximately 200m in most cases but as effects are dependent on many factors (such as species, roost type, surrounding habitat, commuting routes *etc.*), this is assessed on a case-by-case basis and the ZoI may increase / decrease from this distance accordingly. Given the large foraging ranges for some species, the ZoI of potential landscape scale impacts, such as habitat loss and severance, could extend for several kilometres from the Proposed Scheme but the most significant effects are likely to occur within 1km of important roost sites (e.g. maternity roosts).

The ZoI of the Proposed Scheme in relation to likely significant effects on most breeding bird species is generally limited to habitat loss within the footprint of the Proposed Scheme, and disturbance / displacement during construction and disruption in territorial singing due to noise during operation. Disturbance effects may extend for several hundred metres from the Proposed Scheme.

The ZoI in relation to disturbance impacts to wintering birds could extend up to approximately 300m from the Proposed Scheme for general construction activities, as many species (such as waterbirds) are highly susceptible to disturbance from loud and unpredictable noise during construction. However, as many estuarine bird species use inland habitat areas at distances from the coast, the ZoI for *ex-situ* impacts could extend a considerable distance from the Proposed Scheme. In the case of the Proposed Scheme, impacts to wintering birds within this 300m band could affect the use of potential *ex-situ* sites for bird species listed as SCIs of European sites.

Current understanding of construction related noise disturbance to wintering waterbirds is based on the research presented in Cutts *et al.* 2009[27] and Wright *et al.* 2010[28]. In terms of construction noise, levels below 50dB (decibels) 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. At approximately 300m, typical noise levels associated with construction activity (British Standard Institute (BSI) British Standard (BS) 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (hereafter referred to as BS 5228–1) (BSI 2014)) are generally below 60dB or, in most cases, are approaching the 50dB threshold.

There will be no significant removal of hedgerow or scrub and therefore no significant environmental effect on other naturally occurring wild birds.

12.3.2 Designated Conservation Areas

The Zone of Influence (ZoI) may be determined by considering the Proposed Scheme's potential connectivity with European sites, in terms of:

- Nature, scale, timing and duration of all aspects of the proposed works and possible impacts, including the nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of potential pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and

Location of ecological features and their sensitivity to the possible impacts.

The potential for source pathway receptor connectivity is firstly identified through GIS interrogation and detailed information is then provided on sites with connectivity. European sites that are located within a potential Zone of Influence of the Proposed Scheme, due to a potential for connectivity, are listed in Table 12.3 and presented in Diagrams 12.2 to 12.5, below.

Table 12.3: European Sites Located within the Potential Zone of Influence[29] of the Proposed Scheme.

Site Code	Site name	Distance (km)[30]	Pathway/Connectivity
000268	Galway Bay Complex SAC	0.00	Adjacent

[27] Cutts, N., Phelps,A., Burdon, D. (2009). Construction and Waterfowl: Defining Sensitivity, Response, Impact and Guidance. Report prepared by the Institute of Estuarine and Coastal Studies University of Hull and Humber INCA.
[28] Wright, M., Goodman, P., Cameron, T. (2010). Exploring Behavioural Responses of Shorebirds to Impulse Noise. Wildfowl (2010) 60: 150-167.
[29] All European sites potentially connected irrespective of the nature or scale of the Proposed Scheme.
[30] Distances indicated are the closest geographical distance between the Proposed Scheme and the European site boundary, as made available by the NPWS.

000297	Lough Corrib SAC	0.00	Adjacent
004031	Inner Galway Bay SPA	0.00	Adjacent
004042	Lough Corrib SPA	2.82	No Pathway/Connectivity
004142	Cregganna Marsh SPA	7.12	No Pathway/Connectivity
002034	Connemara Bog Complex SAC	12.11	No Pathway/Connectivity
000606	Lough Fingall Complex SAC	13.20	No Pathway/Connectivity
001312	Ross Lake and Woods SAC	13.29	No Pathway/Connectivity
001926	East Burren Complex SAC	13.64	No Pathway/Connectivity

Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on the 11 July 2022. This data was interrogated using GIS analysis to provide mapping, distances, locations and pathways to all sites of conservation concern including pNHAs, NHA and European sites.

The Proposed Scheme is located predominantly on existing roads and footpaths in the urban environment of Galway City.

In view of the nature, scale and location of the Proposed Scheme, the distance of the Proposed Scheme from the European sites concerned, it is considered that there is no pathway and therefore no potential for any likely significant effect on the following European sites:

- Lough Fingall Complex SAC;
- Ross Lake and Woods SAC;
- East Burren Complex SAC;
- Connemara Bog Complex SAC;
- Lough Corrib SPA;
- Cregganna Marsh SPA.

In light of this, it is considered that there will be no potential for significant effects on these European sites.

There are five watercourses adjacent the proposed works area travelling from west to east along University Road to Newtownsmith: the Eglinton Canal, the Gaol River, Persse's Distillery River (formerly called Mill Race), the Lower River Corrib and Friar's River (formerly called Waterside canal).

The Eglinton Canal and Gaol River are not designated for nature conservation but both discharge to the River Corrib downstream of the Project area.

Works in the vicinity of the Salmon Weir Bridge are considered in terms of proximity to the Lower River Corrib. On the western side, the Lower River Corrib is separated from Persse's Distillery River by an existing embankment.

Similarly, on the east, the Lower River Corrib is separated from Friar's River by an existing embankment. The watercourses are linked upstream and downstream.

The main channel of the Lower River Corrib is designated as part of the Lough Corrib SAC (Site Code 000297) and circa 600m downstream of the Salmon Weir

Bridge, on the south side of Wolfe Tone Bridge, the river is designated as part of Galway Bay Complex SAC (Site Code 000268).

Neither Persse's Distillery River or Friar's River are designated for nature conservation, but both discharge to the Lower River Corrib and thus the Lough Corrib SAC and the Galway Bay Complex SAC downstream of the proposed works locations.

There are no points of connectivity or no pathways to European sites for the majority of works in the city centre sections of the proposed works areas.

The proposed works include the diversion of surface water drainage to Lough Atalia at the junction of College Road and Lough Atalia Road with the placement of a new drainage pipe and non-return valve to be installed at discharge point into Lough Atalia. Additionally, a new attenuation tank and petrol interceptor will be installed. The discharge point comprises an artificial rock armour habitat but is also the boundary of the Galway Bay Complex SAC and the Inner Galway Bay SPA.

The Proposed Scheme includes proposed new inbound bus lane with a 2m raised adjacent cycle track at the eastern extent of Lough Atalia opposite the G Hotel, refer to Diagrams 12.2 to 12.5 below. The Proposed Scheme boundary overlaps the boundary of the Galway Bay Complex SAC and is adjacent to but outside the boundary of the Inner Galway Bay SPA at this point at Lough Atalia

NHAs are designations under Section 16 of the Wildlife Acts to protect habitats, species or geology of national importance.

In addition to NHAs, there are pNHAs which are also sites of significance for wildlife and habitats and were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. pNHAs are offered protection in the interim period under the county or city development plans which requires that planning authorities give due regard to their protection in planning policies and decisions.

The NHAs and pNHAs identified in Diagram 12.2 are located outside the Zone of Influence, with the exception of those which share the boundaries of the Galway Bay Complex SAC and Inner Galway Bay SPA. Accordingly, the Galway Bay Complex pNHA is considered under its higher conservation status as a European site.

The River Corrib is not designated as a pNHA for the stretch of river from the Quincentenary Bridge to Wolfe Tone Bridge to the north and south of the Proposed Scheme respectively. However, it is included in the Lough Corrib SAC.

These areas are considered in more detail in the habitat descriptions below.

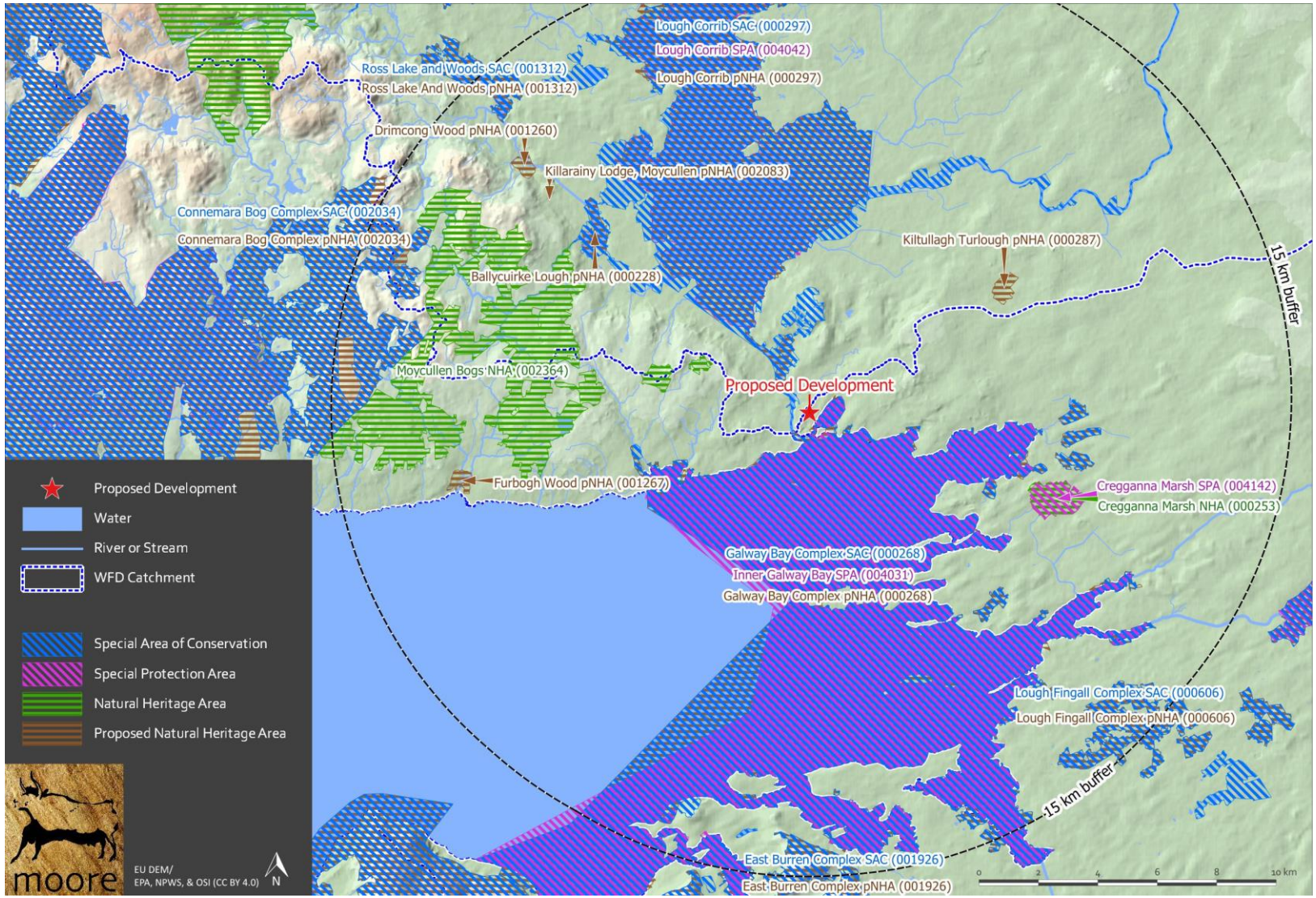

Diagram 22.2: European Sites and NHAs/pNHAs in the wider Vicinity of the Proposed Scheme.

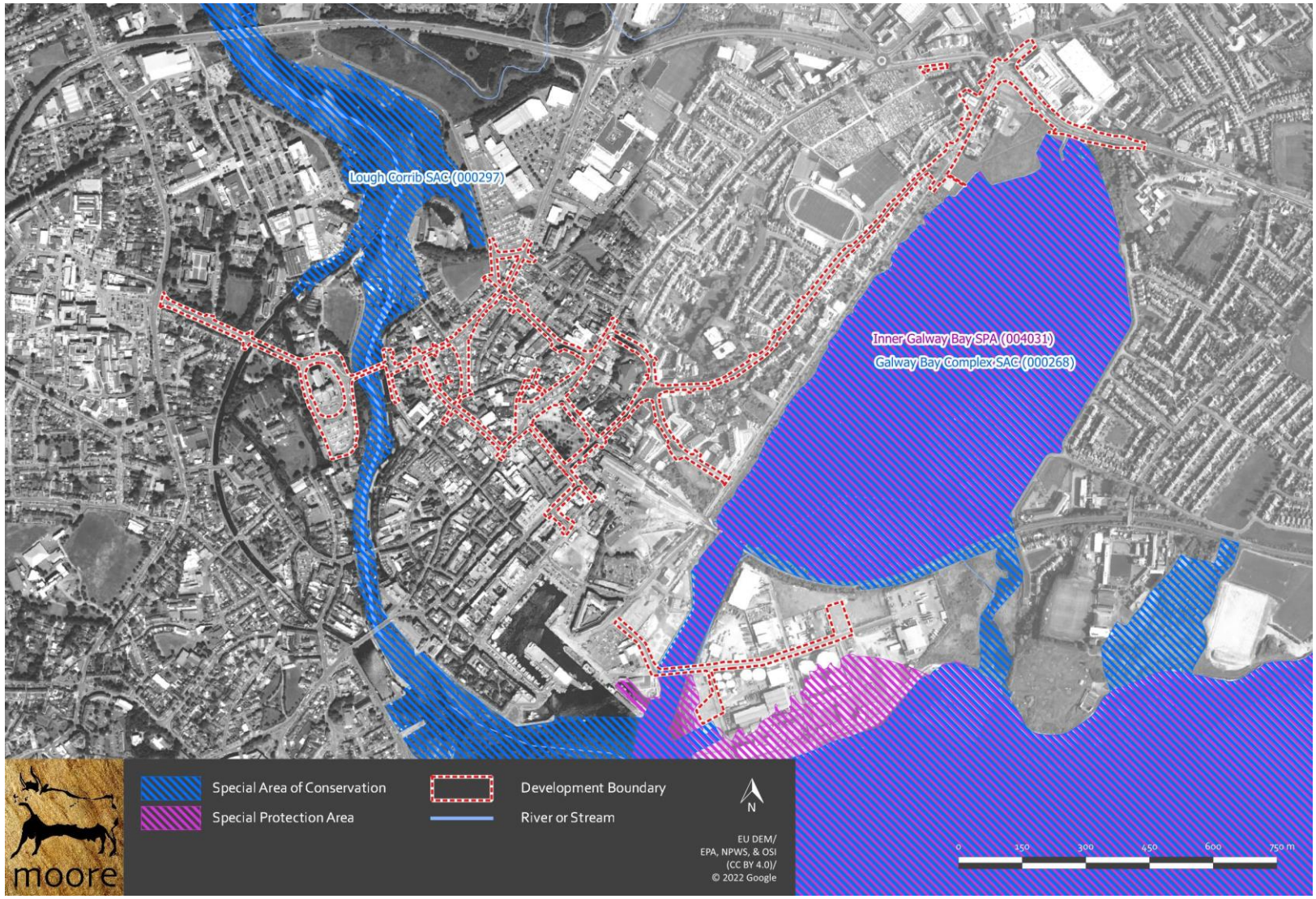

Diagram 13.3: Detailed view of European sites in the nearer Potential Zone of Influence of the Proposed Scheme.

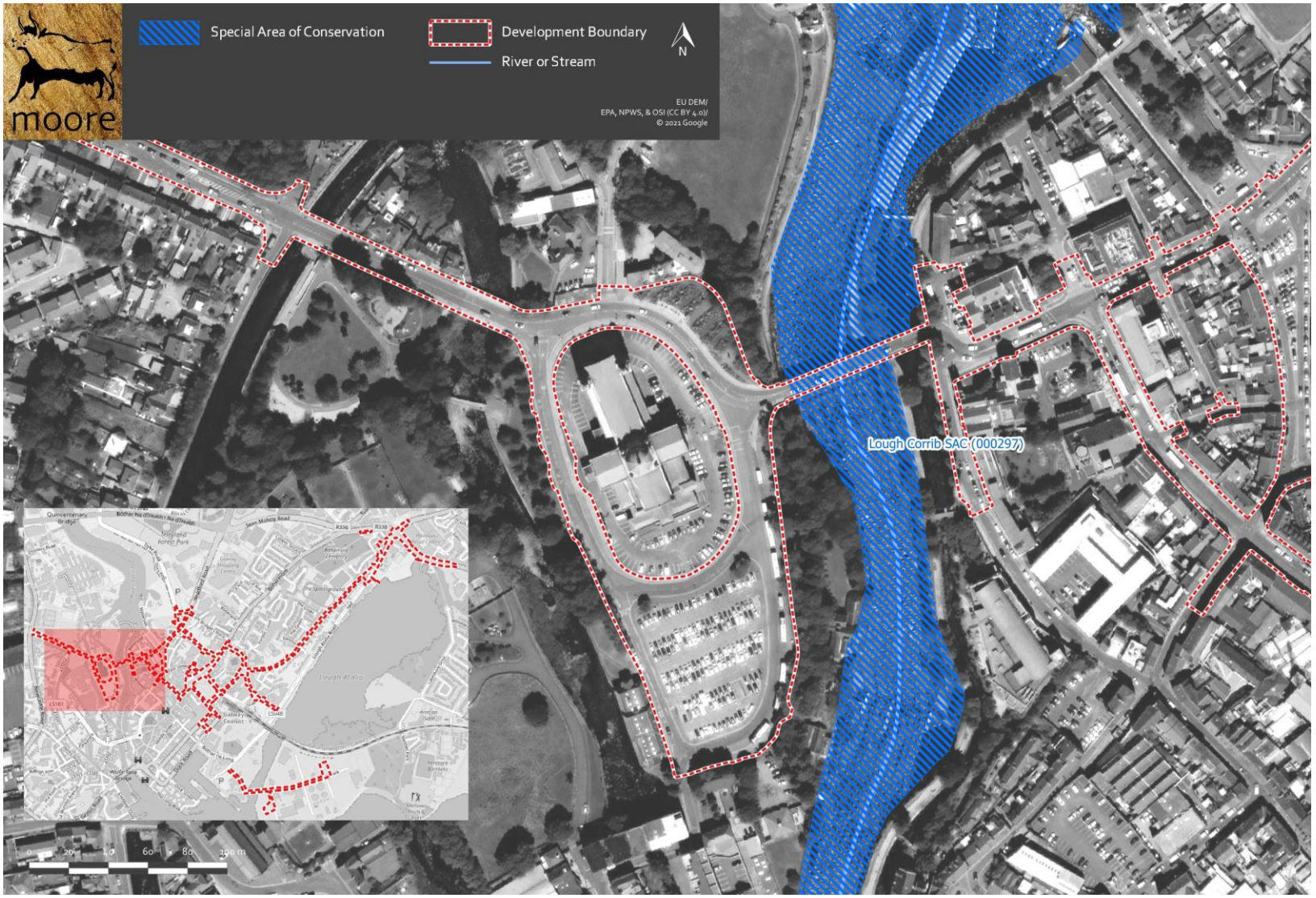

Diagram 12.4: Detail of the Locations of nearby European sites within the Potential Zone of Influence of the River Corrib.

Diagram 12.5: Detail of the Locations of nearby European Sites within the Potential Zone of Influence of Lough Atalia.

12.3.3 Habitats, Flora & Fauna

In general, there are few natural habitats in the majority of the Proposed Scheme area. They have either been modified or are artificial in nature the urban context of Galway City. The main natural habitats of conservation concern are the River Corrib and Lough Atalia. Habitats are classified under the Fossitt codes (Fossitt, 2000).

The following is an overview of the main habitat types present in proposed works areas. Detailed habitat descriptions are provided in areas that either intersect or have hydrological connectivity with European sites, see Diagrams 12.4 and 12.5.

12.3.3.1 Habitats & Flora

The Proposed Scheme would be constructed in the existing urban areas of Galway City which is predominantly comprised of the existing buildings and hardstanding areas 'Buildings and artificial surfaces' (BL3) which comprise the roads, paths, cycle lanes, laybys, parking areas and artificial surfaces of the city.

There were no rare or protected flora recorded in the Project area.

Specific detailed surveys of areas of the Eglinton Canal, the Galway Harbour Enterprise Park and amenity grassland at Lough Atalia are presented in detailed habitat maps below.

University Road

Along University Road (from the junction with Newcastle Road to the Salmon Weir Bridge), the proposed scheme works will involve footpath widening, provision of an entry treatment at the entrance to NUIG, provision of two raised tables along the route at Canal Road Upper and Fisheries Field and the provision of two new signalised pedestrian crossings. Between the entrance to Fisheries Field and the Salmon Weir Bridge, it is proposed to install a bus gate and to designate the carriageway as a time-regulated bus lane in both directions.

The predominant habitat present is Buildings and artificial surfaces (BL3). Adjoining lands in NUIG comprise Amenity grassland (GA2), Mixed broadleaved woodland (WD1) and Flower beds and borders (BC4). These latter habitats will not be affected, see Photo 12.1.

The immediate aquatic environment in the Eglinton Canal adjacent to the Proposed Scheme site does not contain any designated habitats but is important in terms of water quality as a habitat for salmonids and otters.

Photo 12.1: View of University Road (07/04/20) from the Eglinton Canal Bridge at Ward's Shop looking West.

University Road crosses the Eglinton Canal (FW3) at the intersection of Canal Road Upper and the entrance to NUIG. It has been established that while the canal is not designated as part of the Lough Corrib SAC, it discharges to the River Corrib downstream at Wolfe Tone Bridge and at the Claddagh Basin over 800m downstream. There are records for otters at the rear of the Ryan Institute building in NUIG upstream of the bridge at Ward's Shop.

Excavation and removal of the existing footpath is proposed over the bridge and replacement with a new concrete footpath. Excavation of the existing footpath and part of the existing road carriageway surface, to a depth of 100mm – 150mm approximately is expected. The existing road surface will be removed using a mechanical planer. Immediately adjacent to the bridge, a new raised table is to be constructed from bituminous products. This will require the removal of a maximum of 100mm of existing road surface and replacement with approximately 200-250mm of new bituminous material.

No trenching is anticipated to be required cross the bridge or in close proximity to the bridge or watercourse.

There are no planned discharges to surface water. However, there are openings from the road to the Eglinton Canal particularly at Ward's Corner with connectivity to the River Corrib downstream and the potential for contaminated surface water runoff to the canal is uncertain. The Eglinton Canal is not monitored by the EPA for water quality.

However, the main channel of the River Corrib at the Salmon Weir Bridge sampling point returned a Q4 value for the most recent sampling period, 2021, indicating Good water quality status.

Gaol Road and Galway Cathedral

To the west of Galway Cathedral, on Gaol Road, the works involve footpath widening at the junction with University Road and to the south on Gaol Road the works involve re-development of the car and coach parking area to the south of Galway Cathedral. To the east of Galway Cathedral, the works involve the closure of the existing carriageway and creation of a pedestrianised public space.

The area to the east of Galway Cathedral is to be closed to vehicular traffic and designated as a public pedestrian space, and the carriageway and footpaths that will ultimately become part of the public space will be removed and/or regraded, with a new paved area installed to connect with the existing walls both to the east (adjacent to Persse's Distillery River) and to the west (adjacent to the boundary wall of Galway Cathedral). This will require the removal of the existing bituminous layers on the road and replacement with new materials.

University Road crosses the Gaol River which is a branch of the Eglinton Canal (FW3), Photo 12.2. The predominant habitat present around the Cathedral is Buildings and artificial surfaces (BL3). Adjoining lands in NUIG comprise Amenity grassland (GA2) of the Fisheries Field, Mixed broadleaved woodland (WD1) along the Persse's Distillery River and Flower beds and borders (BC4). These latter habitats will not be affected.

Photo 12.2: View of Gaol River looking North toward the Ryan Institute NUIG from Beggars Bridge (07/04/20).

Salmon Weir Bridge

On the Salmon Weir Bridge, the works include widening the existing footpath on the northern side of the bridge and the removal of the footpath on the southern side of the bridge and replacing it with a rubbing strip. Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths.

The main channel of the river is comprised of bedrock, boulders and cobbles which can be seen during the summer months. During the winter months, the powerful flow and substantially increased volume of the river prevents the establishment of Annexed habitats. As mentioned above, the main channel of the River Corrib at the Salmon Weir Bridge sampling point returned a Q4 value for the most recent sampling period, 2021, indicating Good water quality status. There are no planned discharges to surface water and it is unlikely that the minor works proposed would generate any significant emissions to water or air.

At the time of writing (May 2022) preparation construction work had commenced on the Salmon Weir Pedestrian Bridge at the Cathedral side of the river and several trees visible in the aerial photo (Diagram 12.6) had been removed as part of that approved Project.

Newtownsmith/Waterside

The works at this location will involve the permanent closure of Waterside as it approaches St. Vincent's Avenue from the north (with the resultant space used to create a public space), and the narrowing of Newtownsmith as it approaches St. Vincent's Avenue from the south (reduced to a single northbound traffic lane, with resultant wider footpaths). The project boundary takes in a small area of Amenity Grassland (GA2) adjacent to the river at Waterside, see Diagram 12.6 below. The adjacent area of the River Corrib is part of the Lough Corrib SAC. However, there will be no direct or indirect impacts here.

The predominant habitat present Newtownsmith is Buildings and artificial surfaces (BL3) and a small patch of Amenity Grassland (GA2) adjacent to the river at Waterside, see Photo 12.3 below. One newly sprouting London Plane (*Platanus x hispanica*) (c.f. photo insert from 07/04/20) and a compromised Rowan (*Sorbus aucuparia*) are the only trees in this area which will be removed.

A single Lime tree at the northern end of a line of semi-mature Lime trees has been removed as part of the Salmon Weir Pedestrian Bridge Project. There are no plans to remove the remaining trees for the Proposed Scheme.

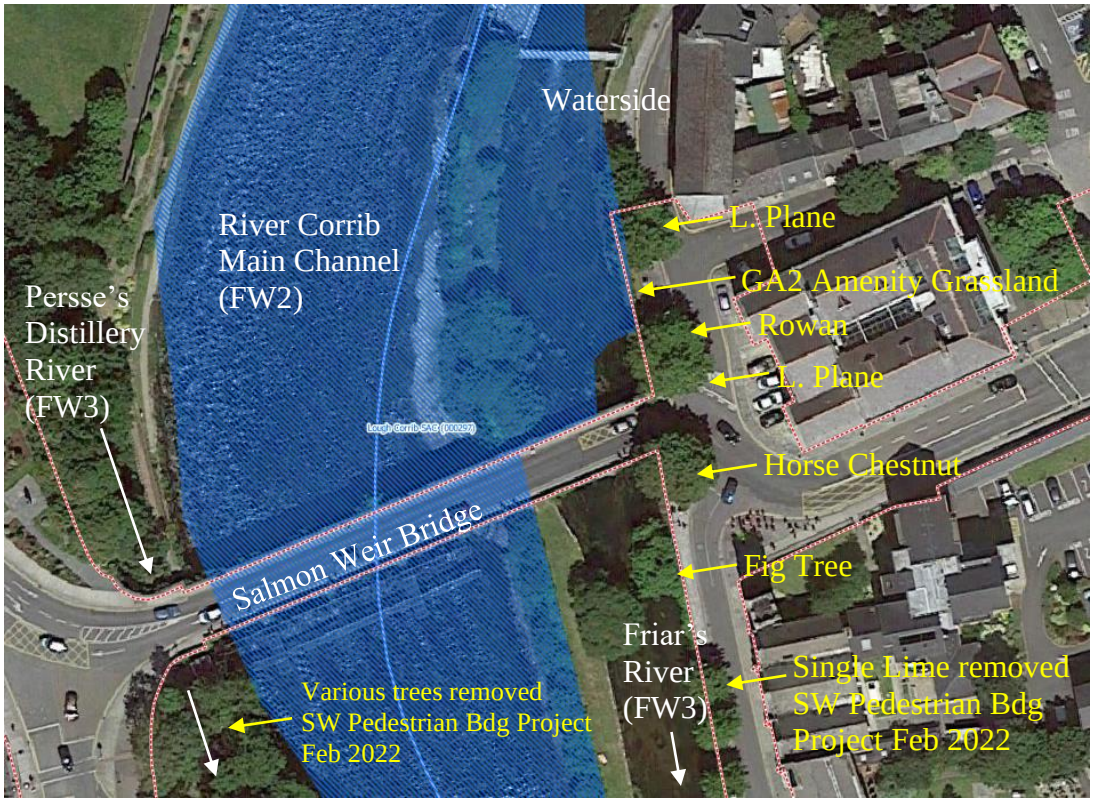

Diagram 12.6: Showing the Project Boundary in detail and Habitats at Waterside with Lough Corrib SAC hatched in Blue.

Photo 12.3: View of Amenity Grassland at Waterside on 18/10/21 (inset 07/04/20).

Dyke Road/Headford Road

The project boundary extends for a short distance north along the Dyke Road past the former Clifden Railway Line embankment. The works proposed are pavement improvement and there will be no direct impacts on the section of Lough Corrib SAC which encompasses the reedbed to the east of the Commercial Boat Club, circa 9m from the Dyke Road, see Diagram 12.7 and Photo 12.4 below.

Diagram 12.7: Showing the Project Boundary in detail and Habitats at the Dyke Road with Lough Corrib SAC hatched in Blue Corresponding to Reedbed and Trees marked for removal (S = Sycamore).

The locations of two residences to be demolished are indicated at the Headford Road and St. Brendan's Avenue.

Photo 12.4: View of Amenity Grassland at the Dyke Road adjacent to the SAC Area (07/04/20).

City Centre

The predominant habitat present in the following areas is Buildings and artificial surfaces (BL3). There are no natural habitats and there are no predicted impacts on ecology in these areas:

- St. Vincent's Avenue/Walsh's Terrace;
- St. Francis Street/Eglinton Street/Williamsgate Street;
- Woodquay/Daly's Place/Mary Street;
- Bóthar na mBan/St. Brendan's Avenue;
- Prospect Hill;
- Eyre Square North/Eyre Square East/Eyre Square South;
- Victoria Place/Merchant's Road/Queen Street;
- Forster Street;
- College Road/Forster Street/Fairgreen Road/Bóthar Uí hEithir junction;
- Bóthar Uí hEithir;
- Fairgreen Road.

The project boundary extends to the eastern end of Fairgreen Road at the junction of Lough Atalia Road. The Galway Bay Complex SAC and Inner Galway Bay SPA extend into Lough Atalia in this area but the SAC/SPA site boundaries are circa 30m from the project boundary in this area and there will be no direct or indirect effects in this area.

College Road/Lough Atalia Road Junction;

The junction of College Road/Lough Atalia Road is to be realigned into a standard, signal controlled, T-junction arrangement, with a reduced junction footprint. The College Road (from City Hall) arm of the junction will be the minor arm of the 'T' arrangement. Existing traffic islands within the existing junction are to be removed, and the College Road approach to the junction realigned to route through the existing grassed area between College Road and Lough Atalia Road. The new T-junction will be signalised. The existing junction area that becomes redundant will be used to provide new or widened footpaths and provision of new landscaped areas. The existing entrance to Loyola Park will be retained in its current location, but altered to a priority controlled access with a new entry treatment and kerblines.

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the new drainage network.

A new drainage pipe and non-return valve to be installed at discharge point into Lough Atalia at this location adjacent to the eastern perimeter of Lough Atalia Playground. The maximum depth of trench excavation required to install the new pipe, gully post and new connection pipes is 2.2m. Additionally, a new attenuation tank and petrol interceptor will need to be installed, which will require excavation of approximately 3.5m -3.75m for installation.

The ecological boundary of this SAC may be considered to be co-aligned with the Inner Galway Bay SPA boundary in this area which in coastal areas corresponds to the Mean High Water Mark.

Lough Atalia is included in the Galway Bay Complex SAC as a Coastal Lagoon [1150]. Coastal lagoons are priority habitats under the Habitats Directive.

The existing habitat on the western perimeter of Lough Atalia Playground, surveyed on 20-21 January 2022, is Amenity grassland (GA2) which surrounds the Playground area (BL3). The shoreline curves around to a bend in the rock armour corresponding to the end of the propriety garden or plot at the eastern end of Lough Atalia Road where the existing outfall is located. As mentioned, the shoreline is comprised of rock armour, an artificial shoreline placed in the late 1990s, see Diagram 12.8 and Photo 12.5.

Lough Atalia is considered in terms of water quality under as a Transitional Water Body and is assigned an EPA status for the period 2018-2020 of 'Unpolluted'.

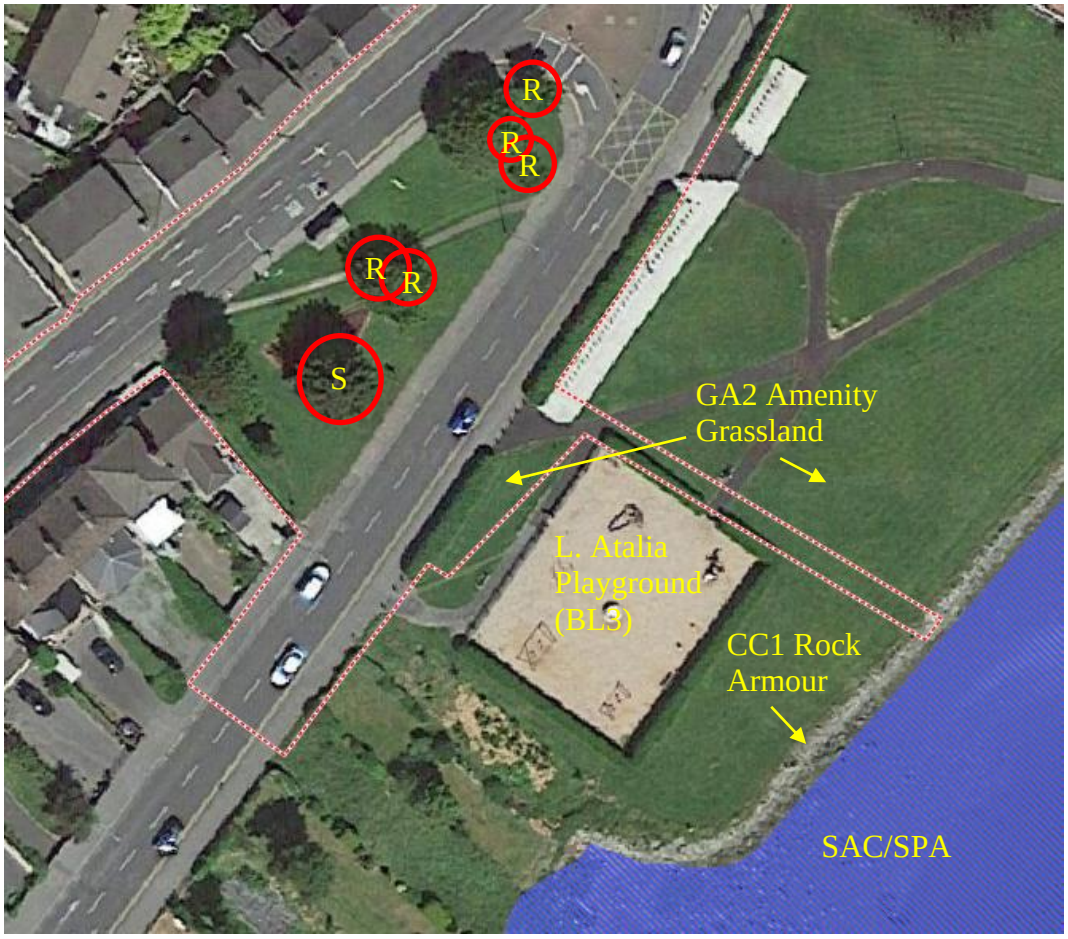

Diagram 12.8: Showing the Project Boundary in detail and Habitats at the Proposed Surface Water Discharge Point at Lough Atalia Playground and Trees marked for removal (S = Sycamore, R = Rowan/Mtn. Ash).

Photo 12.5: Showing the Habitat types at Lough Atalia Playground and adjacent Amenity Grassland adjacent to Lough Atalia.

The lower shore is covered by seawater at hightide and at low tide presents as soft mud with occasional weed covered rocks corresponding to Mixed sediment shore (LS5). The rock armour was searched for possible otter holt or resting habitat during surveys in March 2022 but found to be based on poured concrete with no potential in this regard. The proposed works refer to the removal of the upper sections of the rock armour to facilitate the placement of a new outfall after interception.

R338 Dublin Road

The works on the R338 Dublin Road comprise the installation of inbound and outbound bus lanes, raised adjacent cycle lanes and footpaths on both sides of the road, extending for approximately 350m east of the Moneenageisha Road. This is to be achieved via a combination of carriageway widening, re-purposing of existing traffic lanes and setting back the existing footpath. An entry treatment is proposed at the entrance to the Huntsman Inn.

Approaching the junction at Moneenageisha, footpath widening is proposed as part of the tightening of the entrance to the junction (removal of the left-slip to College Road, etc.).

Footpath widening works will require the existing footpaths to be broken out, and the bituminous layers of the road carriageway where widening is proposed to be removed, and the new widened footpath installed. This will require excavations of approximately 300mm of the existing road and footpaths. Drainage gullies will be relocated to the new kerb edge and will connect back to the existing drainage network. The maximum depth of trench excavation required to install gully post and new connection pipes is 1.2m. Other utilities, where present will be retained within the new footpath.

The predominant habitat present on the R338 Dublin Road is Buildings and artificial surfaces (BL3). Lough Atalia is included in the Galway Bay Complex SAC as a Coastal Lagoon [1150]. Coastal lagoons are priority habitats under the Habitats Directive. It is also included in the Inner Galway Bay SPA. The SPA, in the vicinity of the widening, is a dry bay, with a grassed surface and is bounded by a cut stone dock wall which runs perpendicular to the Dublin Road, which degrades to a loose stone embankment as it wraps around the bay, running parallel to the Dublin Road. The section parallel to the proposed works is heavily vegetated. It is assumed that the section through this area comprises of a degraded loose stone wall beneath the vegetation.

The proposed works comprises a new 4.0m wide footway/cycleway offset approximately 0.9m from the SPA boundary. Due to the uncertainty of the existing wall, it is proposed to install a new retaining wall through here to support the footway/cycleway, which is approximately 1.3m above the depressed bay level. To avoid encroachment into the SPA boundary, it is proposed to retain the existing stone wall/embankment by constructing a mass concrete gravity wall in behind it. This requires the material in behind the wall to be excavated out and then backfilled with mass concrete. Due to the potential instability of the stone wall, care is required during construction to protect the existing stone wall/embankment. The area behind the wall is designated as an SPA. In order to avoid the collapse of the existing wall/slope, the installation of a

temporary/sacrificial support to maintain the integrity of the slope and contain the concrete from seeping through the stone wall and into the SPA will be provided in a worst-case construction scenario. Protection from construction run-off into the SPA will be implemented during construction along this section, refer to measures included in the CEMP (Appendix 5.1 of this EIAR), see Diagram 12.9.

The boundary of the SAC is adjacent to the southern side of the road and the artificial surfaces of the road and footpath in this area. The overlapping section of the Proposed Scheme and the SAC comprises bramble scrub over a retaining wall. The seaward side of this scrub boundary is located within the Inner Galway Bay SPA and comprises components of upper salt marsh. However, the salt marsh does not correspond with any of the Annexed Qualifying Interests of the SAC; (1310 Salicornia and other annuals colonising mud and sand; 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) or 1410 Mediterranean salt meadows (*Juncetalia maritimi*).

Species present includes frequent Common bent grass (*Agrostis stolonifera*), frequent Sea mayweed (*Tripleurospermum maritimum*), occasional Sea Aster (*Aster tripolium*)(closer to the low water mark) and abundant Spear-leaved Orache (*Atriplex patula*). Sea rush (*Juncus maritimus*) was present in a few tufts confined to the low water tide line.

The Proposed Scheme boundary is located adjacent to and outside the boundary of the Inner Galway Bay SPA at this point at Lough Atalia.

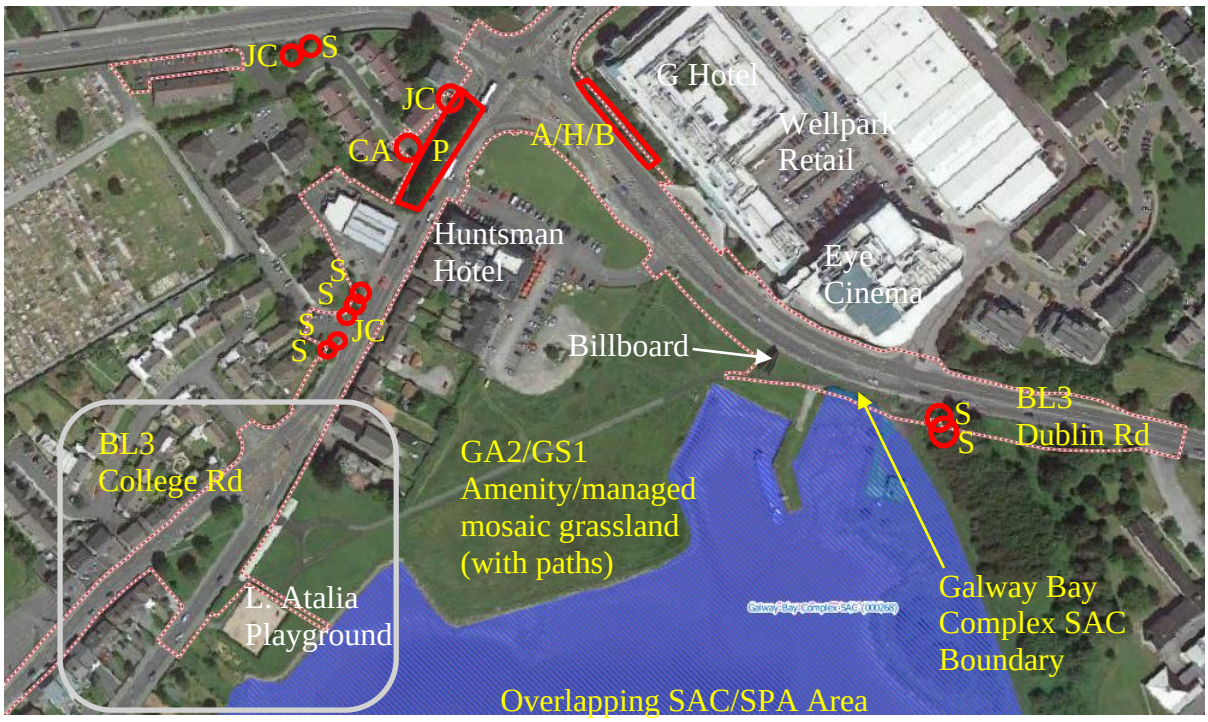

Diagram 12.9: Showing the Project Boundary in detail and Habitats at the Dublin Road and Trees marked for removal (S = Sycamore, P = Poplar Treeline, A/H/B = Alder/Holly/Birch mix, JC = Japanese cherry, CA = Crab Apple).

The site was surveyed in August 2019, April 2020,September and October 2020, September 2021 and in August 2022 by the author and ground truthing showed

that there are no Annexed habitats or no qualifying habitats under the footprint of the intersecting areas.

The upper area of intersecting SAC habitat at the inner extent of Lough Atalia adjacent to the Dublin Road comprises bramble scrub with Lilac bushes (*Syringa vulgaris*) and large patches of Winter heliotrope (*Petasites pyrenaicus*) along the roadside boundary wall (see Photo 12.6 below), under the billboard and surrounding the Huntsman car park.

Many of the fringing habitats around this section of Lough Atalia have been modified by modern development such as private gardens lining the lough, the Playground area to the west of the Huntsman Inn, and amenity grassland which is managed by Galway City Council. To this end, they are of reduced value to Wintering birds which prefer the intertidal and aquatic habitats of the lagoon itself.

Unmanaged areas recorded in July and August 2019 correspond to rough neutral grassland (GS1) managed for biodiversity. Thus the grassland at this area presents a transitional mosaic of amenity and rough neutral grassland depending on the time of year and management.

Species recorded in unmanaged areas in site visits in July includes abundant False oat grass (*Arrhenatherum elatius*), Common knapweed (*Centaurea nigra*), Tufted vetch (*Vicia cracca*), Red clover (*Trifolium pratense*), Creeping cinquefoil (*Potentilla reptans*), Black medick (*Medicago lupulina*), Ribwort plantain (*Plantago lanceolata*), Broad dock (Rumex obtusifolius), Thistles (*Cirsium arvense & C. vulgare*), Common sorrel (*Rumex acetosa*) with Meadowsweet (*Ulmaria filipendula*), Hard rush (*Juncus inflexus*) in wetter patches along with abundant Great willowherb (*Epilobium hirsutum*). Silverweed (*Potentilla anserina*) was common in the areas closer to the Huntsman along with frequent Red Bartsia (*Odontites verna*).

These areas were mown by the time the site visit was undertaken in April 2020 and again in Autumn 2020. Additionally, some repairs had been made to the boundary wall in the vicinity of the proposed path side works outside the SAC area, see Photo 12.6.

Photo 12.6: Showing the approach to Moneenageisha junction on the Dublin Road. Note the disturbed ground and wall repairs.

Galway Harbour Enterprise Park

It is proposed to use two sections of the Galway Harbour Enterprise Park as Construction Compounds see Diagram 12.10 and Photo 12.7 below. The areas comprise existing rough ground compounds with Recolonising bare ground (ED3) being the predominant habitat. Species present include typical ruderals such as Nipplewort (*Lapsana communis*), Dandelion (*Taraxacum* agg.), Ragwort (*Senecio jacobaea*), Bucks-horn plantain (*Plantago coronopus*) and Daisy (*Bellis perennis*). Sea radish (*Raphanus raphanistrum ssp.maritimus*) is also common throughout the area with Broad dock (*Rumex obtusifolius*), Coltsfoot (*Tussilago farfara*), Nettle (*Urtica diocia*) and Red valerian (*Centranthus ruber*). Two plants of Japanese Knotweed (*Reynoutria japonica*)(JKW) are located circa 32m from the site boundary in this area (ITM 530713 725014).

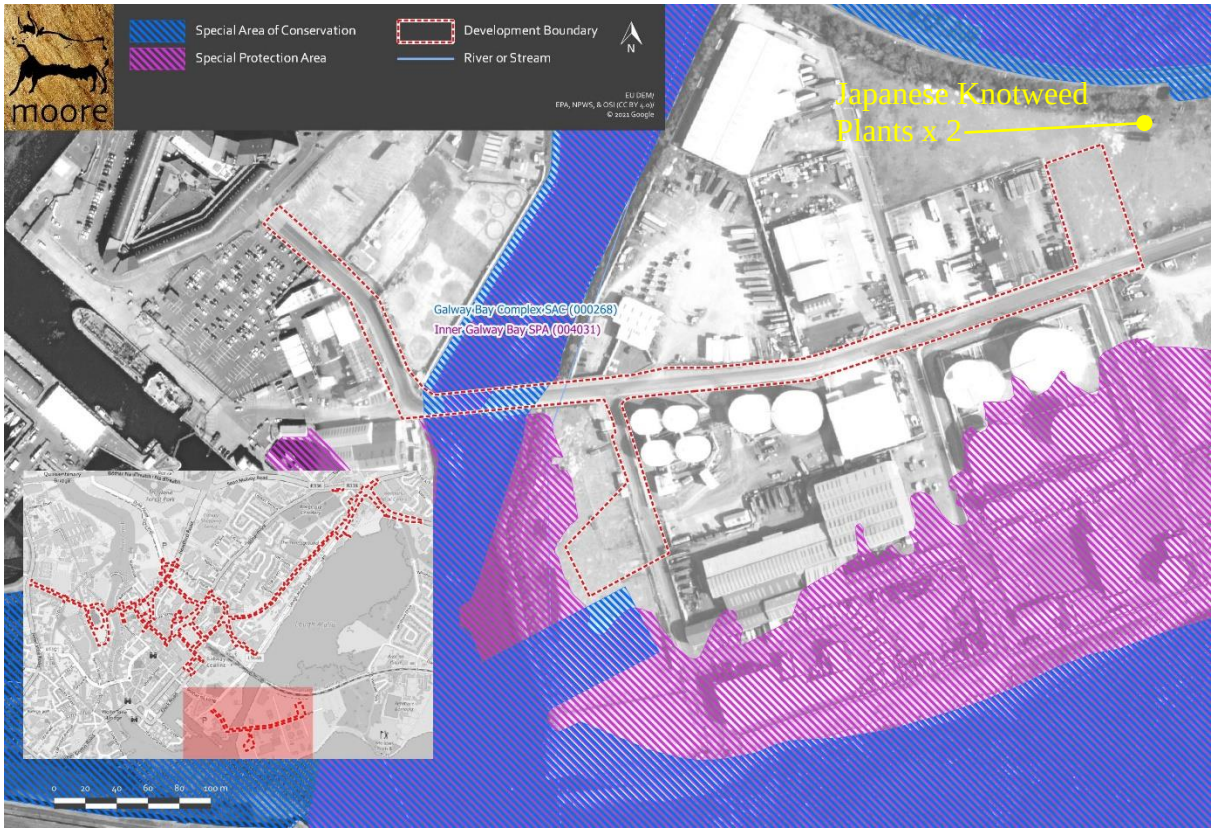

Diagram 12.10: Showing the project boundary in the Galway Harbour Enterprise Park area.

Invasive Species

There are no records of Third Schedule[31] invasive species within in the Project redline boundary.

One record of two relatively small bushes of Japanese Knotweed were recorded during habitat surveys located circa 32m to the east of a proposed Construction Compound at Galway Harbour Enterprise Park, see Photo 12.7 below.

There are two known records of Japanese Knotweed currently undergoing treatment by GCC in close proximity to the Scheme.

A record at Beggars Bridge, University Road, on the south side adjacent to the Millennium Children's Park appears to have been successfully treated with no signs of regrowth in March 2022.

A record at Lough Atalia Playground, adjacent to the bike park appears to have been successfully treated with no signs of regrowth in March 2022.

[31] The European Communities (Birds and Natural Habitats) Regulations 2011 contain provisions to address the problem of invasive species. These are listed in the Third Schedule of the Regulations.

Photo 12.7: Showing two Japanese Knotweed plants in the Galway Harbour Enterprise Park.

12.3.3.2 Fauna

Otters

Otters are well known to occur in the River Corrib both upstream of the Salmon Weir, in the Eglinton Canal and in the lower estuarine section of the river along Nimmo's Pier and signs have been record in Lough Atalia.

There is low potential for otter holts in the mill races or main river channel in the survey area given the solid bedrock and artificial surfaces historically placed as foundation for the main river channel and adjacent mill races. The rock armour of sections of Lough Atalia provides more opportunities in this respect.

Otters have been recorded upstream of the Salmon Weir and this author observed one swimming in the upper river circa 500m upstream of the weir to the rear of the NUIG campus in November 2015. There is an undocumented record from February 2020 by Dr. P. Gargan, IFI (pers. comm.) from the area below the Salmon Weir.

There are several sightings of otter on the NBDC website from 2015 – 2016 in the upper river and along the Eglinton Canal, which is directly connected to the upper river, and at the Claddagh Quay, see Diagram 12.11 below.

The closest records are of sightings of live animals with records from the Eglinton Canal in the vicinity of the Ryan Institute at NUIG from April and June 2016, from the splitting point from the Eglinton Canal of St. Clare's River at Canal

Road Upper from 2013, 2014 and 2016, and one record from the location of the 'Bish Weir' downstream on St. Clare's River from 2016.

There are also records from the Eglinton Canal where it meets the Claddagh Basin and also from the estuarine section of the river around Nimmo's Pier and Claddagh Beach and in Lough Atalia.

Anecdotal information suggests that there is a possible holt or resting place at the base of the Atlantic Apartment Building adjacent to the Fisheries Tower near Wolfe Tone Bridge (pers. comm. Ross Macklin having surveyed the city waterways for otters). However, this was not evident during the survey of this area during cleaning works in October 2020 when the water level was dropped.

There were no observations of otters using the Persse's Distillery River or the Friar's River channels during current surveys. It is likely that these channels are restricted by barriers such as weirs and culverting.

It is clear from the records that otters are commuting from the lower River near the Claddagh Basin along the mill races at Parkavara and Nuns Island to the Eglinton Canal and the upper River Corrib. This was confirmed during a walk by the author on 3 April 2022 when a single otter was observed swimming in the lower reaches of St. Clare's River at Mill Street opposite the Garda Station. The otter continued under the road leaving Nun's Island and was observed disappearing into the sluice under the Bridge Mills Building. A notable record given it was mid-afternoon in bright daylight.

It is likely that the salmon weir and side weirs are limiting factors in terms of movement on the main river channel in this regard.

Records of otters from the NBDC database downloaded on 2 March 2022 are presented in Diagram 12.11 below.

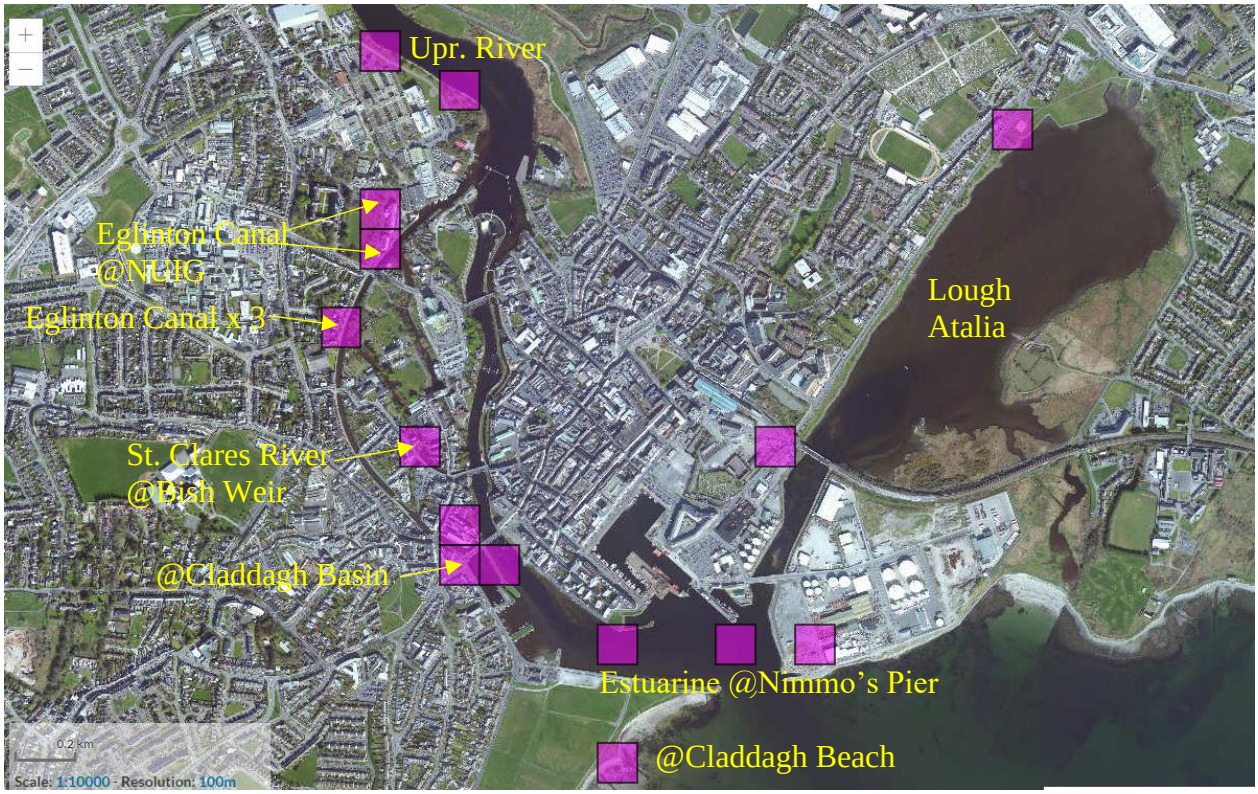

Diagram 12.11: Showing the NBDC records for otters in the study area (02/03/22).

Bats

Walked Transects

The dusk mobile detector survey was carried out on 17 July 2019 completing walked transects of the site of two buildings to be removed the junction of the Headford Road and St. Brendan's Avenue to survey for commuting, feeding and potential roost sites. The survey commenced at 20:00 and continued for four hours in line with recommendations in Chapter 10 of the Bat Conservation Trust 'Good Practice Guidelines, 3rd Edition, 2016' (Collins, J. (ed) 2016[32]) and The Irish Wildlife Manual No. 25' (Kelleher, C. & Marnell, F. 2006[33]).

There were no recorded calls or passing bats on the night of 17 July 2019. There were no signs of emergence from either building during the survey.

Tree Surveys

All trees within the project boundary were assessed for bat roost potential – there were no trees of the appropriate size and with sufficient gaps, cracks, crevices or holes to be used by bats.

[32] Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London

[33] Kelleher, C. &. F. Marnell (2006). *Bat Mitigation Guidelines.* Dublin: National Parks and Wildlife Service, Department of Environment, Heritage

Lesser horseshoe bat (*Rhinolophus hipposideros*)

There were no records of calls from Lesser horseshoe bats recorded in the survey and no cavity found within any tree was suitable for this species.

The results of bat surveys for the N6 Ring Road Project have shown that this species does not occur in the project area and will not be affected. This is supported by the results of radio tracking surveys for the N6 Project which have shown that this species did not forage in the urban area of Galway City to the south of the Quincentenary Bridge (Rush, T., Billington, G., 2015).[34].

Seals

Harbour/Common seal (*Phoca vitulina*) are regularly seen in the estuarine waters downstream of Wolfe Tone Bridge.

Salmonids

The Galway Fishery starts from just below the weir and extends the short distance of 250m down to the Salmon Weir Bridge. It is one of the most prolific salmon fisheries in Ireland as the fish queue up to navigate the weir.

The River Corrib is registered as a Salmonid Water under the Salmonid Regulations. Salmonid waters are included within the Register as areas protected for water dependent species and habitats. The protected areas for Salmonid species are comprised of the 34 Salmonid rivers, tributaries and lakes listed in the Salmonid Regulations (S.I. 293 / 1988).

Lamprey

The River Corrib is noted as an important river for Sea Lamprey (*Petromyzon marinus*) (Igoe *et al.*, 2004[35]) whereas no River Lamprey have been recorded from the system. The Project Ecologist has observed cormorants feeding on sea lamprey both on the riverbank at the Fisheries Tower and from the river downstream of Wolfe Tone Bridge.

During a qualitative survey of lampreys present in the Corrib catchment, only one species of lamprey was confirmed from the Corrib catchment: Brook lamprey (*Lampetra planeri*)[36]. Sea lampreys are present in the catchment but seem to be confined to below the Galway regulating weir.

Although there are records of sea lampreys in some of the tributaries of Lough Corrib, these records pre-date the construction of the existing weir. The success of sea lamprey spawning below the regulating weir in Galway is unknown.

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[34] Rush, T., Billington, G. (2015). Galway bat radio-tracking project. Radio tracking studies of lesser horseshoe bat species, May 2015. Greena Ecological Consultancy. Witham Friary, Frome 2015.

[35] Igoe, Fran & Quigley, Declan & Marnell, Ferdia & Meskell, E. & O'Connor, W. & Byrne, C. (2004). The Sea Lamprey Petromyzon marinus (L.), River Lamprey Lampetra fluviatilis (L.) and Brook Lamprey Lampetra planeri (Bloch) in Ireland: General Biology, Ecology, Distribution and Status with Recommendations for Conservation. Biology and Environment-proceedings of The Royal Irish Academy.

[36] O'Connor, W. (2007) A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments. Irish Wildlife Manuals No. 26. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Birds

Breeding birds

Breeding bird species recorded included regular passerines such as Chaffinch (*Fringilla coelebs*), Blackbird (*Turdus merula*), Wren (*Troglodytes troglodytes*). A list of bird species recorded during fieldwork is presented in Table 12.4.

Gulls flying overhead included Herring gulls (*Larus argentatus*) and Black-headed gulls (*Larus ridibundus*). Herons (*Ardea cinerea*) have been observed perched on dryer banksides during periods of low water during the summer and observed downstream of the shopping centre in the channel of the Friar's River at Newtownsmith and along the shore at Lough Atalia.

A single Dipper (*Cinclus cinclus*) was recorded in October 2019 in the Persse's Distillery River circa 20m downstream of the Salmon Weir Bridge feeding from a discarded bicycle. Dippers were also observed on St. Claires' River and the Parkavera River near Mill Street along with Grey wagtails (*Motacilla cinerea*). Mute swans feed in the main channel of the lower River Corrib during the lower water level seasons and shelter in the inner reaches of Lough Atalia near Lakeshore Drive. There is one well recorded faithful nesting place near the Proposed Scheme in the canal opposite the Cathedral under the footbridge leading to the Millennium Children's Park. The nest site has been repeatedly used successfully over the past number of years and future use is unlikely to be affected by the Proposed Scheme.

Table 12.4: Breeding Birds Recorded during Site Surveys.

Birds	Scientific name	BWI	Habitat Type
Blackbird	*Turdus merula*	Green	Dense woodland to open moorland, common in gardens
Chaffinch	*Fringilla coelebs*	Green	Hedgerows, gardens and farmland
Goldfinch	*Carduelis*	Green	Open woodland, gardens and farmland
Woodpigeon	*Columba palumbus*	Green	Gardens, woods, hedges
Wren	*Troglodytes*	Green	Low cover anywhere, especially woodlands
Swallow	*Hirundo rustica*	Amber	Hedgerows, gardens and farmland.
Mute Swan	*Cygnus olor*	Green	Rivers, lakes, ponds, canals
Mallard Duck	*Anas platyrhynchos*	Green	Rivers, lakes, ponds, canals
Heron	*Ardea cinerea*	Green	Rivers, lakes, ponds, canals
Dipper	*Cinclus hibernicus*	Green	Rocky streams and rivers

In addition to summer breeding birds, the presence of Common tern (*Sterna hirundo*) in Lough Atalia is notable as is the presence of a nesting raft placed in 2019 at the western end of the lough opposite the Galmont Hotel. The raft is monitored by Conservation Volunteers Galway and has recorded regular breeding pairs since then. The nearest raft is located circa 570m from the work area at Lough Atalia Playground.

Wintering birds

Inner Galway Bay is a key site supporting numbers of waterbirds of international and national importance. Based on counts between 2013/14 and 2017/18[37], the mean peak annual count is 13,294 and includes the following species; Great Northern Diver, Light-bellied Brent Goose, Bar-tailed Godwit, Black-tailed Godwit, Cormorant, Curlew, Dunlin, Little Egret, Great Crested Grebe, Greenshank, Golden Plover, Grey Plover, Grey Heron, Lapwing, Little Grebe, Redshank, Red-breasted Merganser, Ringed Plover, Shelduck, Shoveler, Teal, Turnstone and Wigeon.

Birdwatch Galway note that during Winter Little Grebe and duck like Wigeon, Teal, Shelduck, Goldeneye and Red-breasted Merganser can be seen at close range. Of special note is the winter Scaup flock, which may number 50 birds[38].

Wintering bird species recorded at low tide at Lough Atalia in the vicinity of the proposed outfall at Lough Atalia Playground includes Mute swan (*Cygnus olor*)(12) and Wigeon (*Anas penelope*)(12) in January 2022, flocks of Black-headed gulls (*Chroicocephalus ridibundus*) +70 on 2 March 2022, small numbers of Teal (*Anas crecca*)(8) and Oystercatcher (*Haematopus ostralegus*)(12), Redshank (*Tringa totanus*)(4) and occasional single Little Egret (*Egretta garzetta*).

As mentioned in the chapter Methodology, while these surveys do not constitute a full Winter bird survey, they are representative of the birdlife present at the location of the proposed outfall at the shoreline at Lough Atalia Playground. It may also be noted that the bird population in the area are mobile and present in varying numbers depending on the state of the tide with much reduced habitat availability at high water when rocks and mudflats are covered.

Additionally, repeated fieldwork particularly in the vicinity of the eastern extent of Lough Atalia and specifically in relation to the areas of amenity grassland, has determined that these areas are of reduced value to Wintering birds due to the existing levels of human activity and preference for the intertidal and aquatic habitats of the lagoon itself.

12.4 Characteristics of the Proposed Scheme

The Proposed Scheme refers to the BusConnects Galway: Cross-City Link (University Road to Dublin Road) Project consisting of the alteration of existing road layouts, including junction layouts, footpaths, signalling, pedestrian crossings, drainage and other associated works.

An overview of the likely scheme construction phasing and the necessary construction works associated with each phase is outlined in Chapter 5 (Construction) of this EIAR.

[37] Fitzgerald, N., Burke, B. & Lewis, L.J. (2021) Irish Wetland Bird Survey: Results of waterbird monitoring in Ireland in 2016/17 and 2017/18. BirdWatch Ireland, Wicklow.
[38] http://www.birdwatchgalway.org/whereto1.htm#atalia

For the majority of the works associated with the scheme, it is envisaged that normal working hours will be followed. In specific circumstances, such as road crossings or road resurfacing, the works will be carried out at night.

Existing signage will be retained or relocated within widened footpaths. Additional new signage will also be required at locations throughout the scheme. Typical excavation depths for installation of new signage will be approximately 1m.

Existing road markings will be retained where still valid within the carriageway. New road markings will be applied at locations throughout the scheme either via removal and replacement of existing markings or application of new road markings following resurfacing works.

Utility covers will be raised to match new ground heights where applicable.

A new drainage pipe and non-return valve to be installed at discharge point into Lough Atalia. The maximum depth of trench excavation required to install the new pipe, gully post and new connection pipes is 2.2m. Additionally, a new attenuation tank and petrol interceptor will be installed, which will require excavation of approximately 3.5m -3.75m for installation.

12.5 Potential Impacts

12.5.1 'Do-Nothing' Scenario

The do-nothing scenario would involve the Proposed Scheme not taking place. The baseline environment would not change. The do-nothing scenario would have a neutral impact on biodiversity.

12.5.2 Construction Phase

12.5.2.1 Habitats & Flora

The predominant habitats under the majority of the footprint of the Proposed Scheme are artificial and include road and paved surfaces. There are no potential effects on the terrestrial habitats of the Proposed Scheme. There are no rare or protected flora under the footprint of the Proposed Scheme.

Habitats at University Road

The predominant habitats at University Road are artificial and include road and paved surfaces. However, the scheme crosses the Eglinton Canal and at Ward's Shop there are openings in the roadside wall to the canal where surface water could potentially enter the canal.

The possibility of this occurring is unlikely but cannot be ruled out and any discharge of contaminated surface water either from an event of sustained elevated suspended solids or a Hydrocarbon spill has the potential to have a negative moderate effect on the immediate receiving environment of the canal. The effect will be temporary and unlikely to reach the main channel of the River

Corrib. However, construction management will be employed to avoid the possibility.

Habitats at Salmon Weir Bridge

The predominant habitats at Salmon Weir are artificial and include road and paved surfaces. However, the scheme crosses the main channel of the river which is designated as part of the Lough Corrib SAC. It is unlikely that surface water will enter river as there are no pathways. It is not predicted that significant levels of dust will be generated from the proposed works.

The possibility of elevated suspended solids from dust occurring is unlikely but cannot be ruled out and the contamination of surface water either from an event of sustained elevated suspended solids has the potential to have a negative moderate effect on the immediate receiving environment of the river. The effect will be temporary and not significant. However, construction management will be employed to avoid the possibility.

Habitats at Lough Atalia

At the College Road Service Station (CRSS), the works will include the removal of two underground tanks and the removal of two pumping stations also requiring the removal and relocation of a number of underground fuel pipes within the site along with excavation of up to approximately 200m^3 of contaminated soil and stone.

This aspect of the Proposed Scheme is considered in Chapter 14 (Land, Soils, Geology and Hydrogeology) of this EIAR which address the potential for contaminated land. The chapter includes a Land Contamination Remedial Strategy for the CRSS.

A new drainage pipe and non-return valve to be installed at discharge point into Lough Atalia. Additionally, a new attenuation tank and petrol interceptor will need to be installed, which will require excavation of approximately 3.5m -3.75m for installation.

The habitats present at Lough Atalia Playground are artificial and include adjacent Amenity grassland (GA2) through which the pipeline to the outfall would be placed. The discharge point is comprised of an artificial rock armour shoreline (CC1) and there are no Annexed habitats under the footprint of the works.

However, uncontrolled surface water could potentially enter the receiving environment of Lough Atalia. The possibility of this occurring is unlikely but cannot be ruled out and any discharge of contaminated surface water either from an event of sustained elevated suspended solids or a Hydrocarbon spill could have a Negative, Moderate effect on the immediate receiving environment of the Lough. The effect would be temporary and construction management will be required to avoid the possibility.

The proposed works at the Dublin Road proximal to Lough Atalia include upgrading of the footpath at the eastern extent of Lough Atalia opposite the G Hotel/Eye Cinema.

Uncontrolled surface water could potentially enter the receiving environment of Lough Atalia. The possibility of this occurring is unlikely but cannot be excluded and any discharge of contaminated surface water either from an event of sustained elevated suspended solids or a Hydrocarbon spill could have a negative moderate effect on the immediate receiving environment of the lough. The effect would be temporary and construction management will be employed to avoid the possibility.

Invasive Species

The record of Japanese Knotweed at Galway Harbour Enterprise Park is located over 32m from the compound boundary and may be noted for avoidance only. It does not require specific management for this Scheme.

The presence of two treated locations at Beggars Bridge and Lough Atalia Playground are also included for reference only and appear to have been successfully treated.

The presence of Winter heliotrope in the Amenity grassland along the Dublin Road from the Huntsman Inn to the corner of the Brothers of Charity Woodlands Campus is of moderate concern.

While not a Third Schedule species, it spreads, if uncontrolled, in contaminated soil. It could have an indeterminate negative effect on the receiving environment in terms of crowding out native species of flora.

12.5.2.2 Water Quality

The primary concern with regard to this project stem from the potential for negative effects from the uncontrolled discharge of contaminated surface water at three key locations:

- University Road at Ward's Shop;
- Lough Atalia Playground at the proposed site of a new outfall; and
- Lough Atalia adjacent to the Dublin Road opposite the Eye Cinema.

Considering that the Proposed Scheme will pass though the forecourt of the College Road Service Station and because it is located in the vicinity of Lough Atalia SAC a detailed assessment of the contamination in the soil has been carried out in that area. The assessment has followed the methodology presented in the Environmental Protection Agency's "Guidance on the management of Contaminated Land and Groundwater at EPA licensed sites". The assessment is presented in the Appendix 14.3 of Volume 4 of this EIAR.

The results of this assessment show:

- The site has been previously a print works and a filling station has been operated on the site since the 1960's. A detailed ground investigation was carried out which did not prove any significant soil or groundwater contamination from the storage of fuels on the site.
- Based on the results of the ground investigation cadmium and hydrocarbons are present in groundwater under the CRSS that is likely to originate from

made ground under the CRSS. It is possible that cadmium and hydrocarbons originating from the made ground under CRSS is the source of elevated cadmium and hydrocarbons in the seepages on the banks of Lough Atalia.

Any deterioration of water quality from the established Good quality status of the River Corrib and Unpolluted status of Lough Atalia could potentially have a negative indeterminable temporary effect on either the food sources in the aquatic habitats or on aquatic species outlined in the section on fauna below. It would also be contrary to the obligations of the Water Framework Directive 2000/60/EC[39].

12.5.2.3 Fauna

Otters

There were no signs of otters at Lough Atalia Playground along the shore from the vicinity of the Dublin Road to the site of the proposed outfall. The rock armour is embedded in concrete and does not present opportunities for holt construction.

Any previous signs, such as spraints would have been from occasional passing otters.

There will be no direct effects on otters. It is unlikely that the construction phase would generate significant disturbance to otters and there will be no permanent barriers to otter movement during the construction phase.

A worst-case scenario may be considered where a pollution event would indirectly affect food availability to otters. However, a Construction Environmental Management Plan (CEMP, refer to Appendix 5.1 of Volume 4 of this EIAR) which includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals will be implemented.

Bats

Both residences at St. Brendan's Avenue and Headford Road Junction were determined to have low potential for bat roosting given the status of their roofs and recent maintenance resulting in reduced potential.

No bats were recorded during a sample survey at the appropriate season time and good weather conditions.

All trees to be impacted are assigned a Category 4 (refer to Table 12.2) status according to Bat Conservation Guidance indicating no roost potential.

There will be no loss of potential bat roosts and there will be no significant adverse effect on bats.

Seals

There will be no direct effect on Common seals; potential impacts are indirectly related to water quality and food sources.

[39] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

In the absence of mitigation, potential indirect negative effects could be indeterminable but would be unlikely and temporary.

The CEMP (refer to Appendix 5.1 of Volume 4 of this EIAR) includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals.

Salmonids

There will be no direct impact on salmonids; potential impacts are indirectly related to water quality and food sources.

Elevated suspended solids may be harmful to salmonids resulting in reduced oxygenation of surface waters due to settlement and the formation of deposits on the riverbed which in turn can give rise to septic and offensive conditions. Elevated suspended solids can clog salmonid gills and potentially cause mortality.

Chemical spills can result in fish mortality and could affect feeding habitats for bird species that rely on the sand and mudflats downstream in Galway Bay for food sources.

Wet concrete and cement are very alkaline and corrosive and, in the absence of mitigation, can cause serious pollution to watercourses.

In the absence of mitigation, potential indirect negative effects are considered to be moderate but would be unlikely and temporary.

Lamprey

There will be no direct impact on Lamprey species; potential impacts are indirectly related to water quality and food sources.

In the absence of mitigation, potential indirect negative effects are considered to be indeterminable but would be unlikely and temporary.

Birds

Breeding Birds

All birds are protected under the Wildlife Acts. There will be no direct effects on birds and there will be no significant loss of bird habitats.

Nesting swans in the canal opposite the Cathedral are highly unlikely to be affected by the Proposed Scheme given the repeated use of the nesting site with existing levels of traffic and uncontrolled human activity.

Nesting terns in Galway Bay are highly unlikely to be affected by the Proposed Scheme given the distance of the proposed works from the nearest raft at Fairgreen Road circa 320m and over 500m to the proposed outfall works at Lough Atalia.

Chemical spills can result in fish mortality and could affect feeding habitats for bird species that rely on the sand and mudflats downstream in Galway Bay for food sources.

In the absence of mitigation potential indirect negative effects are considered to be indeterminable but would be unlikely and temporary.

Wintering Birds

The proposed works at the intertidal site of the proposed outfall at Lough Atalia Playground have the potential to disturb wintering birds in these areas. Given, the quieter more secluded location of the proposed outfall, Wintering birds are less likely to be acclimatised to disturbance. The potential impact in the absence of mitigation would be negative, moderate and temporary and can be avoided.

Given the proximity of the adjacent Dublin Road opposite the Eye Cinema and the existing level of urban disturbance on a busy national road and walkers on the Lough Atalia pathways, the potential effects from disturbance on birds in this section of the SPA are unlikely in an area up to 150m from the works area. In this area, birds are accustomed to the existing levels of disturbance and the effect will be imperceptible and short term and will not require timing restriction.

12.5.3 Operation Phase

12.5.3.1 Habitats & Flora

The Proposed Scheme will not have any operational effects on Habitats or Flora. Standard SuDS features such as gully traps and interception will control surface water runoff.

The Proposed Scheme includes measures particularly at Lough Atalia to redirect uncontrolled surface water runoff to the Lough and redirect it to settlement and interception to improve the water quality of surface water entering Lough Atalia. This is considered a Positive, Long-term effect.

12.5.3.2 Air Quality

An assessment of the impact of the Proposed Scheme has been undertaken using the approach outlined in the IAQM guidance document ‘A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1) (IAQM 2020)’. An assessment of the ecologically sensitive sites listed in Section 7.2.5.5 of Chapter 7 (Air Quality) of this EIAR has been carried out. The detailed results are not repeated in this chapter. However, the assessment of air quality during the operational phase are pertinent.

There are three ecologically designated sites which are within 2km of the boundary of the Proposed Scheme, namely Galway Bay Complex SAC and pNHA (Site Code 000268), Lough Corrib SAC (Site Code 000297) and Inner Galway Bay SPA (Site Code 004031).

Potential maximum deposition of nitrogen (including background) is in compliance with the worst-case critical load at the worst-case receptor. The IAQM guidance states that where the proposed contribution (PC) is less than 70% of the long-term critical level / load, the PC is likely to be insignificant. There will therefore be no impact on ecologically sensitive sites. In accordance with the EPA

Guidelines (EPA 2022) the ecological effects associated with the operational phase traffic emissions are overall Neutral and Long-term.

12.5.3.3 Fauna

Otters

The Proposed Scheme will not result in any barriers to movement to otters once the project becomes operational.

Bats

Having regard to the Urban Development and Building Heights: Guidelines for Planning Authorities (DoHLG, 2018)[40], in development locations in proximity to sensitive bird and/or bat areas, proposed schemes need to consider the potential interaction of the building location, building materials and artificial lighting to impact flight lines and/or collision.

Any new lighting will be LED type which is directional and reduces light spill to the surrounding environment. The replacement of older sodium lamps with new LED directional lights such as those erected in the vicinity of the Millennium Children's Park at University Road has not affected bat commuting activity recorded regularly during repeated Galway Bat Group walks in this area by the author.

To this end, the Proposed Scheme does not include any significant changes in lighting or streetscape that would have a significant effect on bat commuting in Galway City.

Seals

The Proposed Scheme will not result in any barriers to movement to seals once the project becomes operational and Common seals will not be affected during the operational phase.

Salmonids

The Proposed Scheme will not result in any barriers to movement to Salmon or fish once the project becomes operational and Salmonids will not be affected during the operational phase.

Lamprey

The Proposed Scheme will not result in any barriers to movement to Lamprey once the project becomes operational and Lamprey will not be affected during the operational phase.

Birds

There will be no direct effects on birds and there will be no significant loss of bird habitats.

[40] Department of Housing, Planning and Local Government (2018) Urban Development and Building Heights: Guidelines for Planning Authorities

12.6 Mitigation Measures & Monitoring

12.6.1 Construction Phase

A Construction Environmental Management Plan 'CEMP' (refer to Appendix 5.1 of Volume 4 of this EIAR) establishes the potential connectivity of the proposed project to the Galway Bay Complex SAC, the Lough Corrib SAC and the Inner Galway Bay SPA, and the requirement for avoidance of adverse effects from construction activity as well as specific mitigation for local biodiversity, e.g. tree removal.

The Contractor will be required to enforce the CEMP which will include the following construction management measures. An Ecological Clerk of Works (EcOW) will be employed to maintain a watching brief on the proposed mitigation measures included for the protection of European sites.

12.6.1.1 Environmental Incident Response Plan

In the event of an environmental emergency, all personnel will react quickly and adhere to the Environmental Incident Response Plan procedure, refer to Section 5.6 of the CEMP included in Appendix 5.1 of Volume 4 of this EIAR (to be updated by the Contractor). The following outlines the information on the types of emergency which must be communicated to site staff:

- Release of hazardous substance – fuel or oil spill.
- Concrete spill or release of concrete.
- Flood event – extreme rainfall or rising river level event.
- Environmental buffers and exclusion zones breach.
- Housekeeping of materials and waste storage areas breach.
- Stop work orders due to environmental issue or concern (e.g. threat to ecological feature).

12.6.1.2 Invasive Species Management Plan

Refer to the CEMP (Appendix 5.1 of Volume 4 this EIAR) for full details on the management of the potential for invasive species.

12.6.1.3 Habitats & Flora

With regard to biodiversity any felling of trees will take place outside the Bird nesting season March 1st to August 31st.

12.6.1.4 Water Quality

The primary concern with regard to this project stem from the potential for negative effects from the uncontrolled discharge of contaminated surface water at four key locations:

- University Road at Ward's Shop;

- River Corrib at the Salmon Weir Bridge;
- Lough Atalia Playground at the proposed site of a new outfall; and
- Lough Atalia adjacent to the Dublin Road opposite the Eye Cinema.

The CEMP includes specific management measures for the prevention of the pollution of water courses from dust, suspended solids or chemicals.

These measures accord with the principles set out in industry guidelines including CIRIA's report 'C532: Control of water pollution from construction sites'.

The following site specific mitigation measures will be employed:

River Corrib at Salmon Weir Bridge

- As a precaution, the control of dust emissions will be enforced by providing a suitable barrier to prevent dust entering the River Corrib at the Salmon Weir Bridge for the length of the Scheme required to prevent emissions to Persse's Distillery river, the main channel of the river and Friar's River at Newtownsmith from the proposed disturbance area. The barrier will be inspected on a weekly basis for gaps or displacement and reinstated when required.
- A record of inspection and efficacy of the barrier will be noted in the printed version of the CEMP as an inspection sheet. The record of inspections will be maintained on site and will be available upon request by relevant authorities.
- Details of the dust minimisation measures are included in a Construction and Demolition Resource and Waste Management Plan, as described in the CEMP.

Eglinton Canal at University Road/Ward's Shop

- The control of surface water discharge will be enforced by providing a suitable barrier to prevent surface water entering the Eglinton Canal at gaps in the boundary wall leading to the canal and for the length of canal required to prevent drainage to the canal from the proposed disturbance area. The barrier will comprise a silt curtain placed with sand bags or a suitable supporting frame. The silt curtain will be inspected on a weekly basis for gaps or displacement and reinstated when required.
- A record of inspection and efficacy of the barrier will be noted in the printed version of the CEMP as an inspection sheet. The record of inspections will be maintained on site and will be available upon request by relevant authorities.

Lough Atalia Playground Outfall

- The works at Lough Atalia Playground will avoid potential disturbance to wintering birds by undertaking the works outside the Winter bird period October to March.
- The works at Lough Atalia Playground will be timed to avoid 'spring' high water times and inclement weather (southerly/south-westerly winds) in order to avoid washing of surface water to the sea. Tide times are available from several websites. The delay time for the ebb and flow time to Lough Atalia will be determined by the Contractor or representative Resident Engineer.

- The control of surface water discharge will be enforced by firstly providing a temporary sandbag dam at the headwall of the proposed outfall prior to work commencing in this area at low tide. The temporary dam will comprise 1 tonne bags (or similar suitable size) placed at low tide at the foot of the rock armour berm in this area. A silt curtain or suitable geotextile barrier will be placed inside the dam and secured using smaller sandbags as required to form an impermeable barrier to prevent hydrocarbon and contaminated surface water runoff to Lough Atalia.
- The control of surface water discharge will be enforced by providing a suitable barrier to prevent surface water entering Lough Atalia in the proposed trench leading to the outfall. The barrier will comprise a silt fence placed with sand bags or a suitable supporting frame. A typical silt fence consists of a piece of synthetic filter fabric (also called a geotextile) stretched between a series of wooden or metal fence stakes along a horizontal contour level, see Diagram 12.12 below for sample details. The stakes will be installed on the downhill side of the fence, and the bottom edge of the fabric will be trenched into the soil and backfilled on the uphill side. The fence will be installed on a site before soil disturbance begins and is placed down-slope from the disturbance area. The design/placement of the silt fence will create a pooling of runoff, which then allows sedimentation to occur. The silt fence fabric becomes "blocked off" with fine soil particles and clean water can seep through the fabric. The silt fence will be inspected on a weekly basis for gaps or displacement and reinstated when required.
- A record of inspection and efficacy will be noted in the printed version of the CEMP as an inspection sheet. The record of inspections will be maintained on site and will be available upon request by relevant authorities.

Lough Atalia Adjacent to the Dublin Road

- The works at the Lough Atalia Dublin Road area will be timed to avoid ‘spring’ high water times and inclement weather (southerly/south-westerly winds) in order to avoid washing of surface water to the sea. Tide times are available from several websites. The delay time for the ebb and flow time to Lough Atalia will be determined by the Contractor or representative Resident Engineer.
- The control of surface water discharge will be enforced by providing a suitable barrier to prevent surface water entering Lough Atalia. The barrier will comprise a silt fence placed with sand bags or a suitable supporting frame such as a staked fence. A typical silt fence consists of a piece of synthetic filter fabric (also called a geotextile) stretched between a series of wooden or metal fence stakes along a horizontal contour level, see Diagram 12.12 below for sample details. The stakes will be installed on the downhill side of the fence, and the bottom edge of the fabric can be trenched into the soil and backfilled on the uphill side. The fence will be installed on a site before soil disturbance begins and is placed down-slope from the disturbance area. The design/placement of the silt fence should create a pooling of runoff, which then allows sedimentation to occur. The silt fence fabric becomes "blocked off" with fine soil particles and clean water can seep through the fabric.
- The silt fence will be inspected on a weekly basis for gaps or displacement and reinstated when required.

- A record of inspection and efficacy will be noted in the printed version of the CEMP as an inspection sheet. The record of inspections will be maintained on site and will be available upon request by relevant authorities.

All Working Areas Adjacent to Water Courses/Water Bodies

- Tools and equipment will not be cleaned in grassland or aquatic areas.
- Chemicals used will be stored in sealed containers.
- Chemicals shall be applied in such a way as to avoid any spillage or leakage.
- All refuelling, oiling and greasing will take place above drip trays or on an impermeable surface which provides protection to underground strata and away from grassland as far as reasonably practicable. Vehicles will not be left unattended during refuelling.
- All plant will be well maintained with any fuel or oil drips attended to on an ongoing basis.
- Any minor spillage during this process will be cleaned up immediately.
- Best practice in bulk-liquid concrete management addressing pouring and handling, secure shuttering / form-work, adequate curing times will be implemented.
- Wash water from cleaning ready mix concrete lorries and mixers may be contaminated with cement and is therefore highly alkaline, therefore, washing will not be permitted on site.
- Disposal of raw or uncured waste concrete will be controlled to ensure that the aquatic environment will not be impacted.

For the management of excavation and spoil, the Contractor will:

- Ensure all spoil and excavated materials will be stored in the construction compound or removed to an appropriate waste facility;
- Ensure stockpiles and adjacent features of drainage infrastructure will be monitored and maintained appropriately;
- The Construction and Demolition Resource and Waste Management Plan as described in the CEMP identifies any material such as dust, sand, rubble, concrete that may be generated during demolition works and address its storage and appropriate removal from the site to avoid pathways identified as having connectivity with the River Corrib or Lough Atalia;
- Erect all protective fencing; and
- Implement the Surface Water Management Plan (including the installation of drainage infrastructure) as detailed in the CEMP (Appendix 5.1 in Volume 4 of this EIAR) prior to excavation and include areas dedicated to spoil storage with the drainage infrastructure.

Site personnel will be trained in the importance of preventing pollution and the mitigation measures described here to ensure same. A record of this training will be maintained.

The Construction Environmental Management Plan will be read and signed by the Contractor/Site Foreman and made available to the EcOW.

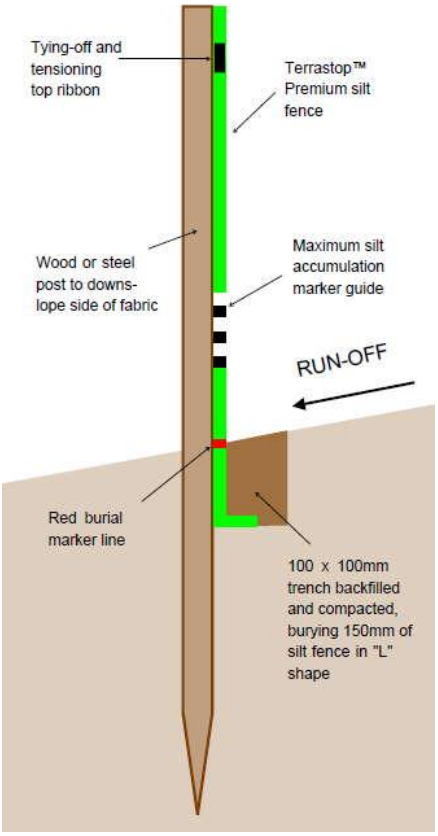

Diagram 12.12: Silt fence

12.6.1.5 Fauna

Otters

There will be no direct impact on Otters and potential impacts are indirectly related to water quality and food sources.

A worst-case scenario may be considered where a pollution event would indirectly affect otters or food availability to otters. The Construction Environmental Management Plan (refer to Appendix 5.1 of Volume 4 of this EIAR) which includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals.

Bats

No records of Lesser horseshoe bat were detected during the survey and no cavity found within any tree was suitable for this species.

Ground level potential roost feature surveys conducted on trees within the study did not reveal any roosting bats. There are no further requirements for mitigation for bats.

The roofs of buildings at the Headford Road and St. Brendan's Avenue are relatively recently upgraded and well-sealed with limited access for bats. However, as a precaution, an internal inspection of the attic spaces will be undertaken at an appropriate time prior to demolition in order to rule out the

presence of bats. If any are recorded, specific mitigation measures which may require a derogation licence from the NPWS will be implemented.

Seals

There will be no direct impact on Seals and potential impacts are indirectly related to water quality and food sources.

A worst-case scenario may be considered where a pollution event would indirectly affect otters of food availability to seals. The Construction Environmental Management Plan (refer to Appendix 5.1 of Volume 4 of this EIAR) includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals.

Salmonids

There will be no direct impact on these Salmonids and potential impacts are indirectly related to water quality and food sources.

A worst-case scenario may be considered where a pollution event would affect water quality and threaten salmonids. The Construction Environmental Management Plan (refer to Appendix 5.1 of Volume 4 of this EIAR) includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals.

Lamprey

There will be no direct impact on Lamprey species and potential impacts are indirectly related to water quality and food sources.

A worst-case scenario may be considered where a pollution event would indirectly affect lampreys. The Construction Environmental Management Plan (refer to Appendix 5.1 of Volume 4 of this EIAR) includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals.

Birds

Any felling, clearing or pruning of vegetation will take place outside the Bird nesting season March 1st to August 31st.

The proposed works at the outfall at Lough Atalia Playground have the potential to disturb wintering birds in these areas. Potential impacts be avoided by undertaking the works at Lough Atalia Playground outside the Winter bird period October to March.

Given the proximity of the adjacent Dublin Road opposite the Eye Cinema and the existing level of urban disturbance on a busy national road and walkers on the Lough Atalia pathways, the potential effects from disturbance on birds in this section of the Proposed Scheme will not generate a disturbance level over or above the existing background levels of disturbance and will not require timing restriction.

12.6.2 Operation Phase

Bats

The Proposed Scheme does not include any significant changes in lighting or streetscape that would have a significant effect on bat commuting in Galway City.

Aquatic Environment

The Proposed Scheme will incorporate SuDS features in order to improve water quality and reduce the quantity of surface water discharging into the receiving system.

12.6.3 Monitoring

12.6.3.1 Monitoring During Construction

An Ecological Clerk of Works (EcOW) will be employed to maintain a watching brief on the proposed mitigation measures included for the protection of European sites.

An initial site environmental induction and ongoing training will be provided to communicate the main provisions of this environmental plan to all site personnel.

Two-way communication will be encouraged to promote a culture of environmental protection.

The following outlines the information which must be communicated to site staff:

- Environmental procedures of the CEMP.
- Environmental buffers and exclusion zones.
- Housekeeping of materials and waste storage areas.
- Environmental emergency response plan.

Prior to any works, all personnel will receive an on-site induction relating to operations adjacent to watercourses and the environmentally sensitive nature of the River Corrib and to re-emphasise the precautions that are required as well as the construction management measures to be implemented.

Galway City Council will also ensure that the engineer setting out the works is fully aware of the ecological constraints and construction management requirements.

12.6.3.2 Monitoring During Operation

In the Operational Phase the maintenance regime for these SuDS will be carried out by local authorities and will be subject to their management procedure. No monitoring has been proposed with respect to effects from operation of the Proposed Scheme.

12.7 Residual Effects

12.7.1 Residual Effects during Construction

Given, the inclusion of avoidance measures for bats and birds and given the inclusion of best practice construction management measures to be employed as per a site specific CEMP with regard to the protection of water courses and maintenance of good water quality for Salmonids, Lamprey, Otters and Seals, there will be no predicted residual effects after the construction phase is completed, whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

12.7.2 Residual Effects during Operation

Given, the inclusion of appropriate design of lighting for the avoidance of potential impacts on feeding and commuting bats, there will be no predicted residual effects once the project becomes operational, whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

The Proposed Scheme will incorporate SuDS features in accordance with the Development Plan requirements to reduce the quantity of surface water discharging into the receiving system particularly at Lough Atalia. This is predicted to be a positive long term residual effect.

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Chapter 13
Water

Contents

13 Water

13.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) assesses the impact of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) (hereafter 'the Proposed Scheme'), on the surface water environment during the Construction and Operational Phases. The following attributes of each surface waterbody (receptor) will be considered: hydrology, hydromorphology and water quality.

During the Construction Phase, the potential surface water impacts associated with the development of the Proposed Scheme have been assessed (see Section 13.4.3). This includes impacts from construction runoff and watercourse disturbance due to utility diversions, road resurfacing and road realignments.

During the Operational Phase, the potential surface water impacts associated with changes in surface water runoff, increased impermeable surfaces and watercourse disturbance have been assessed (see Section 13.4.4).

The assessment has been carried out according to best practice and guidelines (see Section 13.2.2) relating to surface water assessment and has taken account of experience in assessment of similar large-scale infrastructural projects.

An assessment of the compliance of the Proposed Scheme with Water Framework Directive (WFD) requirements for the water bodies within the Study Area is provided in Section 13.3.6.

Flooding has been assessed within a dedicated Flood Risk Assessment (FRA) in Appendix 13.1 in Volume 4 of this EIAR. The results of the FRA have been summarised in Sections 13.3.9 of this chapter.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure in Galway City, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction) of this EIAR. The Proposed Scheme which is described in Chapter 4 (Proposed Project Description) of this EIAR has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through the application of a comprehensive design iteration process with particular emphasis on minimising the potential for environmental impacts where practicable whilst ensuring the objectives of the Proposed Scheme are maintained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development programme was taken into account where appropriate.

13.2 Methodology

This section presents the study area and appraisal method for the assessment of impacts on Water.

13.2.1 Study Area

The study area for this assessment has been set to extend to approximately 250m* beyond the footprint of the Proposed Scheme as any significant impacts are considered to occur at local waterbodies at the stated offset. It is deemed that the 250m distance from the study area will capture all those waterbodies that will have connection to the works. Therefore, any identified surface waterbodies within that area have been considered as receptors including those classified under Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (hereafter referred to as the WFD), including riverine, transitional waterbodies, lake (water) bodies and coastal waterbodies, and non-WFD classified waterbodies. Existing and proposed artificial drainage features such as existing Sustainable Drainage Systems (SUDS) have not been considered as receptors within the assessment.

13.2.2 Relevant Guidelines, Policy, and Legislation

13.2.2.1 Water Framework Directive (WFD)

The WFD established a framework for the protection of both surface and groundwater bodies. The WFD provides a vehicle for establishing a system to improve and / or maintain the quality of waterbodies across the European Communities (EC). It requires all waterbodies (river, lakes, groundwater, transitional, coastal) to attain 'Good Status' (qualitative and quantitative) by 2027.

There are several WFD objectives in respect of which the quality of water is protected. The key objectives at European level are the general protection of aquatic ecology, specific protection of unique and valuable habitats, the protection of drinking water resources, and the protection of bathing water. The objective is to achieve this through a system of river basin management planning and extensive monitoring. 'Good Status' means both 'Good Ecological Status' and 'Good Chemical Status'.

The WFD was transposed into Irish law in December 2003 by S.I. No. 722/2003 – European Communities (Water Policy) Regulations 2003 (hereafter referred to as the WFD Regulations). The WFD Regulations outline the water protection and water management measures required to maintain high status of waters where it exists, prevent any deterioration in existing water status and achieve at least "Good" status for all waters.

* Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, National Roads Authority (now known as TII), 2009.

The WFD Regulations, S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 (hereafter referred to as the Surface Waters Regulations) and S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010 (hereafter referred to as the Groundwater Regulations) govern the shape of the WFD characterisation, monitoring and status assessment programmes in terms of assigning responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments.

The WFD Regulations (2003) require the assessment of permanent impacts of a scheme / project on WFD waterbodies, (rivers, lakes, estuaries, coastal waters, and groundwater). Typically, the permanent impacts include all operational impacts, but can also include impacts from construction depending on the programme (i.e., length and / or nature of the works, etc.) of the Proposed Scheme as some could be considered permanent if they cannot be mitigated. An assessment of the compliance of the Proposed Scheme with WFD requirements is provided in Section 13.3.6 and a summary of the conclusions of the WFD assessment is provided in Section 13.3.10. In the absence of WFD assessment guidance in Ireland, the assessment has been carried out using the UK Environment Agency's "Water Framework Directive assessment: Estuarine and Coastal waters" 2016 (updated 2017) (Environment Agency 2016). No specific guidance exists for freshwater bodies; however, this guidance was used as the basis of the UK's Planning Inspectorate (PINS) Advisory Note 18 "Water Framework Directive" June 2017 (PINS 2017) in which it sets out the stages of an assessment. On this basis it was considered appropriate to use for the assessment of the Proposed Scheme.

13.2.2.2 River Basin Management Plans

River Basin Management Plans (RBMP) provide the mechanism for ensuring an integrated approach to the protection, improvement and sustainable management of the water environment and are published every six years.

The second cycle RBMP 2018 - 2021 was published by the Department of Housing, Planning and Local Government (DHPLG) in April 2018 and covers the entire country (DHPLG 2018). For the second cycle, the original (2009) Eastern, South-Eastern, South-Western, Western and Shannon River Basin Districts were merged to form one national River Basin District (RBD) which covers the whole of Ireland. For those waterbodies 'At Risk' of failing to meet the objectives of WFD, the RBMP 2018 - 2021 identified the most significant pressures impacting them as follows: agriculture (53%), hydromorphology (24%), urban wastewater (20%), forestry (16%), domestic wastewater (11%), urban runoff (9%), peat (8%), extractive industry (7%) and mines and quarries (6%).

The draft third cycle RMBP (2022-2027) was launched for public consultation in September 2021, with a closing date of 31 March 2022. The final plan of the third cycle RBMP is due for publication 2022. It has set out clear strategies to protect all water bodies that are at "good or better" status and to improve on those classified as "below good" status by 2027 (DHPLG, 2022).

13.2.2.3 Other Relevant Legislation

Table 13.1 details of other legislation and policy relevant to this assessment and which informed the preparation of this Chapter where required.

Table 13.1: Other Relevant Legislation

Legislation Level	Title
European Legislation	Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment; Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption; Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks; and Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU of the European Parliament and the Council of 13 December 2011 on the assessment of the impacts of certain public and private projects on the environment (hereafter referred to as the Environmental Impact Assessment (EIA) Directive).
Primary Legislation	Number 1 of 1977 - The Local Government (Water Pollution) Act; Number 21 of 1990 - Local Government (Water Pollution) (Amendment) Act, 1990; and S.I. No. 92/2020 - Planning and Development Act 2000 (Exempted Development) (No. 2) Regulations 2020.
Secondary Legislation	S.I. No. 108/1978 - Local Government (Water Pollution) Regulations, 1978; S.I. No. 81/1988 - European Communities (Quality of Water Intended for Human Consumption) Regulations 1988; S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations, 1988; S.I. No. 722/2003 - European Communities (Water Policy) Regulations 2003, as amended; S.I. No. 268/2006 - European Communities (Quality of Shellfish Waters) Regulations, 2006; S.I. No. 278/2007 - European Communities (Drinking Water) (No. 2) Regulations 2007; S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations, 2009;

Legislation Level	Title
	S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations, 2010; S.I. No. 122/2010 - European Communities (Assessment and Management of Flood Risks) Regulations, 2010; S.I. No. 351/2011 - Bathing Water Quality (Amendment) Regulations, 2011; S.I. No. 122/2014 - European Union (Drinking Water) Regulations 2014; S.I. No. 350/2014 - European Union (Water Policy) Regulations 2014; S.I. No. 495/2015 - European Communities (Assessment and Management of Flood Risks) (Amendment) Regulations 2015; and S.I. No. 296/2018 - European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

13.2.2.4 Guidelines

The assessment has been undertaken in accordance with the Guidelines on the information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022). The following additional guidance detailed in Table 13.2 has also been consulted during the preparation of this Chapter, where relevant. These additional guidance documents are derived from the WFD and aim at satisfying the requirements relevant to the development proposal.

Table 13.2: Relevant Guidelines

EIA Topic	Guidance
General	Transport Infrastructure Ireland (TII) Road Drainage and the Water Environment Guidance Document (TII 2015)
Water	National Road Authority (NRA) Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA 2005) *; NRA Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (hereafter referred to as the TII Assessment Guidelines) (NRA 2009) *; and The Department of the Environment, Heritage, and Local Government (DEHLG) and the Office of Public Works (OPW) Planning System and Flood Risk Management Guidelines for Planning Authorities (hereafter referred to as the FRM Guidelines) (DEHLG and OPW 2009).

EIA Topic	Guidance
*The NRA merged with the Railway Procurement Agency and was effectively dissolved on 1 August 2015. The merger of the two agencies is called Transport Infrastructure Ireland (TII). As a result, all previous NRA documents are now referred to as TII documents.	

13.2.3 Data Collection and Collation

Information presented in this section on the baseline environment including hydrology, hydromorphology and water quality of the receptors within the study area has been collected and collated by undertaking both a desk study and field surveys. Table 13.3 presents information on data sources used to undertake the desk study.

13.2.3.1 Data Sources used to Undertake Desk Study

Table 13.3: Source of Information

Guidance	Description
General	Ordnance Survey of Ireland (OSI) - current and historic mapping; and Aerial photography (i.e., Google Earth).
Surface Water Quality and Hydromorphology	WFD Ireland Database, EPA - water quality monitoring database and reports. EPA Water Environment Maps (EPA 2020a), EPA Environmental Data Maps, National Parks and Wildlife Service (NPWS) - designated sites, and Inland Fisheries Ireland (IFI) - fishery resources.
Hydrology	Catchment Summaries, RBMP 2018-2021, and EPA - flow and water level measurements.
Water / Flood Risk	OPW National Flood Information Portal (OPW 2020).

13.2.3.2 Field Surveys

Field walkover assessments were carried out on November 18th, 2021. All watercourse crossings within the study area were visited to inform the assessment of baseline conditions and pathways to impacts of the Proposed Scheme.

Water quality sampling data was obtained from the EPA's water quality monitoring programme. Specifically, all culvert and bridge crossing locations and fluvial flood inundation extents were visited. Observations were made from bridges and from the top of riverbanks. The following observations were recorded at each survey location:

- Flow conditions (recording observations such as homogenous flow, low flow, or high flow);
- Riverbed (recording observations such as the sediment type and whether there was any deposition);
- Water quality (recording any potential sources of pollution as well as visual indicators of poor quality (e.g., presence of sewage fungus, litter, or foam lines);
- Bank stability (recording any instances of erosion and aggradation);
- Natural and manmade features of the river (including modifications, examples of structures could include culverts, weirs, or bridges);
- Runoff pathway and runoff risk (recording the pathway for any surface runoff to the watercourse and the likelihood of surface runoff to the river;
- Riparian vegetation (recording the surrounding vegetation); and
- Outfalls and discharges (recording any outfalls and discharges and whether these were active at the time of the survey).

Information gathered during the field surveys is summarised in Section 13.3.1.

13.2.4 Appraisal Method for the Assessment of Impacts

13.2.4.1 General Approach

The following method for the assessment of impacts has been adapted from the TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (TII 2015), specifically Section 5.6. The assessment also took account of the guidance set out in the EPA Guidelines.

The surface water environment is intrinsically linked to flood risk, ecological receptors, and groundwater, considered in the FRA Report (Appendix 13.1 in Volume 4 of this EIAR), Chapter 12 (Biodiversity) and Chapter 14 (Land, Soils, Geology & Hydrogeology) of this EIAR respectively.

Commercial and recreational use of the water environment is not included in the scope of this Chapter, as commercial and recreational interests are considered and assessed in Chapter 18 (Material Assets) and Chapter 10 (Population) of this EIAR.

The TII Guidelines (NRA 2009) outline how impact type, magnitude, and duration should be considered relative to the importance of the hydrological receptor and its sensitivity to change to determine significance of the impacts.

The overall impact on surface water receptors (i.e., rivers, canals, transitional waterbodies, coastal waterbodies, and lakes) because of the Proposed Scheme will be determined based on two parameters:

- The sensitivity of the waterbody attributes (hydrology, water quality and geomorphology) to change; and
- The magnitude of the impacts on waterbody attributes.

13.2.4.2 Sensitivity of Receptors

The sensitivity of surface water attributes to changes because of the Proposed Scheme are determined by a set of criteria including their relative importance or 'value' (e.g., whether features are of national, regional, or local value). Table 13.4 outlines the criteria for estimating the sensitivity of receptors and their attributes.

Table 13.4: Sensitivity of Receptor

Sensitivity	Criteria	Typical Example
Extremely High	Receptor (or receptor attribute) has a very high quality or value on an international scale	Any WFD waterbody which is protected by European Union (EU) legislation (e.g., Designated European Sites (Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) or 'Salmonid Waters', and A waterbody that appears to be in natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, free from any modification or anthropogenic influence.
Very High	Receptor (or receptor attribute) has a high quality or value on an international scale or very high quality or value at a national scale	Any WFD waterbody (specific EPA segment) which has a direct hydrological connection of <2km to European Sites or protected ecosystems of international status (SAC / SPA or Salmonid Waters), WFD waterbody ecosystem protected by national legislation (Natural Heritage Area (NHA) status), A waterbody that appears to be largely in natural equilibrium and exhibits a diverse range of morphological features (such as pools and riffles), There is a diverse range of fluvial processes present, with very limited modifications; and Nutrient Sensitive Areas.
High	Receptor (or receptor attribute) has a moderate value at an international scale	A WFD waterbody with High or Good WFD Status, A Moderate WFD Status (2013 - 2018) waterbody with some hydrological connection (<2km) to European Sites

Sensitivity	Criteria	Typical Example
	or high quality or value on a national scale	or protected ecosystems of international status (SAC / SPA or Salmonid Waters) further downstream, WFD waterbody which has a direct hydrological connection to sites/ecosystems protected by national legislation (NHA status), A waterbody that appears to be in some natural equilibrium and exhibits some morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, with very limited signs of modification or other anthropogenic influences, and Direct hydrological connectivity to Nutrient Sensitive Areas.
Medium	Receptor (or receptor attribute) has some limited value at a national scale	WFD waterbody with Moderate WFD Status (2013 - 2018), WFD waterbody with limited (>2km <5km) hydrological importance for sensitive or protected ecosystems (much further downstream), A waterbody showing signs of modification or culverting, recovering to a natural equilibrium, and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences, Evidence of historical channel change through artificial channel straightening and re-profiling; and Some hydrological connection downstream Nutrient Sensitive Areas.
Low	Receptor (or receptor attribute) has a low quality or value on a local scale	Waterbody with Bad to Poor WFD Status (2013 - 2018), A WFD waterbody with >5km (or no) hydrological connection to European Sites or national designated sites, Or A non-WFD water feature with minimal hydrological importance to sensitive or protected ecosystems; and / or economic and social uses, A highly modified watercourse that has been changed by channel modification, culverting, or other anthropogenic pressures. The watercourse exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes and not likely to be

Sensitivity	Criteria	Typical Example
		affected by modification. Highly likely to be affected by anthropogenic factors. Heavily engineered or artificially modified and could dry up during summer months; and Many existing pressures which are adversely affecting biodiversity.

13.2.4.3 Magnitude of Impact

The scale or magnitude of potential impacts (both beneficial and adverse) depends on both the degree and extent to which the Proposed Scheme may impact the surface water receptors during the Construction and Operational Phases.

Factors that have been considered to determine the magnitude of potential impacts include the following (EPA 2022):

- Nature of the impacts;
- Intensity and complexity of the impacts;
- Expected onset, duration, frequency, and reversibility of the impacts;
- Cumulation of the impacts with other existing and / or approved projects impacts; and
- Possibility of effectively reducing the impacts.

The criteria for assessing the magnitude of impact are presented in Table 13.5.

Table 13.5: Criteria for Assessing Magnitude of Impact[†]

Magnitude of Impact	Criteria
Large Adverse	Results in loss of receptor and / or quality and integrity of receptor.
Moderate Adverse	Results in impact on integrity of receptor or loss of part of receptor.
Small Adverse	Results in minor impact on integrity of receptor or loss of small part of receptor.
Negligible	Results in an impact on receptor but of insufficient magnitude to affect either use or integrity.

[†] Box 5.2 - Guidelines and Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2009).

Magnitude of Impact	Criteria
Small Beneficial	Results in minor improvement of receptor quality.
Moderate Beneficial	Results in moderate improvement of receptor quality.
Large Beneficial	Results in major improvement of receptor quality.

13.2.4.4 Significance of Impact

The significance of an impact is determined by combining the sensitivity of the receptor with the potential magnitude of impact, as listed in Table 13.6.

Table 13.6: Categories of Environmental Impacts (EPA 2022)

Sensitivity	Magnitude of Impact			
	Negligible	Small	Moderate	Large
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Profound / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

Description of the categories are explained in the EPA (2022) guidance and are given in Table 13.7.

Table 13.7: Description of Impacts (EPA 2022)

Impact Categories	Description
Profound adverse	Where the Proposed Scheme will potentially result in degradation of the water environment because of profoundly adverse impacts on at least one water attribute. For example:

Impact Categories	Description
	• Deterioration of overall status in a High or Good WFD status Class waterbody; • Long-term deterioration of an EU Designated Salmonid fishery; • Loss or extensive change to a site / habitat protected under EU or Irish legislation: SAC, SPA, Ramsar site, Water Protection Zone, Salmonid Water; and • High risk of pollution from spillages when discharging into a Good or High-status Class under the WFD. Where the Proposed Scheme will potentially result in an increased flood risk. For example: • Significant increase in impermeable areas; • Development within Flood Zones and / or increased runoff without Sustainable Drainage Systems (SUDS), and • Where the Proposed Scheme will potentially result in adverse impacts on receptor Hydromorphology including changes in drainage regime.
Significant adverse	Where the Proposed Scheme will potentially result in the degradation of the water environment because of significant adverse impacts on at least one attribute. For example: • Potential contribution towards the deterioration of a WFD quality element; • Potential failure of any Environmental Quality Standard (EQS) in a Moderate or Poor WFD status waterbody; • Loss or damage to channel morphology that may contribute to a reduction in waterbody WFD hydromorphology classification; • Potential short-term failure of any EQS in a High or Good WFD status waterbody; • Moderate / Low risk of pollution from spillages in a Good WFD status waterbody; • Moderate / High risk in a Moderate or Poor WFD status waterbody; • Partial loss or change to a fishery; and • Impact on the integrity of the existing flora and fauna.
Moderate adverse	Where the Proposed Scheme will potentially result in a degradation of the water environment because of moderate adverse impacts on one or more attributes. For example:

Impact Categories	Description
	• Potential short-term failure of any EQS in a Moderate or Poor WFD status waterbody; • Loss or damage to channel morphology but insufficient to have any impact on waterbody WFD hydromorphology classification; • Moderate / Low risk of pollution from spillages in a Moderate or Poor WFD status waterbody; and • Temporary loss to, or loss in productivity of, a fishery.
Slight adverse	Where the impact of the Proposed Scheme is slight because it will result in no appreciable negative impact on the identified attribute. For example: • No risk identified of failing any EQS; • Minimal or no measurable change from baseline conditions in terms of sediment transport, channel morphology and natural fluvial processes; and • Risk of pollution from spillages is Low.
Imperceptible	Where the impact of the Proposed Scheme has no noticeable change to baseline conditions.
No Impact	Where there is no impact of the Proposed Scheme
Slight beneficial	Where the impact of the Proposed Scheme is slight because it will result in no appreciable positive impact on the identified attribute.
Moderate beneficial	All other situations where the Proposed Scheme provides an opportunity to enhance the water environment or provide an improved level of protection to an attribute. For example: Assessment show that EQS will Pass from previous Fail condition for existing discharges; and Reduction by 50% or more in existing pollution risk from spillages into High to Poor status waterbodies (when previous spillage risk was Moderate).
Significant beneficial	Where the Proposed Scheme provides an opportunity to enhance the water environment because it will result in a significant improvement for an attribute. For example: • Contribution toward the improvement of a WFD quality element status; • Assessment shows that EQS will Pass from previous Refer or Fail condition for existing discharges;

Impact Categories	Description
	• Reduction by 50% or more in likelihood of pollution to waterbodies from spillages from existing discharges through retrofitting of pollution control to outfalls into a High to Poor waterbody (existing risk is Moderate); and • Recharge of aquifer through provision of treated discharges to ground resulting in measurable improvements to a connected site/habitat of local nature conservation value i.e., Local Nature Reserve.
Profound beneficial	It is extremely unlikely that any new or improved development will fit into this category. However, proposals could have a large positive impact from a 'very' or 'highly' significant improvement to a water attribute(s), with insignificant adverse impacts on other water attributes. For example: • Improvement of one or more WFD quality elements contributing to or resulting in the improvement of the overall status of a WFD waterbodies overall status; • Removal of an existing polluting discharge through provision of pollution prevention measures, or any other measure, affecting a site / habitat protected under EU or Irish legislation (SAC, SPA, Ramsar site, NHA and Salmonid Water); and • Reduction by 50% or more in the existing likelihood of pollution arising from a spillage affecting a site / habitat protected under EU or Irish legislation (SAC, SPA, Ramsar site, NHA and Salmonid Water) where existing risk is Moderate.

13.2.4.5 Methodology for the Operational Phase of the Traffic Impact Assessment

To determine the potential impacts, because of increases or decreases in traffic, data from the Traffic Impact Assessment (Chapter 6 - Traffic & Transport) of this EIAR in relation to modal shifts as well as absolute numbers (Average Annual Daily Traffic (AADT)) have been reviewed and compared to existing drainage patterns .

To determine the potential for impacts because of displaced traffic onto the local road network, a 'decision tree' approach was adopted (see Diagram 13.1). The first question in the decision tree was whether the resultant AADT of displaced traffic is greater or less than 10,000.

In line with the TII Road Drainage and the Environment (TII 2015), it is considered that roads carrying less than 10,000 vehicles AADT are lightly trafficked and therefore pollutants occur in lower concentrations.

Most of the increase in AADT because of the Proposed Scheme is <1,000, but certain roads (lower section of College Road, Lough Atalia Road, and various other roads) have displaced traffic <5,000. A notable increase (i.e., <10,000) is on Newcastle Road.

However, the drainage system is connected to a separate system and outside of the study area. As such no significant impact on receptors are considered likely. These road sections can therefore be screened out of further assessment.

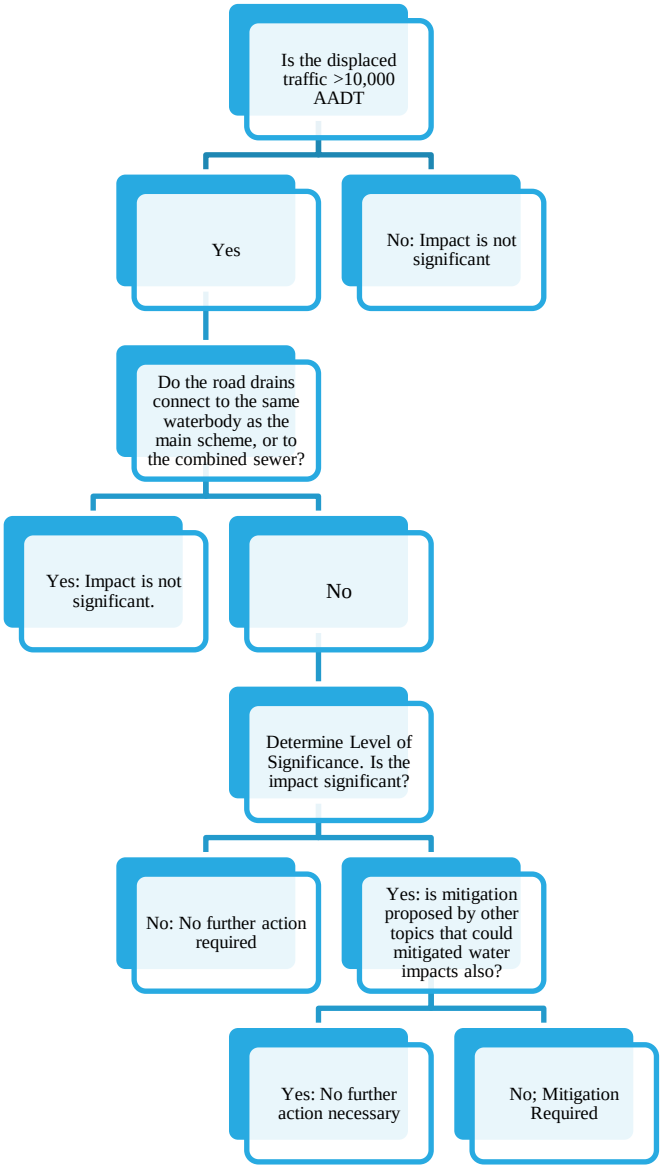

Diagram 13.1: Traffic Assessment Decision Tree

13.3 Baseline Environment

13.3.1 Field Survey

A walkover survey of sections of the Study Area was completed on November 18th, 2021. Specifically, manhole and drainage outfall locations were surveyed. Weather conditions were recorded as dry on the day of the survey. The results of the field survey are detailed in Table 13.8.

Table 13.8: Field Survey Notes

Survey Attribute	Survey Notes
Survey Locations	College Road, Lough Atalia Road, Dublin Road, Moneenageisha Road, University Road, Woodquay Street, etc.
Visual Flow	Drainage pipes generally dry or very small flow.
Condition of Manholes	Manholes inspected are generally in good condition. However, some require cleaning to avoid the risk of blockage.
Surface water ponding	None observed
Structural Deterioration	All in good condition.
Runoff Risk	None observed
Other	Some of the manholes are located on the main road pavement.

13.3.2 Existing Drainage System and Outfall Locations

A desk study of the existing road drainage system within the study area, using online mapping tools (Google Street view and OpenStreetMap) and historical sewer network information, was conducted to determine the existing road drainage and outfall locations provided currently.

The existing system within the Study Area is serviced by surface water and combined drainage network. Flows are typically collected in standard gully grates and routed via a gravity network to outfall points. There are no SUDS/attenuation measures on the existing system. A summary of the outfall drainage system types and outfall locations are listed in Table 13.9 and shown in Diagram 13.2.

Table 13.9: Outfall Drainage System types and Outfall Locations

Catchment	Existing Network Type	Existing Outfalls
University Road/Canal Road Upper	Combined Sewer	Mutton Island Wastewater Treatment Plant.
Gaol Road	Surface Water	Distillery River.
St Vincent's Avenue	Surface Water	Friar's River.
Dyke Road	Combined Sewer	River Corrib.
Williamsgate Street	Surface Water and Combined Sewer	Mutton Island Wastewater Treatment Plant.
Merchant's Road and Forthill Street/ Bóthar Bhreandain Uí Eithir	Surface Water	Mutton Island Wastewater Treatment Plant.
College Road (Fairgreen Road)	Surface Water	Lough Atalia
Loyola Park	Surface water	Lough Atalia
College Road (Loyola Park)	Surface Water	Lough Atalia
Lough Atalia Road	Surface Water	Mutton Island Wastewater Treatment Pantology via Atalia Pumping Station
College Road/Lough Atalia Road	Surface Water	Lough Atalia
College Road/Dublin Road	Surface Water	Lough Atalia
Sailin	Surface Water	Lough Atalia
Dublin Road	Surface Water	Lough Atalia

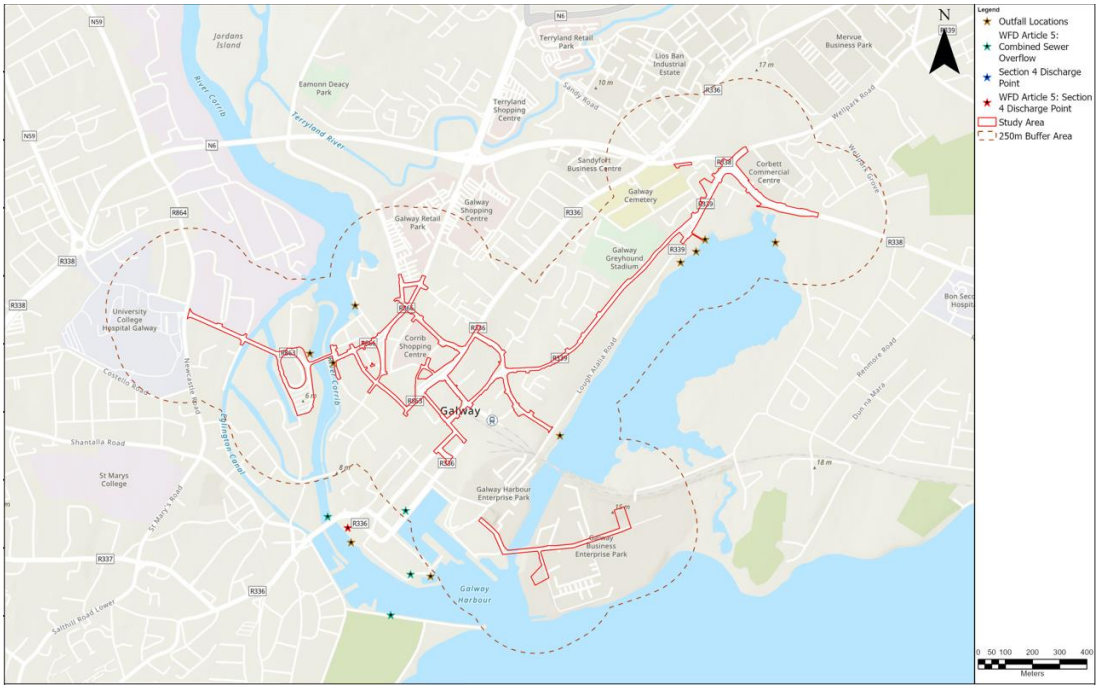

Diagram 13.2: Outfall Locations

It can be summarised that the main surface water receptors for the drainage system within the study area are:

- River Corrib,
- Distillery River,
- Friar's River, and
- Lough Atalia.

Both Distillery River and Friar's River are parts of the Corrib River system. The Corrib River has a Q4 (Good) status. Lough Atalia (Galway Bay Complex) and River Corrib both form parts of SACs.

13.3.3 Sustainable Urban Drainage System

The drainage system design is based on principles of best practice options for drainage design in accordance with the SUDS hierarchy as described in the CIRIA SUDS manual (CIRIA 2015).

The CIRIA SUDS manual recommends that when considering SUDS solutions, the preferred approach is a hierarchy whereby runoff using source control solutions (e.g. pervious surfacing) are considered first; where source control is not possible or cannot fully address an increase in runoff from a development, residual flows are then managed using site controls (e.g. bioretention/infiltration basins); if this is not practical or residual flows remain above existing runoff rates, regional controls (e.g. attenuation ponds or tanks) are used.

SUDS provide the dual benefits of controlling flows and treating water quality.

In areas where the catchment is proposed to remain unchanged as no additional impermeable areas are proposed, the design consists of relocating existing gullies (where possible) to new locations and provision of petrol interceptors and attenuation systems where required.

The drainage design principles ensure that there will be no net increase in the surface water flow discharged to identified receptors. Attenuation will be in the form of filter drains and/ or attenuation tanks. These measures will allow a level of treatment to be provided before discharge to the receptor, reducing the impact on water quality as well as preventing an increase in runoff rates.

13.3.4 WFD Catchment Overview

Diagram 13.3 shows the WFD Catchment/Sub catchment near the study area.

Under the Water Framework Directive (WFD), river water quality is monitored by the EPA and assigned an overall status based on the lowest status for the quality element monitored within that river waterbody. The River Water Quality Status of the River Corrib (CORRIB_020) for the 2013-2018 monitoring period is ‘Good’. The water quality in Lough Atalia (Corrib Estuary) is monitored as part of the River Corrib estuary waterbody. The Transitional Waterbody WFD status (2013-2018) of Lough Atalia (and the River Corrib estuary waterbody) is ‘Good’.

Under the WFD, an Approved Risk is assigned to each waterbody. The River Corrib (CORRIB_020) and Lough Atalia (Corrib Estuary) are each assigned ‘Not at risk’ status as river and transitional waterbodies respectively under the WFD.

13.3.4.1 Hydrometric Areas

The study area lies within Hydrometric Area (HA) 29 Galway Bay South East and HA 30 Corrib as shown in Diagram 13.3.

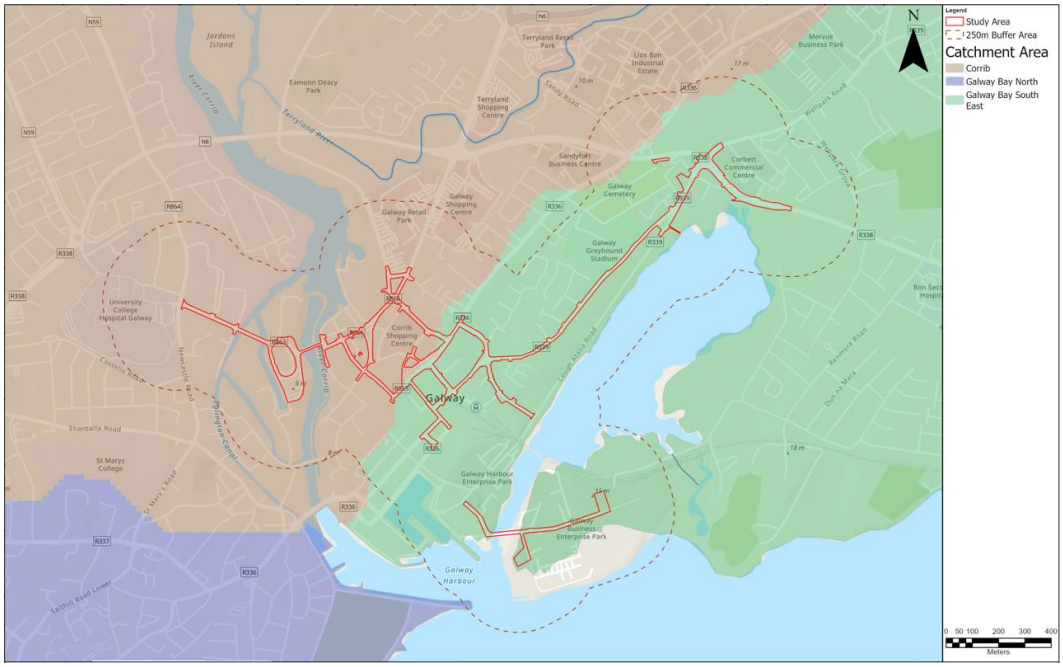

Diagram 13.3: Hydrometric Areas within and around the Study Area

- The Galway Bay South East Catchment Assessment 2010-2015 (HA 29) (EPA, 2018) describes the catchment as drained by all streams entering tidal water in Galway Bay between Black Head and Renmore Point, draining a total area of 1,270 km². The total population of the catchment is approximately 74,400, with a population density of 59 people per km².
- The Corrib Catchment Assessment 2010-2015 (HA 30) (EPA, 2018) describes the catchment as drained by the River Corrib and all streams entering tidal water between Renmore Point and Nimmo's Pier, Galway, a total area of 3,112 km². The total population of the catchment is approximately 116,900 with a population density of 38 people per km².

Both catchments are underlain by karstified limestone with highly interconnected groundwater and surface water systems. Whilst the catchment areas are split between Galway City, it remains the largest urban centre for both catchments. Other main urban centres include Athenry, Loughrea, Gort, and Oranmore to the east and Tuam, Ballinrobe, Claremorris and Ballyhaunis to the west.

There are three drainage catchments/sub-catchments within the study area as shown in Diagram 13.4. From west to east the catchments/sub-catchments are the Corrib Catchment including Terryland River Valley, Trusky Stream, and Lough Atalia catchment in the east of the study area.

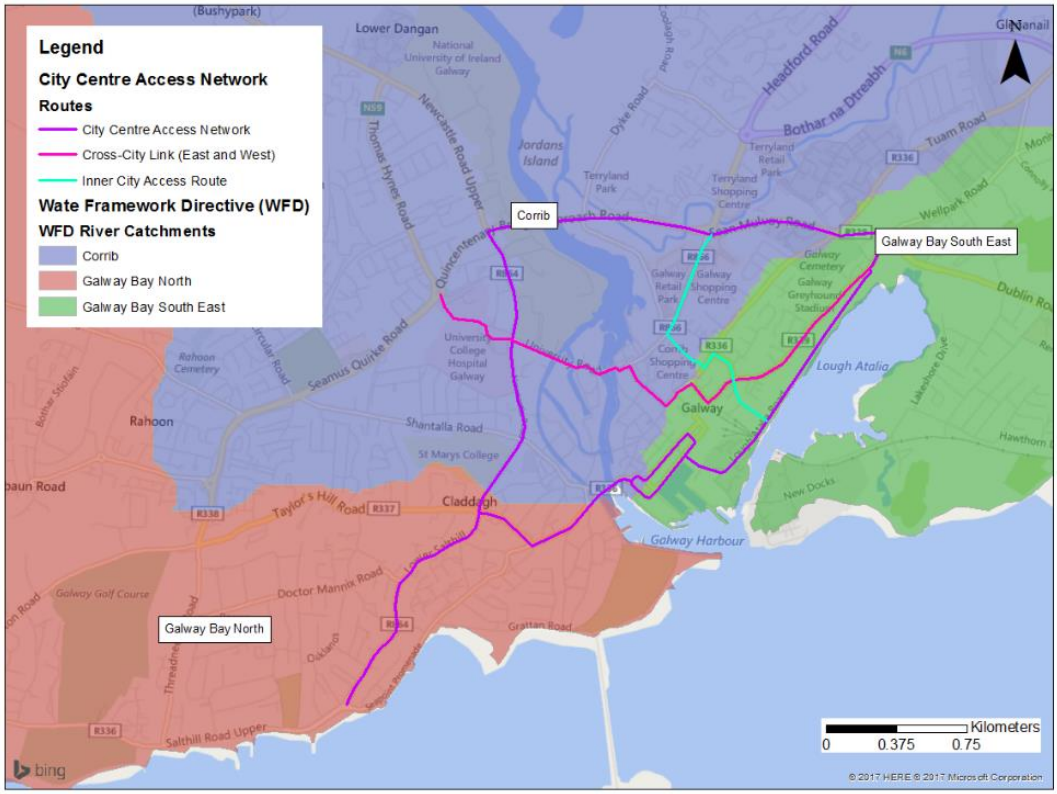

Diagram 13.4: WFD River Catchments in Galway City

The Lower River Corrib flows through Galway City centre from north to south. There are four bridges crossing the River Corrib in Galway City; from north to south, these are the Quincentenary Bridge, Salmon Weir Bridge, O'Briens Bridge and Wolfe Tone Bridge. The Office of Public Works (OPW) regulates the water levels in the River Corrib through gated control at the Salmon weir. Gates are opened and closed by the OPW depending on existing and forecasted rainfall conditions. The canals and mill races through the city are fed by the River Corrib upstream of the Salmon Weir and outfall into the Corrib Estuary.

The Eglinton canal is the main canal network west of the main River Corrib channel. The canal opens off the Lower River Corrib north of the Salmon Weir Bridge and loops west around Nuns Island, re-joining the River Corrib estuary upstream of Wolfe Tone Bridge at the Claddagh Basin. There are several small canals that offshoot from the Eglinton canal including, from west to east along University Road to Newtownsmith: the Eglinton Canal, the Gaol River, Persse's Distillery River (formerly called Mill Race), the Lower River Corrib and Friar's River (formerly called Waterside canal). The canal is prone to siltation as the flow through is restricted by lock gates, weirs, and turbines.

13.3.4.2 Hydrometric and National Monitoring Stations

The active hydrometric stations within the two hydrometric areas in proximity to the study area are shown in Table 13.10. The location of the national water monitoring stations in the study area are provided in Table 13.11.

Table 13.10: Active Hydrometric Stations near the Study Area

Station Name	Station No.	Water Body	Catchment Area, km2	Responsible Organisation	Measurement	Grid Reference (m)
Angliham	30089	Lough Corrib	3122	OPW	Water Level	E128992 N230240
Dangan	30098	Corrib River	3121	OPW	Water Level and Flow	E128264 N227831
Galway Barrage	30099	River Corrib	3135	OPW	Water Level	E129589 N225788
Wolfe Tone Br.	30061	Corrib Estuary	3136	OPW	Water Level	E129616 N224896
Galway Port	29062	Galway Bay	N/A	Marine Institute	Water Level	E130115 N224787

Table 13.11: National Water Monitoring Stations

Station Name	Station ID	Water Body	Responsible Organisation	Grid Reference (m)
Salmon Weir Bridge	RS30C020600	River Corrib	Galway City Council	E129598 N225525
Corrib - Waterside	RS30C020500	River Corrib	Galway City Council	E128264 N225873
Quincentennial Bridge	RS30C020460	River Corrib	Galway City Council	E129306 N226310
Br d/s Terryland Br on Ring Road	RS30T010500	Terryland River	Galway City Council	E129640 N226326
CORRIB - Just u/s Terryland River	RS30C020450	Corrib River	Galway City Council	E130115 N224787

13.3.5 Surface Water WFD Status

The EPA River dataset is designed as a geometric river network for monitoring, management, and reporting purposes. The EPA has split up rivers and streams into smaller sections to allow areas to be easily distinguished. These segments are assigned segment codes (estuaries and canals are not assigned segment codes). The EPA's segmented coding and naming system has been applied throughout this Chapter.

WFD designated waterbodies within the 500m study area included in this assessment shown on Diagram 13.5.

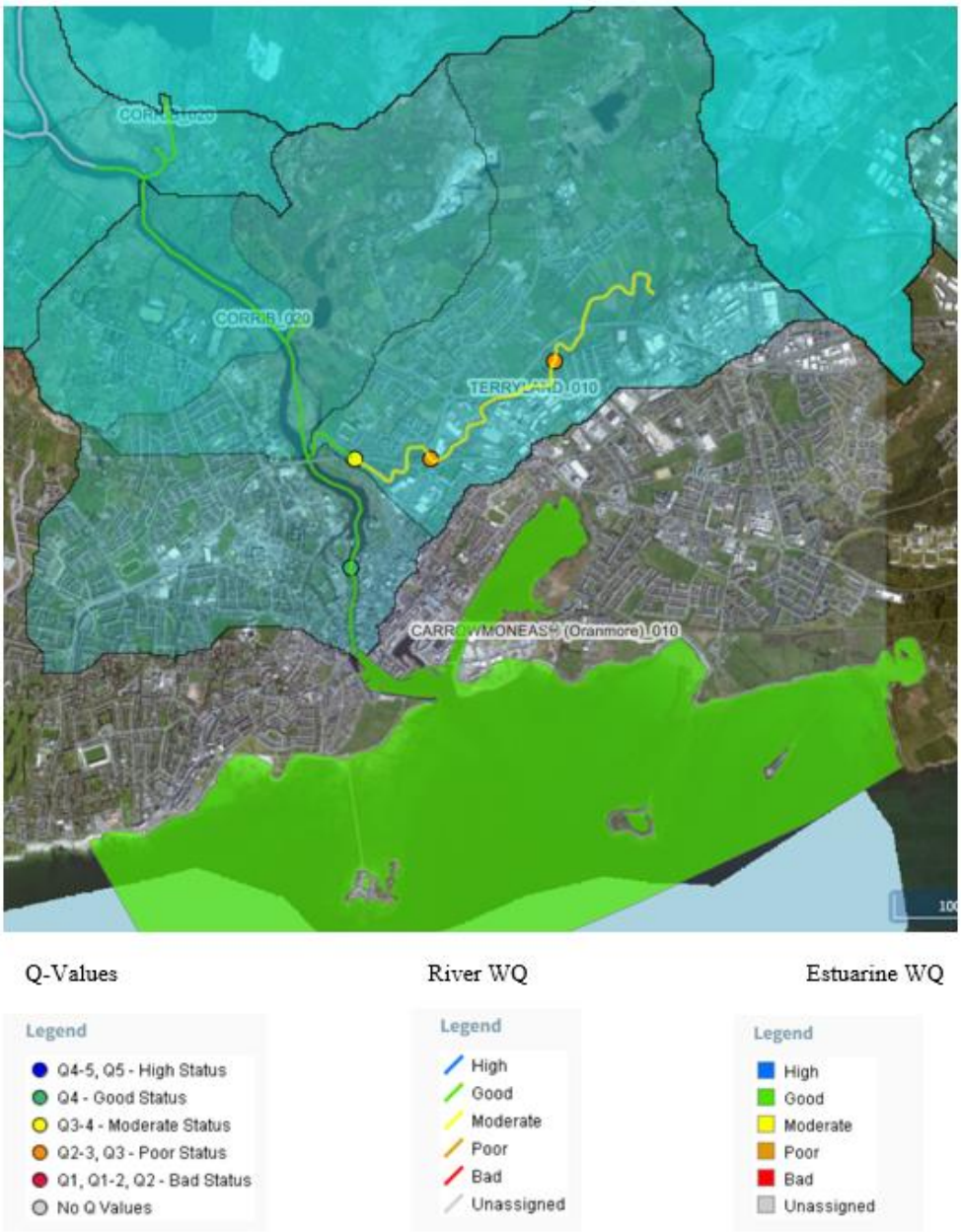

Diagram 13.5: River Q-Values, River, and Estuarine Water Quality

The WFD status of the rivers and streams within the Study Area of the Proposed Scheme are detailed in Table 13.12.

13.3.5.1 Surface Water Features

The four main WFD waterbodies within the study area are as follows:

- Corrib_020,
- Terryland_010,
- Carrowmoneash [Oranmore]_010, and
- Corrib Estuary.

The desk study identified four other surface waterbodies within the study area which are not classified as a WFD waterbody:

- Eglinton Canal,
- Gaol River,
- Persse's Distillery River (formerly called Mill Race), and
- Friar's River (formerly called Waterside canal).

All waterbodies within the study area flow into the Galway Bay and the Corrib Estuary. The RBMP 2018 - 2021 (DHPLG 2018) does not list any of the waterbodies within the study area as 'Priority Areas for Action'.

The overarching hydromorphology of the study area includes highly modified straight planform waterbodies with walled or artificial riparian zones.

The following EU designated sites are in proximity: Lough Corrib Special Protection Area (0004042); Lough Corrib Special Area of Conservation (000297); Galway Bay Complex Special Area of Conservation (SAC) (000268); and Inner Galway Bay Special Protection Area (SPA) (004031).

A summary of the baseline condition of each of these waterbodies and their associated flood risk within the study area is detailed below. Table 13.12 details the distances and number of crossings of each waterbody within the study area.

Table 13.12: Surface Water Features

Waterbody	Nearest Scheme Section	Approximate Distance from Proposed Scheme (m)	Number of Crossings by Proposed Scheme
Corrib_020	Salmon Weir Bridge	0	1
Terryland_010	Dyke Road	350m (north of Dyke Road)	0
Carrowmoneash (Oranmore)_010	Temporary Construction Compound	200m (north of Construction Compound)	0

Waterbody	Nearest Scheme Section	Approximate Distance from Proposed Scheme (m)	Number of Crossings by Proposed Scheme
Lough Atalia/ Corrib Estuary	College Road/Moneenageisha Junction/Dublin Road	100m (south west of junction at College Road and Lough Atalia Road)	0
Eglinton Canal	University Road	0	1
Gaol River	University Road	0	1
Persse's Distillery River	Salmon Weir Bridge	0	1
Friar's River	Salmon Weir Bridge	0	1

Corrib_020

The Corrib_020 flows from Lough Corrib, approximately 5km north of Galway, through Galway City and into the Galway Bay (SAC and SPA) and Corrib Estuary. There are four bridges crossing the Corrib_020 in Galway City; from north to south, these are the Quincentenary Bridge, Salmon Weir Bridge, O'Brien's Bridge and Wolfe Tone Bridge. The Proposed Scheme will cross the Corrib_020 on the existing Salmon Weir Bridge.

The Office of Public Works (OPW) regulates the water levels in the River Corrib through gated control at the Salmon Weir. Gates are opened and closed by the OPW depending on existing and forecasted rainfall conditions.

The Corrib_020 has a total length of 6.32km. Along the Corrib_020, land use to the north of Galway City is for agricultural purposes whilst land use to the south, is predominantly urban.

As shown in Table 13.14, the WFD status of the Corrib_020 is 'Good' and it is classified as 'not at risk' of achieving 'Good' Status by 2027.

The most recent Biological Q Value assessment of the Corrib_020 was 21/06/2018. Only one station (station code RS30C020600) is located on this watercourse which gave a recorded Q Value of Q4 (see Table 13.8).

The EPA River Quality Surveys: Biological (EPA 2020b) reported that: '*The River Corrib at the Weir Bridge in Galway city maintained Good ecological conditions in 2018.*'

Overall, the Corrib_020 has 'Good' status and is assigned Extremely High sensitivity due to being designated as a Salmonid River, the EU Designation as SAC and its hydrological connection with Galway Bay, Lough Atalia and the Corrib Estuary.

Terryland_010

Terryland_010 flows from north east of Galway City between Bothar na dTreabh and Tuam Road westwards towards Dyke Road and discharging into the Corrib_020 north of the N6 Bridge and Terryland Castle. There are various crossings of the Terryland_010 as it meanders through the north west and north of Galway City including the N6, Headford Road, Sandy Road and Bothar na dTreabh. The Whilst Terryland_010 is within the study area, the Proposed Scheme does not cross the Terryland_010 at any location.

The Terryland_010 has a total length of 3.71km. Land use across the entire length of Terryland_010 is urban with a mix of residential and industrial.

As shown in Table 13.14, the WFD status of Terryland_010 is 'Moderate' and it is classified as 'at risk' of achieving 'Good' status by 2027.

In terms of Biological Value, there are three stations (station code RS30T010200, RS30T010400 and RS30T010500) The most recent Biological Q Value assessment of the Terryland_010 was 21/06/2018 with samples taken from station RS30T010500 located at 'Terryland Bridge on N6 Ring Road' which returned a Biological Value of Q3-Q4 (see Table 13.8).

The EPA River Quality Surveys: Biological (EPA 2020b) reported that: Terryland_010 had '*Unsatisfactory conditions persist at this site but a slight improvement in ecological quality from Poor to Moderate was noted in 2018.'*

Overall, the Terryland River (Terryland_010) has a WFD classification status of "Poor" (2015) and is "at risk" status and is assigned 'High' sensitivity due to being hydrologically connected with the Corrib_020 which is a designated as a Salmonid River and hydrologically connected with Galway Bay SAC and SPA.

Carrowmoneash [Oranmore]_SC_010

The Carrowmoneash (Oranmore)_010 flows from Renmore Lough which is located between Galway Harbour Enterprise Park and Renmore Barracks in the south east of Galway City. The river flows north under the Portarlington-Galway Railway and into Lough Atalia before flowing southwards to the Corrib Estuary. There is one existing crossing of the river which is at the railway line. The Proposed Scheme will not cross this river however the haul route to the proposed temporary construction compounds will utilise the existing bridge crossing within the Galway Harbour Enterprise Park.

The Carrowmoneash [Oranmore]_SC_010 is known to be under pressure from nutrient (phosphate and ammonia) in its upper reaches and urban diffuse and wastewater pressure in its lower reaches. Land use in the vicinity of the river is predominantly industrial.

As shown in Table 13.14, the WFD status of Carrowmoneash [Oranmore]_010 is 'Unassigned' and it is classified as 'at risk' of achieving 'Good' status by 2027.

There is no Biological Q Value available for this watercourse.

Overall, the Carrowmoneash (Oranmore)_010 has 'Unassigned' status and is assigned 'High' sensitivity due to being hydrologically connected with Lough Atalia which is located within Galway Bay SAC and SPA.

Lough Atalia/Corrib Estuary

Lough Atalia is a located to the east of Galway City Centre and is within the Galway Bay Complex SAC and Inner Galway Bay SPA. The lough is a tidal waterbody and part of the Corrib Estuary. The Corrib Estuary is a transitional waterbody. There are two existing crossings of Lough Atalia at the seaward end of the lough: the railway crossing and the road bridge crossing in Galway Harbour Enterprise Park. There are no proposed new crossings as part of the Proposed Scheme. However, the haul route to the proposed temporary construction compounds will utilise the existing bridge crossing within the Galway Harbour Enterprise Park.

Lough Atalia has a total catchment of approximately 50 ha. Land use in the vicinity of the lough is a mix of residential, commercial, educational, and industrial.

The water quality in Lough Atalia (Corrib Estuary) is monitored as part of the River Corrib estuary waterbody. The Transitional Waterbody WFD status (2013-2018) of Lough Atalia is 'Good' and is classified as 'Not at risk' status by 2027.

There is no Biological Q Value available for Lough Atalia.

Overall, Lough Atalia (Corrib Estuary) has 'Good' status and is assigned 'Extremely High' sensitivity due to being within the EU designated Galway Bay SAC and SPA.

Non-designated Waterbodies

The four non-designated waterbodies (Eglinton Canal, Gaol River, Persse's Distillery River, and Friar's River) are fed by the River Corrib upstream of the Salmon Weir and outfall into the Corrib Estuary.

The Eglinton canal is the main canal network west of the main River Corrib channel. The canal opens off the Lower River Corrib north of the Salmon Weir Bridge and loops west around Nuns Island, where it is culverted before re-joining the River Corrib estuary upstream of Wolfe Tone Bridge at the Claddagh Basin. There are other small canals that offshoot from the Eglinton Canal including the Gaol River, Persse's Distillery River (formerly called Mill Race), the Lower River Corrib and Friar's River (formerly called Waterside canal). The canal is prone to siltation as the flow through is restricted by lock gates, weirs, and turbines.

Overall, the four non-designated waterbodies are hydrologically connected with the Corrib_020.

As the Corrib_020 flows through Galway City, the four non-designated watercourses are separated from the main river to the north of the Salmon Weir and reconnect with Corrib_020 again at the Claddagh Basin, before flowing seaward into the Galway Bay SAC and SPA. Therefore, each watercourse is assigned 'High' sensitivity due to the hydrological connections with the Corrib_020.

13.3.5.2 Designated Sites

The designated sites that have been summarised in this section are located within the study area. The sites described comprise EU designated sites, proposed Natural Heritage Area (pNHA), salmonid rivers, shellfish areas and marine bathing waters. There are no known Nutrient Sensitive Areas within the study area.

The following EU designated sites are close to the Proposed Scheme:

- Lough Corrib Special Protection Area (site code: 0004042);
- Lough Corrib Special Area of Conservation (site code: 000297);
- Galway Bay Complex Special Area of Conservation (site code: 000268); and
- Inner Galway Bay Special Protection Area (site code: 004031).

The Inner Galway Bay is also identified as a proposed Natural Heritage Area (pNHA). The River Corrib is a designated Salmonid River. There are no designated shellfish areas within the study area and the closest shellfish area is the Outer Galway Bay Indreabhan which is approximately 28km west of Galway City. According to Bathing Water Quality in Ireland 2020 (EPA, 2021), there are four bathing waters within Galway City Council and the bathing water quality classification is confirmed in Table 13.13. All the bathing waters are downstream of the Proposed Scheme.

Table 13.13: Bathing Water Classification (EPA, 2021)

Identified Bathing Water	**Bathing Water Classification**			
	2017	**2018**	**2019**	**2020**
Ballyloughane Beach	Poor	Sufficient	Poor	Sufficient
Grattan Road Beach	Good	Sufficient	Sufficient	Sufficient
Salthill Beach	Excellent	Excellent	Excellent	Excellent
Silverstrand Beach	Excellent	Excellent	Excellent	Excellent

13.3.5.3 Non-Designated Waterbodies

In addition, there are four non-designated watercourses adjacent to the Proposed Scheme:

- Eglinton Canal,
- Gaol River,
- Persse's Distillery River (formerly called Mill Race), and
- Friar's River (formerly called Waterside canal).

The Eglinton Canal and Gaol River are not designated for nature conservation but discharge downstream to the River Corrib, which is designated under the Lough Corrib SAC, refer to Table 13.14.

Table 13.14: WFD Waterbodies

WFD Sub-catchment	Waterbody Name & Code	Type	WFD Status (2013-18)	Key Pressures: Elements causing or with potential to cause less than good status[3]	Risk Categorisation
Corrib_SC_010	Corrib Lower (IE_WE_30_666a)	Lake	Good	Invasive species	At risk
	Terryland_010 (E_WE_30T010500)	River	Moderate	Urban runoff & Hydromorphology	At risk
	Corrib Upper (IE_WE_30_666b)	Lake	Good	Invasive species	Review
	Menlough (IE_WE_30_290)	Lake	Unassigned	None identified	Not at risk
	Corrib_010 (IE_WE_30C020300)	River	Unassigned	None identified	Not at risk
	Carrowmoneash (Oranmore)_010	River	Unassigned	Domestic Wastewater, Urban	At risk

[3] Corrib catchment Report (HA 30), 3rd Cycle Draft Report. 2021. Catchment Science and Management Unit, Environmental Protection Agency.

WFD Sub-catchment	Waterbody Name & Code	Type	WFD Status (2013-18)	Key Pressures: Elements causing or with potential to cause less than good status[3]	Risk Categorisation
Carrowmoneash [Oranmore]_SC_010	(IE_WE_29C050400)			Wastewater, and Urban Runoff	
	ROCKHILL (Galway)_010 (IE_WE_29R090950)	River	Unassigned	Domestic Wastewater and Agriculture (pasture)	Review
Corrib	Lough Atalia / Corrib Estuary (IE_WE_170_0700)	Transitional	Good	No significant pressure affecting the Corrib Estuary	Not at risk

13.3.6 Summary of WFD Assessment

Taking into consideration the anticipated impacts of the Proposed Scheme on the biological, physico-chemical and hydromorphological quality elements, and implementation of good practice design measures, it is concluded that it will not compromise progress towards achieving "Good" Status or cause a deterioration of the overall GEP of any of the water bodies that are in scope. Therefore, the Proposed Scheme does not require assessment under Article 4.7 (Table 13.15).

Table 13.15: WFD Assessment

Environmental Objective	Proposed Scheme	Compliance with the WFD Directive
No changes affecting high status sites	No waterbodies identified as high status	Yes
No changes that will cause failure to meet surface water Good Ecological Status (GES) or Good Ecological Potential (GEP) or result in a deterioration of surface water GES or GEP	After consideration as part of the detailed compliance assessment, the Proposed Scheme will not cause deterioration in the status of the water bodies during construction; during operation, no significant impacts are predicted. Good practice measures employed during construction and operation will minimise any risk to the waterbodies.	Yes

No changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies	The Proposed Scheme will not cause a permanent exclusion or compromise achieving the WFD objectives in any other bodies of water within the River Basin District.	Yes
No changes that will cause failure to meet good groundwater status or result in a deterioration groundwater status.	The Proposed Scheme will not cause deterioration in the status of the of the groundwater bodies.	Yes

13.3.7 EPA Surface Water Monitoring

The EPA assesses the water quality of rivers and streams across Ireland using a biological assessment method (McGarrigle et al. 2002). The EPA assigns biological river quality (biotic index) ratings from Q5 to Q1 to watercourse sections (refer to Table 13.16). Q5 denotes a watercourse with high water quality and high community diversity, whereas Q1 denotes very low community diversity and bad water quality. This data will be used to inform baseline receptor importance.

The WFD also considers highly modified waterbodies (HMWB) and artificial surface waterbodies (AWB). The WFD requires HMWB and AWB to achieve good ecological potential rather than Good Status.

Table 13.16: EPA Scheme of Biotic Indices or Quality (Q) Values (EPA 2018)

Biotic Index 'Q' Value	WFD Status	Pollution Status	Condition	Quality Class
Q5, Q4 - Q5	High	Unpolluted	Satisfactory	Class A
Q4	Good	Unpolluted	Satisfactory	Class A
Q3 - Q4	Moderate	Slightly Polluted	Unsatisfactory	Class B
Q3, Q2 - Q3	Poor	Moderately Polluted	Unsatisfactory	Class C
Q2, Q1 - Q2, Q1	Bad	Seriously Polluted	Unsatisfactory	Class D

13.3.8 Drinking Water Supply (Surface Water)

There are no Geological Survey Ireland (GSI) Public Supply Source Protection Areas or National Federation of Group Water Schemes (NFGWS) Source Protection Areas within the study area. The River Corrib, from Lough Corrib to

O'Brien's Bridge is designated Drinking Water (Corrib_020). Abstraction for Galway City water supply takes place at a location downstream of Quincentenary Bridge for treatment at Terryland WTP.

The nearest surface water abstraction point is on River Corrib downstream of Quincentenary Bridge for treatment at Terryland Water Treatment Works. This abstraction point is within the Lough Corrib SAC (Site Code 000297) and SPA (Site Code 004042) which is approximately 1.0 km north of the Proposed Scheme. This is a major public water supply abstraction point (approximately 46,000 m^3/day) which supplies approximately 70,000 people, serving Galway City and its environs. However, since it is not downstream of the study area, this has not been included in the assessment.

13.3.9 Flood Risk

A full assessment of the Flood Risk is included in Appendix 13.1 in Volume 4 of this EIAR. Only a summary of the baseline flood risk and the assessment of future risk from the Flood Risk Assessment is provided here for completeness.

The FRA was prepared in accordance with the Department of the Environmental, Heritage and Local Government (DEHLG) and the Office of Public Works (OPW) Planning System and Flood Risk Management Guidelines for Planning Authorities (DEHLG and OPW 2009).

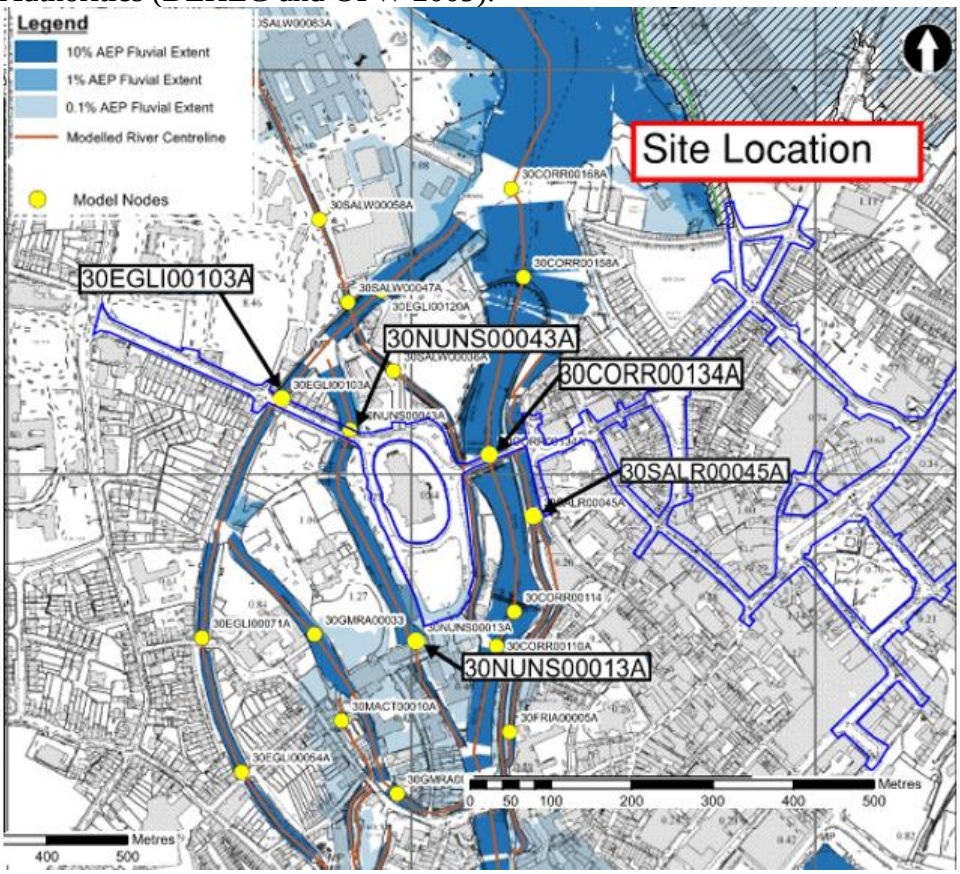

Diagram 13.6: **Shows the Fluvial Flood Risk Map and Diagram 13.7 shows the Tidal Flood Risk Map for the Area**.

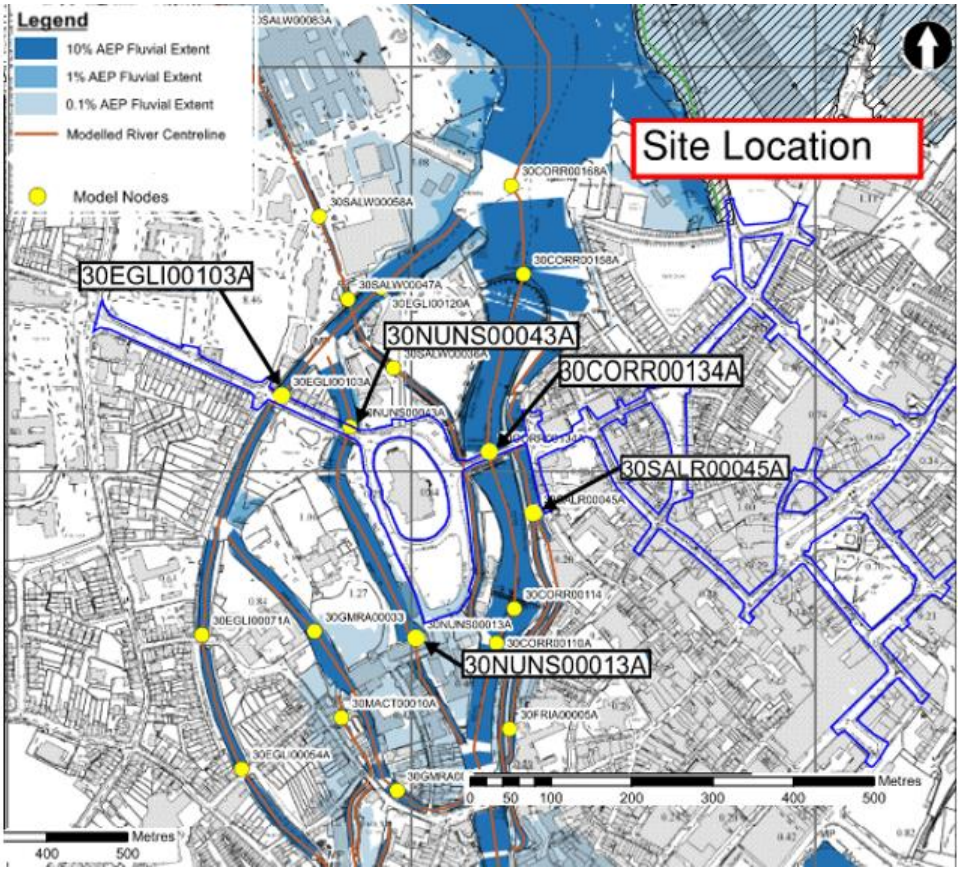

Diagram 13.6: Fluvial Flood Risk Map

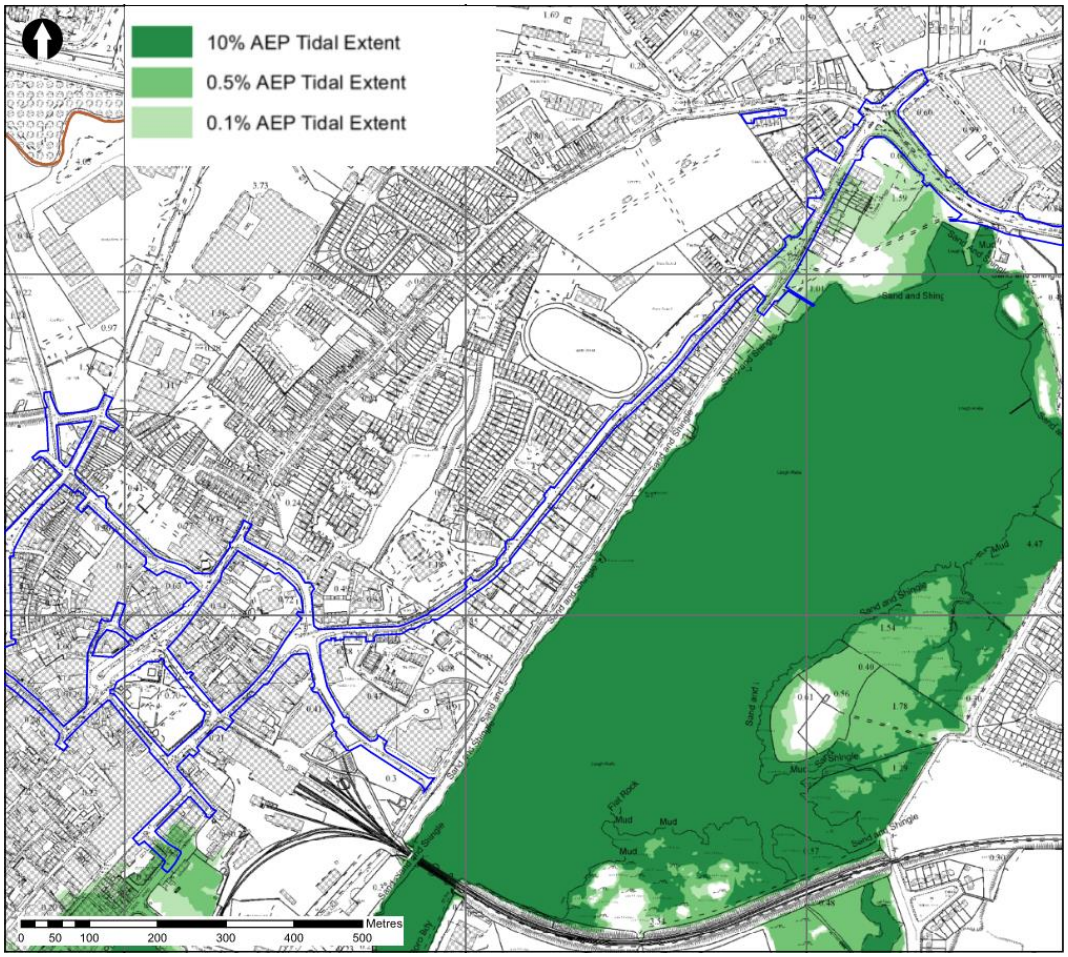

Diagram 13.7: Tidal Flood Risk Map

The FRA concludes that:

a) Fluvial Flooding: -

- a small portion of the Study Area (Nun's Island) is within the 0.1% Annual Exceedance Probability (AEP) event flood extent. The 1% and the 0.1% AEP flood levels at the nearest nodes (30NUNS00013A) are at 6.38m AD and 6.87m OD, respectively. The centreline of the road is at 6.57m OD on the southern side of the road and hence floods at 0.1% AEP fluvial event.

b) Tidal Flooding: -

- a small portion of the Study Area is (Dock Road) is within the 0.5% AEP event.
- Significant portion of the Study Area on College Road and Dublin Road is within the 0.5% of Tidal Event.

c) Pluvial Event: -

- The risk of pluvial flooding was considered generally low. Moreover, the risk of pluvial flooding is further mitigated by landscaping and drainage system.

d) Groundwater Flooding: -

- The risk of groundwater flooding is considered generally low or non-existent. However, due to the proximity of the study area the various surface water bodies, the water table is expected to be at relatively at shallow depth which can increase the risk during excavation works.

e) Mechanical/Operational Failure:-

- There are several bridges and locks on River Corrib which may fail or block due to mechanical error, deterioration, and operational. However, none of this are anticipated to impact on the flood risk within the study area.

A Development Management Justification Test is completed in accordance with the guidelines. This was to ensure the development proposal is not at risk of flooding to itself or does not increase the risk elsewhere. Although not all parts of the development are considered at risk as they are outside of Flood Zone A or B, the Justification Test was applied for the whole development area.

The Proposed Scheme was determined to have satisfied all requirements of the justification test outlined in the guidelines.

As flood risks are present is some areas, risk reduction measures are implemented as outlined in the FRA which enabled the Justification Test to be passed. These measures include:

- Upgraded road drainage system including various forms of SUDs for surface water management,
- Routine maintenance plan for the drainage system, and
- Tidal flood risk warning awareness system by Galway City Council, as is current practice.

13.3.10 Known Pressures

The EPA online database (EPA 2020) was reviewed to determine the presence of point source environmental pressures within the study area. The presence / absence of urban wastewater treatment plants (UWWTP) and associated storm water overflows (SWOs) and Industrial Emissions Licence (IEL) / Integrated Pollution Control (IPC) licensed sites were examined. The following IE / IPC licensed sites were identified within the 500m distance from Scheme boundary:

- IPC Licensed Facility Heiton Buckley Limited, Well Park, Galway, Reg No. P0339;
- IPC Licensed Facility Thermo King Ireland Limited, Monivea Road, Mervue, Galway, Reg No. P0142; and
- IE Licensed Facility Trane Technologies International Limited, Monivea Road, Mervue, Galway, Reg No. P0994.

The other main pressure identified for the waterbodies in the study area include diffuse pollution and discharges from SWOs.

These pressures result mainly from discharge of surface water and/or SWOs within the existing drainage system.

Failure in the drainage system, either because of insufficient capacity, poor maintenance, or incorrectly connected wastewater from domestic or commercial properties is likely to exacerbate these issues within the study area.

13.3.11 Summary of Baseline Receptor Sensitivity

A qualitative assessment of the sensitivity of the baseline environment was established based on the review of national data base used for determining the WFD status.

The ratings used are outlined in Section 13.2.4 based on the likely impact on the receiving environment during construction and maintenance of the Scheme (Table 13.17).

Table 13.17: Baseline Receptor Sensitivity

Waterbody	Attributes	Indicator/Feature	Sensitivity
Corrib_020	WFD 'Good'	Salmonid watercourse, hydrologically connected to Galway Bay SAC and SPA	Extremely High
Terryland_010	WFD 'Moderate'	Hydrologically connected to Galway Bay SAC and SPA	High
Carrowmoneash (Oranmore)_010	WFD 'Unassigned'	Hydrologically connected to Galway Bay SAC and SPA	High
Lough Atalia/ Corrib Estuary	WFD 'Good'	Designated SAC and SPA within Inner Galway Bay Complex	Extremely High
Eglinton Canal	Heavily modified	Hydrologically connected to Galway Bay SAC and SPA	High
Gaol River	Heavily modified	Hydrologically connected to Galway Bay SAC and SPA	High

Waterbody	Attributes	Indicator/Feature	Sensitivity
Persse's Distillery River	Heavily modified	Hydrologically connected to Galway Bay SAC and SPA	High
Friar's River	Heavily modified	Hydrologically connected to Galway Bay SAC and SPA	High

13.4 Potential Impacts

13.4.1 Introduction

The main hydrological impacts to the character of the receiving waters within the study area are those associated with working near water bodies generating sediment which may find its way to the watercourses via the road drainage system during construction. The existing road drainage system has surface runoff outfalls at several locations within the River Corrib system and Lough Atalia as shown in Diagram 13.2.

Known sources of pressure within the study area are outlined in Section 13.3.10 and no new outfalls (except that the existing Lough Atalia is to be relocated from the southern to the northern side of the playground) are proposed under the current development proposal. The proposed upgrade to the existing drainage system to match the needs of the development proposal is an opportunity to mitigate the impacts on the receiving waters. This is achieved by means of SUDS such as petrol interceptors, infiltration systems, attenuation facilities, etc. The general principles followed for sustainable urban drainage system design is outlined in Section 13.3.3.

13.4.2 Do Nothing Scenario

In this EIAR, the 'evolution of the baseline without the development' is described as the 'Do Nothing' scenario.

The Baseline (Section 13.3) describes the existing pressures on the waterbodies within the study area. These are identified and categorised under the RBMP for Ireland 2018-2021 process under baseline conditions (i.e., what is there at present) and reported by the EPA. The RBMP categorises significant pressures impacting waterbodies in Ireland into 14 categories, and identifies measures and actions aimed at addressing each pressure. This supports the analysis of future trends expected in the water environment to determine the 'evolution of the baseline without the development'. Future trends will be more noticeable, predictable, and measurable in the short to medium-term in relation to water quality, whereas hydrological and hydromorphological changes are subject to more long-term trends.

Future trends are determined based on the significant pressures identified under the RBMP, and the measures and actions in relation to policy and monitoring identified for the waterbodies to meet the requirements of the WFD Directive and any information available detailing progress on those measures or actions.

The most significant waterbody 'At Risk' of achieving "Good" status close to the Study Area is the Terryland_010 (Status 2013-2018: Moderate) where hydromorphology from diffuse sources (urban runoff) were identified as significant sources of pressure. Urban runoff may comprise a mixture of misconnections, leakage from sewers and runoff from paved and unpaved areas and has been identified as a significant pressure to Terryland_010. Galway City and the Local Authority Water Programme (LAWPRO) is required to collaborate to determine the nature and extent of the impacts.

With this action in place to locate and improve deficient infrastructure, it is anticipated that pressures from urban wastewater and urban runoff will be reduced over the coming years. Therefore, in the absence of the Proposed Scheme the surface water environment in the area should improve, albeit in the long term, particularly in relation to water quality.

13.4.3 Construction Phase Impacts

13.4.3.1 Overall Scheme

There are several potential construction-related impacts which could occur during the construction of the Proposed Scheme if not carefully designed and impacts mitigated where identified. The potential for any impacts for the Proposed Scheme are considered for the various construction activities and each receiving waterbody (the Corrib System and Lough Atalia) within the study area. These may include the following:

Impact on Hydrology

- Change in the natural hydrological regime due to an increase in discharge because of dewatering activities (where required) during construction. This may alter the groundwater regime and affect the baseflow to a surface water receptor,
- Potential for disrupting local drainage systems due to diversions required to accommodate the construction works,
- Modifications to the hydraulic characteristics of water features through modifications to the channel dimensions during construction of outfalls and culverts, where required; and
- Potential for temporary increase in hard standing areas and / or soil compaction during construction works which could result in temporary increased runoff rates to waterbodies.

Impact on Water Quality

- Discharge of silty water runoff containing high loads of suspended solids from construction activities. This includes the stripping of topsoil / road surface

during site preparation; the construction of widened roads; the dewatering of excavations and the storage of excavated material.

- Contamination of waterbodies with anthropogenic substances such as oil, chemicals, or concrete washings. This could occur because of a spillage or leakage of oils and fuels stored on site or direct from construction machinery; and the storage of materials or waste near waterbodies or drains connected to the waterbodies.

Impact on Hydromorphology

- Increased sediment loading because of silty water runoff or dewatering activities, introducing a sediment plume, potentially leading to the smothering of bed substrate and changes to existing morphological features.

Surface water management measures are incorporated within the CEMP to mitigate against adverse impacts on hydrology, hydromorphology and water quality of both the Corrib System and Lough Atalia during construction. Therefore, the Proposed Scheme presents no significant impacts to surface water and groundwater quality provided the proposed mitigation measures within the CEMP are implemented.

13.4.3.2 Footpath Widening, Road Resurfacing, Carriage Widening and Road Crossing Trenches

The Proposed Scheme will involve widening of existing footpath, widening and/or resurfacing of carriageway, and excavation of trenches for road crossing.

The principal potential impact of these activities is related to generation of silt/sediment during construction and discharge to sensitive water bodies (Corrib system and Lough Atalia). The risk of accidental spillage and oils and fuel at the Construction Compounds and work sites can also increase. Oils and fuel will be stored within bunded in designated areas. Drainage from designated areas will be collected and disposed safely. These and other best practice measures are included in the CEMP and will be implemented during construction. In the absence of additional mitigation measures, the potential magnitude of impact is negligible, resulting in a short term and imperceptible impact.

13.4.3.3 Impact from Drainage Outfalls

As outlined earlier, there will be no new outfall other than a slight change of location of one of the existing outfalls at Lough Atalia (moved to the other side of the playground) and therefore there will be no net increase in the runoff discharge to the receiving water bodies. However, construction activities have a potential to increase the pollution risk to receiving water bodies during soil stripping, concrete works, accidental spills, operation of plant and equipment, etc. Flood events can also increase the potential input of sediment and other construction material into the water bodies.

The two most important surface water receptors within the Study Area are the River Corrib and Lough Atalia. The River Corrib is a designated Salmonid River. Lough Atalia is within the Galway Bay Complex SAC (Site Code 268). The Inner Galway Bay is also identified as a pNHA and SPA. These sites have international importance and hence assigned *Extremely High* sensitivity.

Good practice measures outlined in the CEMP employed during construction will minimise the identified risks to the receiving water bodies. Therefore, in the absence of mitigation measures, the potential magnitude of impact is negligible, resulting in a short term, and imperceptible impact.

13.4.3.4 Site Compound

Chapter 5 (Construction) of the EIAR outlines the principal Construction Phase activities required to complete the Proposed Scheme and includes details of activities such as road and footpath widening, new and / or improved footpaths and cycle lanes, pavement repairs, new or improved lighting, bus shelters, removal of boundary walls and any other upgrade works, where relevant.

In addition to the main works involved, the location of the Construction Compounds, the location and duration of any necessary traffic diversions, hours of working, and numbers of personnel involved needs careful consideration. Three compounds are proposed: two at Galway Harbour Enterprise Park and another at Galway Cathedral Car Park (Satellite). The first Construction Compound at Galway Harbour Enterprise Parks is approximately 2,180m^2 in area and will contain site offices, and welfare facilities for GCC and contractor personnel. The second Construction Compound at Galway Harbour Enterprise Park is approximately 2,710m^2 in area and will be used to store materials for reuse such as topsoil, subsoil, concrete, rock etc., together with materials delivered to site for use in the construction of the scheme, e.g., pipes and ducting. Items of plant and equipment will also be stored within this Construction Compounds including the provision of a crusher. The satellite compound will have an area of 2,990m^2, approximately and will also be used to store plant and materials, together with site personnel welfare facilities.

All Compounds are at proximity to hydrologically sensitive receptors and will be in place for the full duration of the extent of the works and will be removed and the ground fully reinstated following completion of the works they support. The duration of the Construction Phase is estimated to be 18-20 months which spans longer than a hydrologic year. Therefore, there is a risk of contaminated surface water runoff discharging into the receptors during storm events, albeit for a short term.

13.4.4 Operational Phase

Potential impacts for the Operational Phase are related to water quality and hydromorphology. No changes to hydrology are expected (other than a minor change of outfall location at Lough Atalia) as the drainage design includes attenuation measures (i.e., SUDS) to mitigate against any potential increase in surface runoff rates. Surface water runoff from the Proposed Scheme discharges

the River Corrib and Lough Atalia, both of which have been identified to have international importance.

Potential impacts during the operational phase may include:

- Deterioration in water quality from increased levels of 'routine' road contaminates, such as hydrocarbons, metals, sediment, and chloride (seasonal) due to:
    - Potential increase in pollution and sediment load entering surface water receptors from upgraded or widened roads,
    - Changes to the quality of surface runoff due to changes to the nature, frequency of vehicles using the Proposed Scheme; and
    - Dispersal of traffic onto other local road network which may drain to a different catchment or have less stringent pollution control infrastructure.

Potential hydromorphology changes may include changes in the flow regime due to increased surface water runoff or discharges, from the improved drainage system, resulting in changes to sedimentation processes and morphology.

The amendments to the existing drainage system and the minor change to the location of the outfall at Lough Atalia will have long term, small beneficial magnitude of impact, resulting in a slight beneficial impact on receptor quality.

13.5 Mitigation and Monitoring Measures

This section sets out mitigation measures and good practice guides that are proposed to avoid, prevent, or reduce risks of the potential impacts on the aquatic environment outlined in Section 13.4.3 and 13.4.4 and, where appropriate, identify any proposed monitoring arrangements during the Construction and Operational Phases. Impacts associated to changes in traffic was reviewed and scoped out as not significant in Section 13.2.4.5. Therefore, in the absence of mitigation measures, the potential operational phase impact due to changes in the nature of the traffic is negligible and imperceptible impact.

Construction works will take place in accordance with the CEMP (the CEMP is included in Appendix 5.1 in Volume 4 of the EIAR). The Surface Water Management Plan (SWMP), which forms part of the CEMP sets out the good practice measures that will be implemented to minimise pollution discharge into local water courses.

Mitigation measures that will be implemented during the various phases of the scheme are detailed in the following sections.

13.5.1 Construction Phase

13.5.1.1 Overall Scheme

The Proposed Scheme has a potential to cause environmental impact during construction if not mitigated against. The mitigation measures proposed for management of surface runoff are generally contained in good practice guidance

documents that should be adhered to during the construction over or near water bodies. Some of the relevant guidance documents include:

- Guidelines on Protection of Fisheries During Construction Works in and adjacent to Waters - Inland Fisheries Ireland, 2016
- CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors, and
- CIRIA C648 Control of Water Pollution from Constructional Sites

Following on from the above guidelines, the following general and specific mitigation measures are outlined:

- Appropriate timing of the works to avoid flooding seasons and water pollution incidents, as is current standard practice;
- A site boundary fence will be constructed around the construction footprint with adequate vegetation buffer to prevent unintentional discharge to adjacent watercourses;
- A silt fence will be used during construction at the outfall at Lough Atalia where a sediment laden runoff is likely to be generated;
- While working near water bodies (Corrib River and Lough Atalia), it is required to capture and treat all surface runoff before discharging to these water bodies;
- Sampling and monitoring of storm water discharges from construction sites, the need, location, and frequency as determined by the Environmental Clerk of Works (ECoW). Parameters of interest may include Turbidity (or TSS), pH, and hydrocarbons.

A SWMP is provided as part of the CEMP. The CEMP includes a list of control measures to be implemented during the Construction Phase:

- A requirement for an Emergency Incident Response Plan (EIRP);
- Construction Compound management including the storage of fuels and materials;
- Control of sediment generation and discharge;
- Provision of SUDs (attenuation pond and petrol interceptor) before discharge of construction dewatering water to the receiving waters;
- Use of pre cast concrete where possible or construction method to be approved by the ECoW; and
- Management of vehicles and plant including refuelling and wheel wash facilities – spills and discharge are contained and prevented from entering the surface water receptor.

13.5.1.2 Construction Compound

The storage facilities at the Construction Compounds shall be fenced off at a minimum distance of at least 5m from surface water receptors. This and other measures included in the Construction Environmental Management Plan (CEMP refer to Appendix 5.1 of Volume 4 of this EIAR) (to be updated by the appointed Contractor) relevant to the site compound will be implemented by the appointed Contractor during construction.

13.5.1.3 Surface Water Quality Monitoring

As outlined in the SWMP, the Appointed Contractor shall carry out visual monitoring of surface water control measures (settlement tanks, silt fences, fuel storage areas etc.) on a daily basis. In addition, weekly visual inspections of the water bodies in proximity to Proposed Scheme will be carried out by the Appointed Contractor. Refer to the CEMP (Appendix 5.1 of Volume 4 of this EIAR) for further information.

13.5.2 Operational Phase

Surface water runoff for the proposed development is hydrologically connected to water bodies (River Corrib and Lough Atalia) which have international importance. There are 4 no. existing surface water outfalls to Lough Atalia and 3 no. outfalls into the Corrib System. No significant hydrological regime change is anticipated as the net increase in the impervious area is only marginal. Moreover, the drainage system is designed in such a way that any discharge to the receiving water body is restricted to predevelopment rate.

The infrastructure, including the maintenance regime for SUDS (Swales and Raingardens) will be maintained by the local authority and will be subject to their management procedures. No other mitigation measures are proposed for the operational phase of the Proposed Scheme.

13.5.3 Monitoring Requirements

No routine monitoring requirement is anticipated during operation of the works.

13.6 Residual Impacts

13.6.1 Construction Phase

Following implementation of the mitigation measures and good practice guides outlined in Section 13.5 and those included in the SWMP of the CEMP, no significant impacts are anticipated on any of the receptors in this study area.

An outline of the various sections of the Scheme and description predicted residual impacts are presented in Table 13.18:

Table 13.18: Review of Construction Stage Residual Impacts

Section	Project Activity	Predicted Impacts		
		Description of Impacts	**Predicted Impact (Pre-Mitigation and Monitoring)**	**Predicted Impact (Post-Mitigation and Monitoring)**
University Road	Footpath widening, gully relocation, entry treatments, bus shelter erection	Minimal sediment release expected. Accidental spills, release of fuel and oil from the construction compound, etc.	Imperceptible, short term	Imperceptible, short term
Gaol Road and Galway Cathedral	Footpath widening, gulley relocation, construction of footpaths and paved areas, consolidation of existing footpath.			
Newtownsmith/Waterside	Footpath widening, gulley relocation, construction of footpaths and paved areas.			
St Vincent's Avenue/Walsh's Terrace	Footpath widening, gully relocation, entry treatments			
Woodquay/Daly's Place/Mary Street	Footpath widening, gully relocation, ducting for proposed signalisation works			
Dyke Road/Headford Road	Resurfacing and associated works			

Section	Project Activity	Predicted Impacts		
		Description of Impacts	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post-Mitigation and Monitoring)
St Francis Street/Eglington Street/Williamsgate Street	Footpath widening, gully relocation, ducting for proposed signalisation works			
Bothar na mBan/St. Brendan's Avenue	Gully relocation, entry treatments, carriageway widening, demolition of two private properties			
Prospect Hill	Footpath widening gully relocation entry treatments ducting for proposed signalisation works			
Eyre Square North/Eyre Square East/Eyre Square	Footpath widening, gully relocation, entry treatments, carriageway widening, ducting for proposed signalisation works			
Victoria Place/Merchant's Road/Queen Street	Footpath widening, gully relocation, entry treatments,			

Section	Project Activity	Predicted Impacts		
		Description of Impacts	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post-Mitigation and Monitoring)
	ducting for proposed signalisation			
Foster Street	Footpath widening, gully relocation			
College Road/Foster Street/Fairgreen Road/Bothar Ui hEithir Junction	Footpath widening, gully relocation, ducting for proposed signalisation works			
Bothar Ui Eithir	Footpath widening, gully relocation, entry treatment			
Fairgreen Road	Footpath widening, gully relocation, entry treatments			
College Road (to Junction with Lough Atalia Road)	Footpath widening, Gully relocation, entry treatments, ducting for proposed signalisation works			
College Road/Lough Atalia Road Junction	Footpath widening, gully relocation, entry treatments, ducting for proposed signalisation works			

Section	Project Activity	Predicted Impacts		
		Description of Impacts	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post-Mitigation and Monitoring)
College Road/Lough Atalia Road to Moneenageisha Junction	Remove boundary walls (including petrol station), carriageway widening, entry treatments			
Moneenageisha Junction	Footpath widening, gully relocation, entry treatments, ducting for proposed signalisation works			
R338 Dublin Road	Footpath widening, gully relocation, carriageway widening, ducting for proposed signalisation works			

13.6.2 Operational Phase

No operational residual significant impacts are anticipated for any waterbody in the study area (refer to Table 13.19), whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

Table 13.19: Summary of Predicted Operational Residual Impact

WFD Waterbody Name	Project Activity	Predicted Impacts		
		Description of Impacts	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post-Mitigation and Monitoring)
Corrib_020	Marginal increase in impermeable	Marginal increase in surface water run off	Slight, beneficial, long term	Slight, beneficial, long term

	area draining to the waterbody			
Corrib Estuary/ Lough Atalia	Marginal increase in impermeable area draining to the waterbody	Marginal increase in surface water run off	Slight, beneficial, long term	Slight, beneficial, long term

13.7 References

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EU Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption

EU, Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU of the European Parliament and the Council of 13 December 2011 on the assessment of the impacts of certain public and private projects on the environment

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Government of Ireland Number 21 of 1990 - Local Government (Water Pollution) (Amendment) Act, 1990; and

Government of Ireland S.I. No. 108/1978 - Local Government (Water Pollution) Regulations, 1978;

Government of Ireland S.I. No. 122/2010 - European Communities (Assessment and Management of Flood Risks) Regulations, 2010;

Government of Ireland S.I. No. 122/2014 - European Union (Drinking Water) Regulations 2014;

Government of Ireland S.I. No. 268/2006 - European Communities (Quality of Shellfish Waters) Regulations, 2006;

Government of Ireland S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations, 2009

Government of Ireland S.I. No. 278/2007 - European Communities (Drinking Water) (No. 2) Regulations 2007;

Government of Ireland S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations, 1988;

Government of Ireland S.I. No. 296/2018 - European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018McGarrigle, et al. (2002). Water Quality in Ireland 1998–2000, Environmental Protection Agency, Wexford, Ireland.

Government of Ireland S.I. No. 350/2014 - European Union (Water Policy) Regulations 2014;

Government of Ireland S.I. No. 351/2011 - Bathing Water Quality (Amendment) Regulations, 2011;

Government of Ireland S.I. No. 495/2015 - European Communities (Assessment and Management of Flood Risks) (Amendment) Regulations 2015; and

Government of Ireland S.I. No. 722/2003 - European Communities (Water Policy) Regulations 2003, as amended;

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Chapter 14
Land, Soils, Geology & Hydrogeology

Contents

14 Land, Soils, Geology & Hydrogeology

14.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the potential land, soils, geology and hydrogeology impacts associated with the Construction and Operational Phases of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) (hereafter referred to as the Proposed Scheme). Chapter 4 (Proposed Scheme Description) of this EIAR includes a full description of the Proposed Scheme.

During the Construction Phase, the potential land, soils, geology and hydrogeology impacts associated with the development of the Proposed Scheme have been assessed. This includes the potential for contamination of soils and groundwater, and the loss of natural soils from excavation activities associated with utility diversions, road resurfacing and road realignments.

During the Operational Phase, the potential land, soils, geology and hydrogeology impacts associated with changes to water supply and the pollution of groundwater and watercourses have been assessed.

Potential impacts in the surface water environment are not considered in this assessment but are considered separately in Chapter 13 (Water) of this EIAR. The impact of the production of excess material for removal off site is discussed in Chapter 17 (Waste & Resources) of this EIAR.

The assessment has been carried out according to best practice and guidelines relating to land, soils, geology and hydrogeology assessment, and in the context of similar scale infrastructural projects.

An assessment is made of the likely significant impacts associated with the Construction and Operational Phases of the Proposed Scheme on these resources. Measures are presented to mitigate or eliminate the impacts of the Proposed Scheme on the soils, subsoils, bedrock, geological resources and geological heritage and hydrogeology

14.2 Methodology

The following sections outline the legislation and guidelines considered, and the adopted methodology for defining the baseline environment and undertaking the assessment in terms of land, soils, geology and hydrogeology.

The potential impacts of the Proposed Scheme on the land, soils, geology and hydrogeology have been assessed by classifying the importance of the relevant attributes and quantifying the likely magnitude of any effect on these attributes.

14.2.1 Study Area

The land, soils, geology and hydrogeology study area for the Proposed Scheme includes the Proposed Scheme and extends to a radius of 250m either side of the Proposed Scheme boundary which is in accordance with the Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (hereafter referred to as the NRA Guidelines) (NRA 2008a)).

14.2.2 Relevant Guidelines, Policy and Legislation

The main documents that have been followed for the preparation of the land, soils, geology and hydrogeology assessment are:

- National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (hereafter referred to as the NRA Guidelines) (NRA 2008a); and
- Guidelines for the Preparation of Soil, Geology and Hydrogeology Chapters of Environmental Impact Statements (Institute of Geologists of Ireland (IGI) 2013) (hereafter referred to as the IGI Guidelines).

Though the NRA is now known as Transport Infrastructure Ireland (TII), for the purpose of this Chapter the guidelines mentioned above are referred to as the NRA Guidelines. As the Proposed Scheme comprises transport scheme the NRA guidelines are considered more relevant and have been used in precedence to the IGI guidelines. The IGI guidelines have been used to supplement the NRA guidelines.

In addition, the assessment has been prepared with reference to the following guidelines and legislation:

- Environmental Protection Agency (EPA). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022);
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA 2008b);
- S.I. No. 350/2014 - European Union (Water Policy) Regulations 2014;
- S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended by:
  - S.I. No. 389/2011 - European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2011;
  - S.I. No. 149/2012 - European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2012; and
  - S.I. No. 366/2016 - European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016.
- S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 as amended by:
  - S.I. No. 327/2012 - European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2012; and
  - S.I. No. 386/2015 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2015.

- S.I. No. 722/2003 - European Communities (Water Policy) Regulations 2003 as amended by:
  - S.I. No. 413/2005 - European Communities (Water Policy) (Amendment) Regulations 2005;
  - S.I. No. 219/2008 - European Communities (Water Policy) (Amendment) Regulations 2008; and
  - S.I. No. 93/2010 - European Communities (Water Policy) (Amendment) Regulations 2010.
- S.I. No 122/2014 - European Communities (Drinking Water) Regulations 2014 as amended by:
  - S.I. No. 464/2017 - European Union (Drinking Water) (Amendment) Regulations 2017.
- SI No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988;
- SI No. 261/2018 - European Union (Water Policy) (Abstractions Registration) Regulations 2018;
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (hereafter referred to as the Water Framework Directive (WFD));
- Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (hereafter referred to as the Groundwater Directive);
- Water Services Acts (2007 – 2017);
- Strive Report Series No. 100. Evaluating the Influence of Groundwater Pressures on Groundwater-Dependent Wetlands. Strive EPA Programme 2007 - 2013 (EPA 2011); and
- Environmental Research Centre Report Series No. 12. A Framework for the Assessment of Groundwater-Dependent Terrestrial Ecosystems under the Water Framework Directive. Strive EPA Programme 2007 – 2013 (EPA 2008).

14.2.3 Data Collection and Collation

Data was compiled from publicly available datasets, the findings of ground investigations, design information, a scheme walkover survey, and other sources, as outlined below.

14.2.3.1 Publicly Available Datasets

The publicly available datasets listed in Table 14.1 have been acquired and consulted in the assessment of the baseline conditions. All datasets were accessed in October 2021.

Table 14.1: Publicly Available Datasets

Source	Name	Description
Ordnance Survey Ireland (OSI)	Current and historical ordnance survey maps	Current and historical survey maps produced by the OSI.

Source	Name	Description
	Including OSI Galway Maps from 1949-1952, 1978 and 1991	Current and historical survey maps produced by the OSI.
OSI	Aerial photography	Current and historical survey maps produced by the OSI.
Google	Aerial photography	Current aerial imagery produced by Google
Bing	Aerial photography	Current aerial imagery produced by Bing (Bing 2019)
Teagasc	Teagasc Soils Data	Surface soils classification and description
Geological Survey Ireland (GSI)	Quaternary Mapping	Geological maps of the site area produced by the GSI and available on GSI online map viewer.
	Bedrock Mapping	
	Aggregate Potential Mapping	
	Mineral Localities	
	Geotechnical viewer	
	Groundwater Mapping	
	Groundwater Levels	
	National Landslide Database	
	Karst Database	
	Active Quarries and pits	
	County Geological Sites (CGS) and Geological Heritage Areas	
EPA	Corine Land Cover 2018	These datasets are based on interpretation of satellite imagery and national in-situ vector data.
	Designated Natural Heritage Area (NHA). Special Protections Area (SPA), Special Area of Conservation (SAC) sites	
	River Network Map	
	EPA Hydro Net	Reports of groundwater level monitoring points.
National Parks and Wildlife Service (NPWS)	Mapping within the area of the Proposed Scheme	This dataset provides information on national parks, protected sites and nature reserves
National Monuments Service (NMS)	Archaeological Monuments	This dataset provides all recorded archaeological monuments (NMS 2019)
Department of Communications,	State Mining and Prospecting Facilities	A booklet contains a list of all current and prospecting mining facilities.

Source	Name	Description
Energy and Natural Resources (DCENR)	Historic Mine Sites – Inventory and Risk Classification	(DCENR 2019)

14.2.3.2 Scheme Walkover

A scheme walkover survey was carried out on 11 October 2021 to inform and verify the review of publicly available datasets.

The findings of the scheme walkover survey including photos and scheme walkover survey notes are included in Appendix 14.1 of Volume 4 of this EIAR.

14.2.3.3 Ground Investigation

Both an intrusive and geophysical ground investigation have been carried out as part of this project. These intrusive ground investigations were carried out for the purpose of investigating the stability of the soils to inform the scheme design. The information obtained from the ground investigations were also used in the preparation of the NIS and EIAR. The investigations were carried out between October 2021 and April 2022. The reports from both investigations are presented in Appendix 14.2a and 14.2b of Volume 4 of this EIAR and are used in the assessment of the site-specific conditions in Section 14.3.3. It is noted that the ground investigation was not carried out within any zones of notification to National Monuments Service and therefore no archaeological monitoring of the ground investigation was carried out.

Additionally, a number of historical ground investigations conducted within the study area have been used in the assessment of the baseline conditions. These historical reports are presented in Table 14.2. These reports are publicly available from the 'EXT GSI Geotechnical Sites layer' of the GSI Spatial Resources Map Viewer (GSI, 2019a).

Table 14.2: Existing Ground Investigations

GSI Report ID	Title	Year	Author	Location	Scope
2010	Galway Waterworks	1971	The Cementation Co. Ltd	Galway City	5 cable percussion boreholes
1347	Nora Barnacle Court	1991	IGSL	Nora Barnacle Court	2 trial pits and 2 rotary coreholes
7196	Car Park Site	2008	IGSL	Newtownsmith	3 cable percussion boreholes and 3 rotary coreholes.
1362	Roches Store	1989	IGSL	Corrib Shopping Centre	25 boreholes with cable percussion with rotary follow on.

GSI Report ID	Title	Year	Author	Location	Scope
4937	Galway City Council buildings	2002	IGSL	Galway City Council Buildings	3 Cable Percussive Boreholes, 7 Rotary coring boreholes and 5 Dynamic Probes.
1350	McDonagh – Galway	1987	IGSL	Merchants Road/ Victoria Place	20 cable percussion boreholes with rotary follow on.
1353	Texaco Garage	1972	N/A	Lough Atalia	5 cable percussion boreholes with rotary follow on and 6 trial pits.

14.2.4 Appraisal Method for the Assessment of Impacts

The likely significant impacts have been assessed by classifying the importance of the relevant attributes and quantifying the magnitude of any likely significant impacts on these attributes. This has been undertaken in accordance with the NRA and IGI Guidelines as outlined in the following sections.

14.2.4.1 Initial Assessment

In order to identify and quantify the likely significant impacts of the Construction Phase and Operational Phase of the Proposed Scheme, it is first necessary to undertake a detailed study of the (baseline) geological and hydrogeological environment of the study area for the Proposed Scheme.

The existing land, soils, geology and hydrogeology conditions in the study area have been interpreted from review of existing data, consultation, scheme walkover surveys and from Proposed Scheme specific ground investigations.

This assessment includes the development of a preliminary Conceptual Site Model (CSM), which describes the ground conditions expected throughout the study area of the Proposed Scheme based on existing literature. Also, as part of this initial assessment, the preliminary generic type of geological / hydrogeological environment is determined. The IGI Guidelines (IGI, 2013) provide five types of environments as examples (Types A to E, as described in Step 3 of the IGI Guidelines. These assist the assessor by establishing the sensitivity of the environment and level of investigation required.

14.2.4.2 Direct and Indirect Site Investigation

Information gathered on the baseline environment during specific ground investigations for the Proposed Scheme corresponds to the second element of the methodology, ‘Direct and Indirect Site Investigation and Studies’.

As part of the second element, relevant site investigations and studies close to the Proposed Scheme are gathered and assessed. Then, the preliminary CSM is refined accordingly.

14.2.4.3 Determination of Likely Significant Impacts

The NRA Guidelines (NRA, 2008a) provide criteria and examples for determining likely significant impacts. The relevant tables from the NRA Guidelines (NRA, 2008a) are as follows:

- Box 4.1: Criteria for Rating Site Attributes – Estimation of Importance of Soil and Geology Attributes (Table 14.3);
- Box 4.3: Criteria for Rating Site Attributes – Estimation of the Importance of Hydrogeology Attributes (Table 14.4:);
- The magnitude of impacts should be defined in accordance with the criteria provided in the NRA Guidelines. This is outlined in (Table 14.5).
- Box 5.1: Criteria for Rating Site Attributes at Environmental Impact Assessment (EIA) Stage – Estimation of Magnitude of Impact on Soil / Geology Attribute (Table 14.6: Table 14.7);
- Box 5.3: Criteria for Rating Site Attributes at EIA Stage – Estimation of Magnitude of Impact on Hydrogeology Attributes (Table 14.7); and
- Box 5.4: Rating of Significant Environmental Impacts at EIA Stage (Table 14.8).

The NRA Guidelines criteria uses the similar significance terminology as the EPA Guidelines (EPA, 2022). However, it has intermediate steps to justify using that terminology:

- Step 1: Quantify the importance of a feature for geology (Box 4.1) and hydrogeology (Box 4.3);
- Step 2: Estimate the magnitude of the impact on the feature from the Proposed Scheme (Box 5.1, Box 5.3); and
- Step 3: Determine the significance of the impact on the feature from the matrix (Box 5.4) based on the importance of the feature and the magnitude of the impact.

Table 14.3: Criteria for Rating the Importance of Identified Geological Features (Table C2 (IGI, 2013) and Box 4.1 (NRA, 2008)).

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and / or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale.	Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes

	Degree or extent of soil contamination is significant on a local scale. Volume of peat and / or soft organic soil underlying route is significant on a local scale.	Geological feature of high value on a local scale (County Geological Site) Well drained and / or highly fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and / or soft organic soil underlying route is moderate on a local scale.	Contaminated soil on site with previous light industrial usage Small recent landfill site for mixed wastes Moderately drained and / or moderate fertility soils Small existing quarry or pit Sub-economic extractable mineral resource
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and / or soft organic soil underlying route is small on a local scale*.	Large historical and / or recent site for construction and demolition wastes Small historical and / or recent landfill site for construction and demolition wastes Poorly drained and / or low fertility soils. Uneconomically extractable mineral resource

Table 14.4: Criteria for Rating the Importance of Identified Hydrogeological Features (Box 4.3 NRA, 2008).

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g., cSAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	Regionally important aquifer with multiple well fields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes Outer source protection area for regionally important water source Inner source protection area for locally important water source

Importance	Criteria	Typical Example
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

Table 14.5: Definition of Magnitude of Impact (Table 5.1 (NRA, 2008))

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and / or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and / or soft organic soil underlying route is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes Geological feature of high value on a local scale (CGS) Well drained and / or highly fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and / or soft organic soil underlying route is	Contaminated soil on site with previous light industrial usage Small recent landfill site for mixed wastes Moderately drained and / or moderate fertility soils Small existing quarry or pit Sub-economic extractable mineral resource

Importance	Criteria	Typical Example
	moderate on a local scale.	
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and / or soft organic soil underlying route is small on a local scale*.	Large historical and / or recent site for construction and demolition wastes Small historical and / or recent landfill site for construction and demolition wastes Poorly drained and / or low fertility soils. Uneconomically extractable mineral resource

Table 14.6: Criteria for Rating Soil and Geology Impact Significance and Magnitude at EIA Stage (Table C4 (IGI, 2013) and Box 5.1 (NRA, 2008))

Magnitude of Impact	Criteria	Typical Example
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves Irreversible loss of high proportion of local high fertility soils Removal of entirety of geological heritage feature Requirement to excavate / remediate entire waste site Requirement to excavate and replace high proportion of peat, organic soils and / or soft mineral soils beneath alignment
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Loss of moderate proportion of future quarry or pit reserves Removal of part of geological heritage feature Irreversible loss of moderate proportion of local high fertility soils Requirement to excavate / remediate significant proportion of waste site Requirement to excavate and replace moderate proportion of peat, organic soils and / or soft mineral soils beneath alignment
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves Removal of small part of geological heritage feature Irreversible loss of small proportion of local high fertility soils and / or high proportion of local low fertility soils Requirement to excavate / remediate small proportion of waste site

Magnitude of Impact	Criteria	Typical Example
		Requirement to excavate and replace small proportion of peat, organic soils and / or soft mineral soils beneath alignment
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature

Table 14.7: Criteria for Rating Hydrogeological Impact Significance and Magnitude at EIA Stage (Box 5.1 NRA, 2008)

Magnitude of Impact	Criteria	Typical Example
Large Adverse	Results in loss of attribute and / or quality and integrity of attribute	Removal of large proportion of aquifer Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems Potential high risk of pollution to groundwater from routine run-off Calculated risk of serious pollution incident during operation >2% annually
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems Potential medium risk of pollution to groundwater from routine run-off Calculated risk of serious pollution incident during operation >1% annually
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Removal of small proportion of aquifer Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems Potential low risk of pollution to groundwater from routine run-off Calculated risk of serious pollution incident during operation >0.5% annually

Magnitude of Impact	Criteria	Typical Example
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident during operation <0.5% annually

Table 14.8: Rating of Environmental Impacts at EIA Stage (NRA, 2009)

		Magnitude of Impact			
		Negligible	**Small**	**Moderate**	**Large**
Importance of Attribute	Extremely High	Imperceptible	Significant	Profound	Profound
	Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
	High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
	Medium	Imperceptible	Slight	Moderate	Significant
	Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

14.2.4.4 Mitigation Measures, Residual Impacts and Final Impact Assessment

The third element of the recommended steps builds on the outcome of the preceding two elements, by identifying mitigation measures to address potential significant or profound impacts and then assessing the significance of any residual impacts. Embedded design measures which have been incorporated into the design for the Proposed Scheme are also considered in this Section 14.5.

The final impact assessment includes a description of any residual impacts. The significance of any residual impact is determined based on the same methodology and reported.

14.2.5 Consultation

As part of a pre-application scoping process, a number of national and local government agencies were contacted. The Geological Survey of Ireland (GSI) provided responses that were directly relevant to this chapter these are summarised below:

- Recommended and encouraged that the assessment reference the various publicly available datasets and attribute them correctly to ‘Geological Survey Ireland’;
- Highlighted that the county geological site St. Augustine’s Well is within the vicinity of the Proposed Scheme;
- Highlighted that the Proposed Scheme is underlain by a “Regionally Important Aquifer - Karstified (conduit)” and a “Poor Aquifer - Bedrock which is

Generally Unproductive except for Local Zones," and the Groundwater Vulnerability map indicates both 'High' and 'Extreme' groundwater vulnerability;

- Recommended the use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability in your assessments, as any groundwater-surface water interactions that might occur would be greater in these areas and referred to the Groundwater Protection Response main report;
- Referred specifically to the availability of the online datasets of bedrock mapping, subsoils mapping, geotechnical ground investigation database and geohazards mapping;
- Requested for a copy of the ground investigation data for inclusion in the geotechnical report database; and
- That any rock cut slopes are not covered in soil and vegetated or alternatively photographs or access for documenting exposures be arranged.

The land soils geology and hydrogeology assessment accounts for the above recommendations and the highlighted datasets have been consulted during the assessment.

14.3 Baseline Environment

14.3.1 Introduction

This section describes the existing conditions and important features in terms of the land, soils, geology and hydrogeology within the study area of the Proposed Scheme. A regional overview is followed by a description of site-specific baseline conditions and a CSM. Features are then identified, and their importance ranked in accordance with the NRA and IGI Guidelines.

14.3.2 Regional Overview

The regional geomorphology, topography, soils and subsoils, bedrock geology and hydrogeology are discussed in this section. The study area ranges from University College Hospital Galway in the west to Corbett Commercial Centre in the east, the study area is shown on Figure 14.1 in Volume 3 of this EIAR.

14.3.2.1 Regional Topography, Geomorphology and Land Use

As shown on Figure 14.1 in Volume 3 of this EIAR, the OSI 10m contour mapping shows the topography of the study area is generally relatively low-lying between 0 and 10mOD. One exception to this is a feature at approximately 20mOD, which runs north-east to south-west orientated and extends from Galway Harbour to the Galway Greyhound Stadium.

Geomorphology is the study of the landforms which comprise the earth's surface, the processes which have modified and shaped it in the past and which continue to modify and shape it at the present time. The topography is heavily influenced by the geomorphology of the area.

To set the scene in a geological context a study area greater than the Proposed Scheme study area is considered. The geomorphology of this wider region within which the corridor study area is located reflects the last period of glacial history. The latest geomorphological features formed during the last major period of glaciation. During this time extensive ice sheets covered the region. Much of the surrounding landscape has also been shaped and rounded due to erosion as a result of the movement of these icesheets, this can be seen in the regional area as Galway City is surrounded by Streamlined Bedrock, Drumlins and Meltwater channels.

Glacial till was deposited at the base of the ice sheets during melt periods, these deposits can be found both within the study area and in the wider surroundings.

The geomorphological features present in the study area can be seen on Figure 14.1 in Volume 3 of this EIAR and the features within the study area are described below:

- 3 No. Drumlins – oval or elongated hills formed by the movement of ice sheets across rock debris or till, the majority of which are located surrounding Lough Atalia, with one located at University College Hospital Galway, one located from Galway Ceannt Train Station to the Galway Greyhound Stadium (the feature mentioned above at 20mOD) and the other underlying Galway Harbour Enterprise Park;

The River Corrib traverses the west of the study area. It flows in a north to south direction, it enters the north-west of the study area and flows south where it enters the Corrib Estuary in Galway Bay to the south-east and outside of the study area.

In the west of the study area the river splits into three channels north of a weir referred to as salmon weir. The western-most channel is named the Eglington Canal which flows along canal road and feeds into Gaol River and the St. Clare River then re-joins the river in the southwest of the study area. The central channel makes up the River Corrib which flows from the north to the south through the site.

The eastern-most channel is referred to as Middle River which splits off and later re-joins the east side of the River Corrib before it enters Corrib Estuary. The eastern and western channels were constructed to allow boats to pass up the river.

Lough Atalia is located to the east of study area. It is an estuarine lagoon connected directly to the Corrib Estuary within Galway Bay approximately 0.7km east of the mouth of the River Corrib.

The Corine land mapping (EPA) classifies the land use in the majority of the study area as a dis-continuous to continuous urban fabric with the north-east and the Galway Harbour area classified as industrial land use.

14.3.2.2 Regional Soils (Teagasc)

The Teagasc national indicative soil map classifies the soils of Ireland into simplified categories. Soil information is categorised from the Irish Forest Soils (IFS) project, which indicates the predominant soil type for each area, and the drainage characteristics of the soil. The Teagasc soil database is available on the GSI public data viewer and can be seen on Figure 14.2 in Volume 3 of this EIAR. The main soils within the study area are listed in Table 14.9 along with their importance with respect to drainage and fertility, as determined by Box 4.1 in the NRA Guidelines (NRA 2008a).

The majority of the Proposed Scheme and the study area is underlain by made ground, that is soils which have been anthropogenically altered and generally used for development. Notwithstanding the Teagasc database, as the Proposed Scheme comprises an area that is currently developed all the soil within the boundary will be made ground.

Also, in the study area are, low permeability soils such as alluvium are present along the River Corrib in the north-west of the study area. Marine Sediment is present along the north shore and southern shore of Lough Atalia. Deep well drained mainly basic soils (labelled as 'BminDW - Grey Brown Podzolics / Brown Earths Basic') are present in the south of the study area north east of Galway Harbour and in the north-east of the study area at Corbett Commercial Centre. Deep well drained mainly acidic soils are present in the centre of the study area south of Galway Greyhound Stadium (labelled as 'AminDW - Acid brown earths / Podzolics'). There is also one pocket of peaty poorly drained mineral to the east of Galway Harbour Enterprise Park (labelled as 'BminPDPT - Peaty Gleys Basic Parent Materials Basic') and one pocket north east of Galway Harbour Enterprise Park of shallow well drained mainly basic soils (labelled as BminSW - Renzinas / Lithosols).

Table 14.9: Soils within the Study Area

Soil Type	Notes / Description	Location	Importance	Justification for Importance Rating
Made Ground - Made	Associated with urban development	Widespread under the Proposed Scheme	Low	Poorly drained and / or low fertility soils
Alluvium - AlluvMIN	Typically found along current and historic watercourses	Along the River Corrib and its tributaries – east of Galway Retail Park	Medium	Moderately drained and / or moderate fertility soils
Marine/Estuarine sediments - MarSed	Typically found along the coast	Adjacent to Lough Atalia	Medium	Moderately drained and / or moderate fertility soils
Topsoil – BminPDPT	Peaty Gleys with Basic	East of Galway Harbour	Medium	Moderately drained and / or moderate fertility soils

Soil Type	Notes / Description	Location	Importance	Justification for Importance Rating
	parent material	Enterprise Park		
Topsoil - BminDW	Deep well drained (Mainly basic)	South of the study area north at Galway harbour and to the north-east of the study area at Corbett Commercial Centre.	High	Well drained and / or high fertility soils
Topsoil - AminDW	Deep well drained (Mainly acidic)	At the centre of the study area south-west of Galway Greyhound Stadium	High	Well drained and / or high fertility soils
Topsoil – BminSW	Shallow well drained (mainly basic)	North-east of Galway Harbour Enterprise park	High	Well drained and / or high fertility soils

14.3.2.3 Regional Subsoils (GSI Quaternary Classification)

Quaternary sediments are the most recently deposited geological strata. A joint project between the GSI and the Geological Survey of Northern Ireland (GSNI) produced an All-Ireland Quaternary geology map at 1:500,000 scale and is available on the GSI public data viewer. The subsoils within the area are shown on Figure 14.3 in Volume 3 of this EIAR and are listed in and the other at the Galway Harbour Enterprise Park .

Table 14.10 below; along with their importance with respect to feature quality and significance, as determined by Box 4.1 of the NRA Guidelines (NRA 2008a).

The Proposed Scheme and the majority of the study area are underlain by urban soils. Fen peat is present along the banks of the River Corrib in the north-west of the study area east of Galway Retail Park. Estuarine silts and clays are present at the north shore of Lough Atalia within the study area south of Corbett Commercial Centre and to the north-east of Galway Harbour Enterprise Park. Till derived from limestone is present in the south of the study area north of Galway Harbour and at Galway Harbour Enterprise Park and to the north-east of the study area at Corbett Commercial Centre. It is expected that this till underlies the made ground. There are two isolated area of bedrock outcropping in the study area, one south of Gaol Road and the other at the Galway Harbour Enterprise Park .

Table 14.10: Subsoils within the Study Area

Subsoil Type	Description	Location	Importance	Justification for Importance Rating
Made Ground – Urban	Associated with urban development	Widespread under the Proposed Scheme	Low	Low value on a local scale
Fen Peat-FenPt	Typically found along current and watercourses	Along the River Corrib and its tributaries, east of Galway Retail Park	Moderate	Volume of peat and/or soft organic soil underlying the route is moderate on a local scale
Glacial till – TLs	Till derived from limestones	South of the study area north of Galway harbour ad at Galway Harbour Enterprise Park and to the north-east of the study area at Corbett Commercial Centre	Low	Abundant within the study area and has a low value on a local scale
Estuarine silts and clays – Mesc	Found adjacent to estuaries, combination of Estuarine silts and clays	Adjacent to Lough Atalia and north of Galway Harbour Enterprise Park	Low	Low value on a local scale

14.3.2.4 Regional Bedrock Geology

The bedrock geology of the study area according to the GSI 100k bedrock mapping can be seen on Figure 14.4 in Volume 3 of this EIAR and is listed in Table 14.11 along with their importance with respect to feature quality and significance as determined by Box 4.1 in the NRA Guidelines (NRA 2008a).

The bedrock geology of the region comprises the metagabbro and orthogneiss suite to the west of the study area from University College Hospital Galway to the Corrib Shopping Centre and to the south of the study area underlying Galway Harbour Enterprise Park. The Burren Formation is present to the east of the study area from the Corrib Shopping Centre to the Corbett Commercial Centre.

The Burren Formation is described as pale grey, clean, skeletal limestone i.e. a limestone which is abundant in fossils and without impurities. This bedrock was deposited during the Carboniferous Period and is the youngest of the bedrock types within the study area.

An unconformity separates the limestones from the older igneous metagabbro and orthogneiss suite to the west of the study area. This unconformity is highlighted on Figure 14.4 in Volume 3 of this EIAR. Unconformities are typically buried erosional surfaces that can represent a break in the geologic record. It called an unconformity because the ages of the layers of rock that are abutting each other are discontinuous. An expected age of layer or layers of rock are missing due to the erosion and, some period in geologic time is not represented.

The metagabbro and orthogneiss suite is described as an igneous undifferentiated quartz-diorite gneiss, a granitic gneiss and metagabbro i.e. a fine to coarse grained metamorphosed intrusive rock.

Table 14.11: Rock Formations within the Study Area

Formation	Description	Location	Importance	Justification for Importance Rating
The Burren Formation	Pale grey clean skeletal limestone – Carboniferous.	East of the study area from the Corrib Shopping Centre to the Corbett Commercial Centre	Low	Low value on a local scale
Meta-Gabbro and ortho-gneiss	An Undifferentiated Quartz-Diorite Gneiss, Quartz Diorite Gneiss & Granitic Gneiss and Metagabbro and Related Lithologies. Coarse to fine grained metamorphic rock.	West of the study area from University College Hospital Galway to the Corrib Shopping Centre and to the south of the study area underlying Galway Harbour Enterprise Park	Low	Low value on a local scale

14.3.2.5 Regional Aquifer Type and Classification

The GSI has devised a system for classifying both bedrock and gravel aquifers in Ireland based on the hydrogeological characteristics, size and productivity of the groundwater resource. The aquifers within the study area can be seen in Figure 14.5 in Volume 3 of this EIAR and are listed in Table 14.12 below along with their importance with respect to feature quality and significance as determined by Box 4.1 in the NRA Guidelines (NRA 2008a).

The metagabbro and orthogneiss suite to the west and south of the study area is classified as a Poor Aquifer, bedrock which is generally unproductive except for local zones (Pl). The limestones of the Burren Formation in the east and north-east of the study area are classified as a Regionally Important Aquifer with karstified (conduit) groundwater flow (Rkc).

Table 14.12: GSI Bedrock Aquifers within the Study Area

Aquifer Type	Description	Location	Importance	Justification for Importance Rating
Regionally Important Aquifer	Bedrock which regionally important and is Karstified conduits (Rkc)	East of St Brendan's Court; Eyre Square; and Fairgreen Road	High	Regionally important aquifer which is important on a regional scale
Poor Aquifer	Bedrock which is generally unproductive except for local zones (PI)	West of St Brendan's Court; Eyre Square and Fairgreen Road, underlying Galway Harbour Enterprise Park	Low	Regionally poor aquifer which has low importance on a regional scale

Groundwater bodies (GWBs) were delineated and described by the GSI in 2004 as Water Framework Directive (WFD) groundwater management units to manage and protect groundwater and linked surface waters. There are 3 no. GWBs present within the study area:

- The Maam-Clonbur GWB located in the west of the study area to the west of the River Corrib;
- The Clare-Corrib GWB located in the centre to the north of the study area from the Corrib Shopping centre northwards; and
- The Clarinbridge GWB located in the east of the study area surrounding Lough Atalia.

The Maam-Clonbur GWB is underlain by igneous and metamorphic bedrocks. According to the GWB descriptions, groundwater levels in these bedrocks are approximately 0 – 8m below ground level (mbgl). Groundwater flow is expected to be concentrated in fractured and weathered zones which are reported to be typically less than 3m thick with shallow flow and short flow paths dominating. Hydraulic gradients are expected to be greater than 0.01.

The Clarinbridge and Clare-Corrib GWB predominantly covers the limestone bedrock within the study area, the Clarinbridge GWB also covers the metagabbro and orthogneiss bedrocks in the centre of the study area. According to the GWB descriptions, groundwater flow is through a shallow epikarstic layer and in a zone of interconnected enlarged fissures and conduits that extends up to approximately 30m below the epikarstic layer. Groundwater flow paths can be up to several kilometres long but shorter paths are noted as well due to the highly karstified nature of the GWB.

Transmissivity is a measure of the rate of groundwater flow through an aquifer and is dependent on aquifer thickness. Transmissivity ranges from

0.2m^2/d to 10^2/d within the Maam-Clonbur GWB and from 1m^2/d to greater than 1,000m^2/d in the Clarinbridge GWB.

14.3.2.6 Regional Aquifer Vulnerability

Groundwater vulnerability is a relative measure of the ease with which groundwater may be contaminated by human activity. It is based on the aquifer's intrinsic geological and hydrogeological characteristics. The vulnerability is determined by the thickness and permeability of overlying deposits and the depth to the bedrock aquifer. For example, bedrock with a thick, low permeability, clay-rich overburden is less vulnerable than bedrock with a thin, high permeability, gravelly overburden.

Within the study area as shown on Figure 14.6 in Volume 3 of this EIAR, groundwater vulnerability ranges from moderate to extreme vulnerability. In the south-east areas of the study area moderate vulnerability is found in the area surrounding Lough Atalia except at Galway Harbour Enterprise Park where it is also high, extreme or rock at or near surface. Areas of high vulnerability are observed to underlie the majority of the rest of the study area. In addition to the area at Galway Harbour Enterprise Park there are six areas of 'extreme [vulnerability] to rock at or near surface', four in the west of the study area and west of the River Corrib, two in the east north of Moneenageisha Road.

14.3.2.7 Regional Karst

Karst is a type of geological feature characterised by caves, caverns and other types of underground drainage resulting from the dissolution of the underlying bedrock. This typically occurs in areas of high rainfall with soluble rock.

There are no karst features identified within the study area in the GSI karst database (GSI 2020). However, there is one Geological Heritage feature which is a karst feature, 'Saint Augustine's Well' located approximately 100m east of the Proposed Scheme on College Road. This well is present on the shore of Lough Atalia. It is recorded as a freshwater karst spring that flows into Lough Atalia.

The source of water is understood to be 1.9km north-east of the spring and outside of the study area, at the Terryland River. The karst feature can be seen on Figure 14.4 in Volume 3 of this EIAR and is listed in Table 14.13 along with its importance with respect to feature quality and significance as determined by Box 4.1 in the NRA Guidelines (NRA 2008a).

Table 14.13: GSI Regional Karst Features within Study Area

Karst feature	Description	Location	Importance	Justification for Importance Rating
St. Augustine's Well	Bedrock Freshwater Karst spring on the shore of a tidal lagoon	100m south-east of the Proposed Scheme on Lough Atalia North shore	High	Feature which is important on a local scale

14.3.2.8 Regional Recharge

Recharge is the amount of effective rainfall that replenishes the aquifer. It is a function of the effective rainfall (i.e. rainfall minus evaporation and run off), transpiration (uptake by plants) and the aquifer characteristics.

Groundwater recharge for the Poor aquifer (under the west and centre of the study area) is capped at 100mm/yr which reflects the low permeability of the aquifer and its limited capacity for water storage. The recharge for the Regionally Important Aquifer ranges from 101mm/yr to 700mm/yr, this recharge value is dependent on the overlying subsoil type. The regional groundwater recharge is shown on Figure 14.7 in Volume 3 of this EIAR.

14.3.2.9 Regional Groundwater Abstractions

Based on available data sources from the GSI there are no Public Water Supply or National Federation of Group Water Scheme groundwater source protection areas within the regional study area.

According to the GSI database, there are six groundwater wells recorded within the study area. Details of the abstraction are summarised in Table 14.14 along with its importance with respect to feature quality and significance as determined by Box 4.1 in the NRA Guidelines (NRA 2008a) and is presented on Figure 14.5 in Volume 3 of this EIAR.

Table 14.14: GSI Groundwater Abstractions

Abstraction feature	Description	Location	Importance	Justification
1121NEW005 – borehole	Ballinfoyle Group scheme. Domestic use only – good yield at 141.8m^3/d	50m to the north-east of the Proposed Scheme	Medium	Locally important abstraction points which is important on a local scale
121NEW011 - borehole	Unknown	50m north of Fairgreen Road of the Proposed Scheme	Medium	Conservatively assumed to be a locally important abstraction point which is important on a local scale
1121NEW015 – borehole	Unknown	10m south of Fairgreen Road of the Proposed Scheme	Medium	Conservatively assumed to be a locally important abstraction point which is important on a local scale
1121NEW014 - borehole	Unknown	50m south of Fairgreen Road of the Proposed Scheme	Medium	Conservatively assumed to be a locally important abstraction point which is important on a local scale

Abstraction feature	Description	Location	Importance	Justification
1121NEW012 - borehole	Unknown	10m south of Fairgreen Road along the Proposed Scheme	Low	Abstraction point associated with a poor aquifer which is likely to have a low importance on a regional scale
1121NE016 - borehole	Unknown	60m south of Fairgreen Road at the Proposed Scheme	Low	Abstraction point associated with a poor aquifer which is likely to have a low importance on a regional scale

14.3.2.10 Regional Environmentally Sensitive Sites

Protected Areas

The National Parks and Wildlife Services (NPWS) is responsible for the designation of environmentally protected sites in Ireland and maintains a publicly available database of these sites. These sites include Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Natural Heritage Areas (NHAs). In addition to these sites, the NPWS also maintains a database of proposed Natural Heritage Areas (pNHAs). These features are assessed in this Chapter relation to soil, geology and hydrogeological impacts and are assessed fully in Chapter 15 (Archaeological Cultural Heritage and Architectural Heritage). The protected areas in the study area are shown on Figure 14.5 in Volume 3 of this EIAR and are listed in Table 14.15 along with their importance with respect to feature quality and significance as determined by Box 4.1 in the NRA Guidelines (NRA 2008a).

Table 14.15: Ecologically Sensitive Sites within the Study Area

Abstraction feature	Description	Location	Importance	Justification
The Lough Corrib SAC and pNHA	This is classified as a SAC as it supports a number of species that are listed on Annex I / II of the EU habitats directive.	West of the study area and underlies the Proposed Scheme at the River Corrib	Extremely High	Attribute has a high quality or value on an international scale
The Galway Bay Complex (Lough Atalia) SAC and pNHA	This area includes the coastal waters of inner Galway Bay and Lough Atalia. This is classified as a SAC as it supports a number of species that are listed on Annex I / II of the EU habitats directive.	East of the study area south of the Proposed Scheme at Lough Atalia and Galway Harbour	Extremely High	Attribute has a high quality or value on an international scale

Abstraction feature	Description	Location	Importance	Justification
The Inner Galway Bay SPA	This area includes the coastal waters of the Corrib Estuary, inner Galway Bay and Lough Corrib. This is designated a SPA under the EU Birds Directive as it is of special conservation interest for a number of bird species.	East of the study area south of the Proposed Scheme at Lough Atalia and Galway Harbour	Extremely High	Attribute has a high quality or value on an international scale

These protected sites do not contain groundwater dependant habitats in the vicinity of the site development. While these sites may not be groundwater dependent, they will receive groundwater flow from within the study area.

14.3.2.11 Regional Soft and / or Unstable Ground

Soft soils consist of peat, fine grained alluvium or very soft cohesive material. Their presence within the regional study area could result in an impact on nearby important features if they require excavation or dewatering. Various sources of information were consulted in establishing these areas within the study area namely:

- Ground investigation data; and
- Scheme walkover survey.

The GSI database (GSI 2017) shows no recorded landslide events within the study area and therefore unstable ground is not considered further in this assessment.

14.3.2.12 Regional Contaminated Land

Considering the location of the Proposed Scheme in the urban environment, there are likely to be some sources of contamination within the made ground throughout the study area. Therefore, the assessment of contaminated land is focused on the footprint and directly on either side of the Proposed Scheme unless there is likely to be a pathway connecting the possible source of contamination to the footprint of the Proposed Scheme.

Various sources of information were consulted in assessing the Proposed Scheme for locations of potential contaminated land:

- CORINE land cover mapping (EPA 2018);
- Teagasc soil map (Teagasc et al. 2017);
- EPA Maps (EPA 2019);
- OSI mapping (OSI 2019);
- The information provided by the design team; and
- Local authority archives and databases.

The known potential sources of contamination relevant to the Proposed Scheme identified within the study area are detailed in

Table 14.16 along with their importance as determined by Box 4.1 of the NRA Guidelines (NRA 2008a).

Table 14.16: Summary of Potential Sources of Contaminated Land Adjacent to the Proposed Scheme

Feature	Description	Location	Importance	Justification for Importance Rating
Petrol Station	College Road Service Station (CRSS) petrol station identified along the Proposed Scheme	College Road	Medium	Contaminated soil on site with previous light industrial usage
Historic Petrol Station	Previous petrol station with overground tanks identified along the Proposed Scheme	Headford Road	Medium	Contaminated soil on site with previous light industrial usage
Galway Ceannt Train Station	OSi 25-inch mapping	Eyre Square	Medium	Contaminated soil on site with previous light industrial usage
Historical Mill	OSi 6-inch mapping	Earls Island	Medium	Contaminated soil on site with previous light industrial usage
Historical Infirmary	OSi 6-inch mapping	Bothar na mBan	Medium	Contaminated soil on site with previous light industrial usage
Historical Foundry	OSi 6-inch mapping	Dock Road	Medium	Contaminated soil on site with previous light industrial usage
Historical Saw Mill	OSi 25-inch mapping	Dock Road	Medium	Contaminated soil on site with previous light industrial usage
Galway Harbour Enterprise Park	Enterprise Park hosting industrial park. Identified on the 1995 OSi Aerial photograph	Galway Harbour Enterprise Park	High	Contaminated soil on site with industrial usage

There are no EPA licensed facilities within the regional study area.

14.3.2.13 Regional Mineral / Aggregate Resources

Considering the location of the Proposed Scheme in an urban environment, there are unlikely to be many opportunities to extract mineral or aggregate resources, however the following datasets were consulted in order to assess the impact of the Proposed Scheme on the economic geology of the study area:

- GSI: aggregate potential mapping (GSI 2016b, GSI 2016c);
- GSI: mineral localities (GSI 2014);
- GSI active quarries (GSI 2019d); and
- GSI APM pits and quarries (GSI 2016c).

A summary of the aggregate resources identified in the study area are outlined in Figure 14.8 in Volume 3 of this EIAR and Table 14.17 along with their importance as determined by the Box 4.1 of the NRA Guidelines (NRA 2008a).

According to the GSI, there is no granular aggregate potential, mineral localities active quarries or historic pits within the study area.

Table 14.17: GSI Aggregate Potential for the Study Area

GSI Aggregate Potential Type	Potential	Location	Importance	Justification for Importance Rating
Crushed rock aggregate potential	Very Low potential	Underlying the River Corrib	Low	Uneconomically extractable mineral resource
Crushed rock aggregate potential	Low potential	West of Saint Brendan's Court, Eyre Square, and Fairgreen Road and continuing until the River Corrib. There are also areas under Earls Island, University Road and northeast of Galway Harbour Enterprise Park	Low	Uneconomically extractable mineral resource
Crushed rock aggregate potential	Moderate potential	West of University Road and an area underlying Galway Harbour Enterprise Park	Low	Sub-economic extractable mineral resource
Crushed rock aggregate potential	High potential	East of Saint Brendan's Court; Eyre Square, underlying Galway harbour Enterprise Park, Fairgreen Road and north-east of both the Moneenageisha Road and the Dublin Road.	Low	Considering the sites urban setting the potential to extract mineral resource is considered very low.

14.3.2.14 Regional Geological Heritage Areas

Geological Heritage Areas are designated as part of the Irish Geological Heritage Programme, a partnership with GSI and the Department of Housing, Local Government and Heritage. The aim of the Programme was to identify, document and protect the wealth of geological heritage in Ireland.

A review of the Geological Heritage Areas (GHAs) within the study area has indicated the presence of two county geological sites (the 2020 county audit did not recommend them as pNHAs). These sites are presented on Figure 14.4 in

Volume 3 of this EIAR and listed in Table 14.18 and Table 14.13 along with their importance as determined by the Box 4.1 of the NRA Guidelines (NRA 2008a).

Table 14.18: GSI Geological Heritage Sites

Geological Heritage Site	Description	Location	Importance	Justification for Importance Rating
Shantalla Sliding Rock– Site Code: GC009	A Landmark outcrop with historical significance in suburban estate amenity park, it is comprised of the Metagabbro. There is also a Stone cross with a plinth made from Carboniferous limestone;	O'Conaire Road	High	Geological feature of high value on local scale (County Geological Site)

14.3.3 Site Specific Environment

The following section discusses the site-specific conditions within the study area for the Proposed Scheme as defined in Section 14.2.1.

Where applicable the importance of the attributes for which the impact of the Proposed Scheme is to be assessed are reported in this Section.

14.3.3.1 Current and Historic Land Use

The current and historic land use is discussed in order to give context to any potential changes to land, soils, geology and hydrogeology that have the potential to influence the importance of a feature and the magnitude of any impacts. The current land use is based on current aerial imagery and mapping available from Ordnance Survey Ireland (OSI) (OSI 2020), Google (Google 2020), Bing (Bing 2020) and the Corine Land Cover maps (EPA 2018). The historic land use is based on the following OSI (OSI 2020) historic aerial imagery and historic maps:

- OSI 6-inch mapping produced between 1837 and 1842;
- OSI 25-inch mapping produced between 1888 and 1913;
- OSI 6-inch Cassini mapping produced between 1830 and 1930s;
- OSI mapping produced between 1945-1962;
- OSI mapping Produced between 1977-1980;
- OSI mapping between 1991 and 1992
- OSI 1995 aerial photography;
- OSI 2000 aerial photography;
- OSI 2005 aerial photography; and
- Corine Land Cover map.

The OSI 6-inch mapping shows that the area underlying the Proposed Scheme was comprised of a both historical development and green-fields.

The historical development was concentrated along the banks of the River Corrib and continued east to Eyre Square. The areas to the far west and far east of the

scheme are described as agricultural. There is a flood plain noted at the north of Lough Atalia.

The OSI 25-inch mapping shows an increase in historical developments in the city particularly east of the River Corrib. The areas surrounding Lough Atalia are shown as agricultural land. There is a flood plain noted at the north of Lough Atalia.

The OSI Galway City maps were also consulted for the Lough Atalia area. The maps from 1945 to 1962 show the area as a tidal flood plain including labelling it as liable to flooding and much of the coast here is listed as mud. The 1977 to 1980 OSi mapping for this area show that the area has been developed and the natural coastline is no-longer indicated on the maps. This suggests that development in these areas took place between 1962 and 1977.

The OSI Aerial 1995 shows that the area underlying the Proposed Scheme has undergone a significant level of infrastructure, urban and residential development.

The OSI Aerial from 2000 to 2020 photographs shows little change in the area underlying the Proposed Scheme from 1995.

14.3.3.2 Local Geology

The following site-specific ground investigations have been completed at the site:

- Apex Geophysics Ltd, 2021. Non-intrusive geo-physical survey, Galway Busconnects – Cross City Link carried out in the east of the Proposed Scheme to collect information on the buried services at College Road Service Station and on the ground profile; and
- Causeway Geotechnical Ltd, 2021. Intrusive ground investigation, Galway Busconnects - Cross City Link carried out mostly in the east of the Proposed Scheme to collect information to inform the design of earth works and collect geoenvironmental information around College Road Service Station. One location was drilled in the west on St Brendan's Avenue to collect information on the strata in that area.

An interpreted generalised stratigraphy base on the results of the 2021 ground investigations is presented in Table 14.19 below. The location of the boreholes and window samples from 2021 referred to in the text below are shown on the 'Exploratory Hole Location Plan' in Appendices 14.2a and 14.2b of Volume 4 of this EIAR. Copies of the logs for the boreholes within the study area are presented in Appendices 14.2a and 14.2b of Volume 4 of this EIAR.

Table 14.19: General Stratigraphy for the East of the Proposed Scheme and at St. Brendan's Avenue based on 2021 Ground Investigation

Stratum	Description	Depth to Top of Stratum (m BGL)	Thickness of Stratum (m)
Topsoil / Bitmac / Concrete	Topsoil with roots and fragments of plastic	0	0.1 - 0.4

Stratum	Description	Depth to Top of Stratum (m BGL)	Thickness of Stratum (m)
Made Ground	Underlying Service Station forecourt – Brown to Grey silty sandy angular to subangular fine to coarse GRAVEL with high cobble content and fragments of plastic. Sand is fine to coarse. Cobbles are subangular. Underlying Lough Atalia reclaimed area - Firm becoming stiff sandy gravelly Clay with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular.	0 – 0.1	0.3 – 2.0
Sub-Soils	Soft to stiff brown to grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. 0.3m thick sand lens noted within WS106. Sand described as dark grey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse.	0.6 – 1.0	0.7 – 1.9
	Grey to brown sandy silty subangular to subrounded fine to coarse GRAVEL with low to medium cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded.	2.5 – 4.0	0.3 – 3.3
	Very soft to soft grey to brown slightly clayey SILT with organic fibres.	1.65	0.45
	Very soft to soft dark brown-black fibrous Peat	2.1	0.8 – 2.8
Weathered Bedrock	The Burren Formation – medium strong grey massive Limestone partially weathered with close fracture spacing. Also described as grey sandy subangular fine to coarse Gravel – possible weathered bedrock in places.	5.1 – 5.8	0.7-1.6
Bedrock	East of Proposed Scheme The Burren Formation –medium strong massive grey Limestone, with local areas of partial weathering and clay deposits along rare joint surfaces.	2.3 – 6.7	Unknown
	West of Proposed Scheme Orthogneiss metagabbro suite – medium to strong dark grey Gabbro with grey to white diorite vein intrusions. Partially weathered with	2.5	Unknown

Stratum	Description	Depth to Top of Stratum (m BGL)	Thickness of Stratum (m)
	slightly reduced strength occasional fractures with orange brown discolouration.		

14.3.3.3 Made Ground

The made ground found in the site investigation was variable. The made ground present underlying the College Road Service Station (CRSS) forecourt was engineered fill. This was found in BH103WS, BH103, BH102, BH102A and WS104. This material was described as a brown to grey silty sandy angular to subangular fine to coarse gravel with high cobble content and fragments of plastic. Sand is fine to coarse. Cobbles are subangular. The madeground ranges from 0.3 to 2.0m in thickness.

The made ground found underlying the Lough Atalia reclaimed area was defined as a firm becoming stiff sandy gravelly clay with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are sub-angular. This material was likely re-worked natural material sourced from the surrounding area.

During the investigation no visual or olfactory evidence of contamination was noted in the made ground. Photo-ionisation detector (PID) readings were taken throughout the investigation and were at measurable level underlying the service station forecourt with readings ranging from 0.1ppm to 0.8ppm. The PID readings outside of the service station forecourt were below the detection limit. Geo-environmental testing was carried out on the made ground, this is further discussed in Section 14.3.3.8 below.

14.3.3.4 Silt and Peat

Silt and peat deposits have been located in WS101 and BH104 only.

These deposits are located to the north of the study area at the Lough Atalia reclamation area. They are described as very soft to soft grey to brown slightly clayey Silt with organic fibres and very soft to soft dark brown-black fibrous Peat.

These deposits are likely Estuarine deposits associated with Lough Atalia and are not wide-spread but are likely to be found in the historic footprint of the Lough that existed prior to reclamation.

14.3.3.5 Gravel

The gravel deposits typically underlie the clay deposits apart from BH102, BH103WS, WS104 where they are overlain by the madeground and WS101 and WS104 where the peat and silt deposits are interbedded between the clay and gravel.

The gravels appear to be in hydraulic connectivity with the underlying limestone bedrock aquifer. No visual or olafactory evidence of contamination was noted within the gravel.

14.3.3.6 Limestone Bedrock

The Buren Formation limestone bedrock was found to be underlying the east of site. This was found in BH101, BH102, BH103, BH104 and BH105. This bedrock is likely to form part of the regional bedrock Locally Important Aquifer.

14.3.3.7 Orthogneiss/Metagabbro Bedrock

The orthogneiss/metagabbro suite bedrock was found to be underlying the centre of the study area at BH106 on St. Brendan's Avenue. The Orthogneiss metagabbro bedrock was medium to strong dark grey Gabbro with grey to white diorite vein intrusions. Partially weathered with slightly reduced strength occasional fractures with orange brown discolouration. This bedrock forms part of the Poor Aquifer to the west of the study area which is generally unproductive except for local zones.

14.3.3.8 Soil Contamination

Considering that the Proposed Scheme will pass though the forecourt of the CRSS and because it is located in the vicinity of Lough Atalia and the Galway Bay Complex SAC a detailed assessment of the contamination in the soil has been carried out in that area. The assessment has followed the methodology presented in the Environmental Protection Agency's "Guidance on the management of Contaminated Land and Groundwater at EPA licensed sites". The assessment is presented in the Appendix 14.3 of Volume 4 of this EIAR.

The results of this assessment show:

- The site has been previously a print works and a filling station has been operated on the site since the 1960's. A detailed ground investigation was carried out which did not prove any significant soil or groundwater contamination from the storage of fuels on the site.
- Based on the results of the ground investigation cadmium and hydrocarbons are present in groundwater under the CRSS that is likely to originate from made ground under the CRSS. It is possible that cadmium and hydrocarbons originating from the made ground under CRSS is the source of elevated cadmium and hydrocarbons in the seepages on the banks of Lough Atalia.

14.3.3.9 Local Hydrogeology

During the 2021/2022 intrusive ground investigation, groundwater strikes were observed in the gravel deposits, the limestone bedrock and the orthogneiss. Groundwater was monitored by hand and using loggers during the 2021/2022 ground investigation in six standpipes installed in either the gravel deposits or the limestone bedrock between the 27th of January 2022 and the 07th of February 2022.

A hydrograph presenting groundwater levels recorded in the east of the Proposed Scheme is presented in Appendix 14.4 of Volume 4 of this EIAR and groundwater contours are presented in the Land Contamination Remedial Strategy in Appendix 14.5 of Volume 4 of this EIAR. In summary groundwater in the east of the Proposed Scheme is present 1.4 to 2.0 mbgl in the gravel and limestone and the groundwater in these layers is in continuity. The groundwater in both strata respond quickly to recharge. The groundwater in the gravel is likely to drain to the lough via seepages on the bank of Lough Atalia and via limestone into the base of the lough.

The groundwater level measured in the orthogneiss metagabbro suite was measured at 1.6mBGL.

14.3.3.10 Groundwater Quality

A comparison of the groundwater quality in the east of the Proposed Scheme against water quality standards is presented in Appendix 14.6 of Volume 4 of this EIAR. A summary of the comparison is presented above in Section 14.3.3.8 and the Land Contamination Remedial Strategy in Appendix 14.5 of Volume 4 of this EIAR.

14.3.4 Summary of the Features of Importance

The importance ranking of the features, based on Box 4.1 of the NRA Guidelines (NRA, 2008a), established for the baseline conditions is summarised below.

Features with an importance ranking of low are not considered further as they will not result in a significant impact according to Box 5.4 of the NRA Guidelines (NRA, 2008a) and are summarised in Table 14.20 for completeness.

Features with an importance ranking of medium or higher are summarised in Table 14.21 and the impact of the Proposed Scheme on these features is assessed in Section 14.4.

Table 14.20: Summary of Land, Soils, Geology and Hydrogeology Features with Low Importance Within the Study Area

Category	Feature	Description	Location	Importance	Justification
Soils (Teagasc soil classification)	Made Ground - Made	Associated with urban development	Widespread under the Proposed Scheme	Low	Poorly drained and / or low fertility soils
Subsoil deposits (GSI Quaternary Classification)	Made Ground - Urban	Associated with urban development	Widespread under the Proposed Scheme	Low	Low value on a local scale
	Glacial till - TLs	Till derived from limestones	South of the study area north of Galway harbour and at Galway	Low	Low value on a local scale

Category	Feature	Description	Location	Importance	Justification
			Harbour Enterprise park and to the north-east of the study area at Corbett Commercial Centre		
	Estuarine silts and clays - Mesc	Found adjacent to estuaries, combination of Estuarine silts and clays	Adjacent to Lough Atalia and north of Galway Harbour Enterprise Park	Low	Low value on a local scale
Bedrock Geology	Burren Formation	Pale grey clean skeletal limestone – Carboniferous.	East of the study area from the Corrib Shopping Centre to the Corbett Commercial Centre	Low	Low value on a local scale
	Meta-Gabbro and ortho-gneiss	An Undifferentiated Quartz-Diorite Gneiss, Quartz Diorite Gneiss & Granitic Gneiss and Metagabbro and Related Lithologies. Coarse to fine grained metamorphic rock.	West of the study area from University College Hospital Galway to the Corrib Shopping Centre and to the south of the study area underlying Galway Harbour	Low	Low value on a local scale
Mineral / Aggregate Resources	Crushed rock aggregate potential	Very Low potential	Underlying the River Corrib	Low	Uneconomically extractable mineral resource
	Crushed rock aggregate potential	Low potential	West of Saint Brendan's Court, Eyre Square, and Fairgreen Road and continuing	Low	Uneconomically extractable mineral resource

Category	Feature	Description	Location	Importance	Justification
			until the River Corrib.		
	Crushed rock aggregate potential	Moderate potential	West of University Road and an area underlying Galway harbour Enterprise Park	Low	Uneconomically extractable mineral resource
	Crushed rock aggregate potential	High potential	East of Saint Brendan's Court; Eyre Square, underlying Galway harbour Enterprise Park, Fairgreen Road and north-east of both the Moneenageisha Road and the Dublin Road.	Low	Uneconomically extractable mineral resource
Aquifer Type and Classification	Poor Aquifer	Bedrock which is generally unproductive except for local zones (PI)	West of St Brendan's Court; Eyre Square and Fairgreen Road, underlying Galway Harbour Enterprise Park Enterprise Park.	Low	Low yielding aquifer
Abstraction points	1121NEW012 - borehole	Unknown	10m south of Fairgreen Road along the Proposed Scheme	Low	Abstraction point associated with a poor aquifer which is likely to have a low importance on a regional scale
	1121NE016 - borehole	Unknown	60m south of Fairgreen	Low	Abstraction point

Category	Feature	Description	Location	Importance	Justification
			Road at the Proposed Scheme		associated with a poor aquifer which is likely to have a low importance on a regional scale

Table 14.21: Summary of Land, Soils, Geology and Hydrogeology Features with Medium to Extremely High Importance within the Study Area

Category	Feature	Description	Location	Importance	Justification
Soils (Teagasc soil classification)	Alluvium - AlluvMIN	Typically found along current and historic watercourses	Along the River Corrib and its tributaries – just North of Dyke Road	Medium	Moderately drained and / or moderate fertility soils
	Marine/Estuarine sediments - MarSed	Typically found along the coast	Adjacent to Lough Atalia	Medium	Moderately drained and / or moderate fertility soils
	Topsoil – PDPT Peaty Gleys Basic	Peaty Gleys with Basic parent material	East of Galway Harbour Enterprise Park	Medium	Moderately drained and / or moderate fertility soils
	Topsoil - AminDW	Typically found along current and historic watercourses	Along the River Corrib and its tributaries – east of Galway Retail Park	High	Well drained and / or high fertility soils
	Topsoil - BminDW	Deep well drained (Mainly basic)	South of the study area north at Galway harbour and to the north-east of the study area at Corbett Commercial Centre.	High	Well drained and / or high fertility soils
	Topsoil – BminSW	Shallow well drained (mainly basic)	North-east of Galway Harbour	High	Well drained and / or high fertility soils

Category	Feature	Description	Location	Importance	Justification
			Enterprise park		
Subsoil deposits (GSI Quaternary Classification)	Fen Peat-FenPt	Typically found along current and watercourses	Along the River Corrib and its tributaries, east of Galway Retail Park	Medium	Volume of peat and/or soft organic soil underlying the route is moderate on a local scale
Groundwater Abstraction points	1121NEW005 – borehole	Ballinfoyle Group scheme. Domestic use only – good yield at 141.8m^3/d	50m to the north-east of the Proposed Scheme	Medium	Locally important abstraction points which is important on a local scale
	121NEW011 - borehole	Unknown	50m north of Fairgreen Road of the Proposed Scheme	Medium	Conservatively assumed to be a locally important abstraction point which is important on a local scale
	1121NEW015 – borehole	Unknown	10m south of Fairgreen Road of the Proposed Scheme	Medium	Conservatively assumed to be a locally important abstraction point which is important on a local scale
	1121NEW014 - borehole	Unknown	50m south of Fairgreen Road of the Proposed Scheme	Medium	Conservatively assumed to be a locally important abstraction point which is important on a local scale
Environmentally Sensitive Areas	The Lough Corrib SAC and pNHA	This is classified as a SAC as it supports a number of species that are listed on Annex I / II of the EU habitats directive	West of the study area and underlies the Proposed Scheme at the River Corrib	Extremely High	Attribute has a high quality or value on an international scale
	The Galway Bay	This area includes the	East of the study area	Extremely High	Attribute has a high quality or

Category	Feature	Description	Location	Importance	Justification
	Complex (Lough Atalia) SAC and pNHA	coastal waters of inner Galway Bay and Lough Atalia. This is classified as a SAC as it supports a number of species that are listed on Annex I / II of the EU habitats directive;	south of the Proposed Scheme at Lough Atalia and Galway Harbour		value on an international scale
	The Inner Galway Bay SPA	This area includes the coastal waters of the Corrib Estuary, inner Galway Bay and Lough Corrib. This is a SPA under the E.U. Birds Directive, of special conservation interest for a number of bird species; and	East of the study area south of the Proposed Scheme at Lough Atalia and Galway Harbour	Extremely High	Attribute has a high quality or value on an international scale
Contaminated Land	Petrol Station	College Road Service Station (petrol station) identified along the Proposed Scheme	College Road	Medium	Contaminated soil on site with previous light industrial usage
	Historic Petrol Station	Previous petrol station with overground tanks identified along the Proposed Scheme	Headford Road	Medium	Medium value on a local scale
	Galway Ceannt Train Station	OSi 25-inch mapping	Eyre Square	Medium	Medium value on a local scale

Category	Feature	Description	Location	Importance	Justification
	Historical Mill	OSi 6-inch mapping	Earls Island	Medium	Medium value on a local scale
	Historical Infirmary	OSi 6-inch mapping	Bothar na mBan	Medium	Medium value on a local scale
	Historical Foundry	OSi 6-inch mapping	Dock Road	Medium	Medium value on a local scale
	Historical Saw Mill	OSi 25-inch mapping	Dock Road	Medium	Medium value on a local scale
	Galway Harbour Enterprise Park	Enterprise Park hosting industrial park. Identified on the 1995 OSi Aerial photograph	Galway Harbour Enterprise Park	High	Contaminated soil on site with industrial usage
Geological Heritage Area	Shantalla Sliding Rock	Landmark outcrop with historical significance in suburban estate amenity park, it is comprised of the Murvey Granite and Metagabbro. There is also a Stone cross with a plinth made from Carboniferous limestone;	O'Conaire Road	High	Geological feature of high value on local scale
Geological Heritage Area and Karst feature	St. Augustine's Well	Freshwater karst spring on the shore of a saline tidal lagoon which was a historic holy well visited for its apparent curative properties;	100m south-east of the Proposed Scheme on Lough Atalia North shore	High	Feature which is important on a local scale
Aquifer type and classification	Regionally Important aquifer	Bedrock which regionally important and	East of Saint Brendan's Court; Eyre Square;	High	Regionally important aquifer which is important

Category	Feature	Description	Location	Importance	Justification
		is Karstified conduits (Rkc)	and Fairgreen Road		on a regional scale

14.3.5 Conceptual Site Model

A Conceptual Site Model (CSM) has been developed for the Proposed Scheme based on the ground investigation data and all publicly available data.

The CSM summarises the important geological and hydrogeological features near the Proposed Scheme. The subsections of the Proposed Scheme listed in Chapter 5 (Construction) of this EIAR are presented in Table 14.22 to Table 14.24 along with the proposed works, expected groundwater levels and the soils and geology at each earthwork area.

The Proposed Scheme is located across Galway City. The west of the Proposed Scheme is in the catchment of the River Corrib which flows southwards and is crossed via Salmon Weir Bridge in the west of the site. The east side of the Proposed Scheme is in the catchment of Lough Atalia which is adjacent to the site boundary at its closest point. Both are tidal features and are Special Areas of Conservation (SAC).

The area of the Proposed Scheme is developed and covered by a layer of made ground seen to be 0.3 to 2.0m thick in places. The made ground has been proven in two areas to overlie a layer of clay which ranges from (but is not limited to) 0.1 to 3.5m in thickness. In the eastern area beneath the clay there is a 0.4 to 3.3m layer of gravels and then bedrock. In the western area of the Proposed Scheme, it is likely that the clay layer directly overlies the bedrock.

There are two types of bedrock observed underlying the Proposed Scheme limestone bedrock in the eastern and centre area of the Proposed Scheme and the orthogneiss/metagabbro bedrock underlying the centre and west of the Proposed Scheme. The Limestone bedrock is a Regionally Important aquifer. The orthogneiss/metagabbro bedrock is a poor aquifer where the bedrock is generally unproductive.

Due to the presence of hardstanding and clay under the made ground it is likely that the amount of recharge to the underlying bedrock is low under the Proposed Scheme. Limestone is likely to receive the majority of its recharge outside of the study area. Notwithstanding this there is evidence that in discreet locations in the east of the Proposed Scheme surface water can infiltrate into the gravel and limestone bedrock groundwater. The recharge to the orthogneiss/metagabbro is likely to be minimal.

The water level in the limestone was recorded to be approximately 1.4 to 2.0m below the surface in the east and 1.6m in the west. The limestone bedrock in the east is believed to be in hydraulic connectivity with the overlying gravel deposit. The regional groundwater flow in the limestone and gravels, where they are present, is to the east or south-east towards Lough Atalia. Groundwater flow in

the orthogneiss/metagabbro is likely to be minimal and is likely to discharge locally to the River Corrib or Galway Harbour.

There is a recorded karst feature present within the limestone bedrock, St. Augustine's well. This is a karst spring present 100m south-east of the Proposed Scheme on the shore of Lough Atalia. It is understood that its catchment area is located 1.9km to the north of the city at the Terryland River to the north of the Proposed Scheme and outside of the 250m study area. In the vicinity of the spring the limestone aquifer vulnerability is classed as medium. In addition, over 0.9m-1.5m of low permeability clay was proven above the bedrock 450m to the north of the spring (WS105 and WS106) hence the spring is not likely to receive any significant recharge from the area of the Proposed Scheme.

Table 14.22: Conceptual Site Model – Section A University Road to Eyre Square, Woodquay and Headford Road

Subsection	Length (m)	Dominant Earthworks Type	Cut (m)		Fill (m)		Expected Ground Conditions	Range of Thickness (m)	Additional Notes
			Max	Avg	Max	Avg			
A1 - University Road	500	At Grade	3.5	<0.5	<0.5	<0.5	Road pavement and foundation (Made ground) overlying Clay overlying bedrock - metagabbro & orthogneiss suite. Metagabbro & orthogneiss suite comprising a Poor Aquifer – Bedrock is Generally Unproductive. Groundwater level range recorded from 3.0mBGL to 3.4mBGL	Made ground: 2.3 to 3.0 Clay: 1.5 to 3.0 Gravels: N/A Bedrock: N/A	Localised pavement reconstruction, Drainage works and construction of a petrol interceptor.
A2 - Gaol Road and Cathedral	-	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction, landscaping works and Drainage works. Proposed Construction compound location.
A3 - Salmon Weir Bridge	85	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction works.
A4 - Newtownsmith/Waterside	130	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction and drainage works.
A5 - St. Vincent's Avenue / Walsh's Terrace	310	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction and drainage works.
A6 - Dyke Road / Headford Road	420	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction and drainage works.
A7 - St. Francis St / Eglinton Street / Williamsgate	390	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction and drainage works.
A8 - Woodquay / Daly's Place Mary Street	260	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction, landscaping works and Drainage works.

Table 14.23: Conceptual Site Model – Section B Eyre Square to Dock Road, Bothar na mBan to College Road

Subsection	Length (m)	Dominant Earthworks Type	Cut (m)		Fill (m)		Expected Ground Conditions	Range of Thickness (m)	Additional Notes
			Max	Avg	Max	Avg			
B1 - Bóthar na mBan/St. Brendan's Avenue	250	At Grade	<0.5	<0.5	<0.5	<0.5	Road pavement and foundation (Madeground) overlying Glacial Till (boulder Clay) overlying bedrock: Metagabbro & orthogneiss suite north of Saint Brendan's Avenue (confirmed from 2021 GI) The Burren Formation - Limestone south of Saint Brendan's Avenue (as inferred from Historic GI and GSI mapping) Metagabbro & orthogneiss suite comprising a Poor Aquifer – Bedrock is Generally Unproductive. The Burren Formation comprising a Regionally Important Aquifer – Bedrock productive on a regional scale	Made ground: 1.2 to 2.5 Clay: 0.9 to 3.5 Gravels: 0.3-0.4 Bedrock: N/A	Localised pavement reconstruction works, road realignment. Demolition of two residential properties.
B2 - Prospect Hill	220	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction works, junction realignment.
B3 - Eyre Square North/Eyre Square East/Eyre Square South	-	At Grade	<0.5	<0.5	<0.5	<0.5			Localised road, pavement reconstruction and landscaping works.
B4 - Victoria Place/ Merchant's Road/ Queen Street	405	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction works.
B5 - Forster Street	155	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction works
B6 - College Road/Forster Street/Fairgreen Road/Bóthar Uí hEithir junction	-	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction works
B7 - Bóthar Uí hÉithir	175	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction works
B8 - Fairgreen Road	275	At Grade	<0.5	<0.5	<0.5	<0.5			Localised pavement reconstruction works

Subsection	Length (m)	Dominant Earthworks Type	Cut (m)		Fill (m)		Expected Ground Conditions	Range of Thickness (m)	Additional Notes
			Max	Avg	Max	Avg			
							Groundwater strike recorded at 5.7mBGL in Metagabbro & orthogneiss unit Groundwater Level strike recorded from 4.35 4.4mBGL in the Limestone		

Table 14.24: Conceptual Site Model – Section C College Road to Dublin Road

Subsection	Length (m)	Dominant Earthworks Type	Cut (m)		Fill (m)		Ground Conditions	Average Thickness of Made Ground (m)	Additional Notes
			Max	Avg	Max	Avg			
C1 - College Road (to junction with Lough Atalia Road)	885	At Grade	<0.5	<0.5	<0.5	<0.5	Road pavement and foundation (Madeground) overlying Glacial Till (boulder Clay) and Pockets of organic Silt and Peat interbedded with the Glacial Till adjacent to Lough Atalia (Estuarine Deposits) overlying bedrock: The Burren Formation - Limestone	Made ground: 0.3-2.0 Clay: 0.1-1.9 Gravel: 0.3 – 3.3 Bedrock: N/A	Localised pavement reconstruction and junction reconstruction works.
C2 - College Road/Lough Atalia Road junction	120	At Grade	3.5	1.2	<0.5	<0.5			Realignment and update of Junction and Localised pavement reconstruction.
C3 - College Road (to junction at Moneenageisha)	195	At Grade	1.9	0.7	<0.5	<0.5			Significant widening on west of College Road adjacent to College Road Service Station petrol station, Localised junction treatments
C4 - Moneengeisha junction	-	At Grade	<0.5	<0.5	<0.5	<0.5			Update of existing Junction and Localised pavement reconstruction.
C5 - R338 Dublin Road	370	At Grade	<0.5	<0.5	0.8	<0.5			Installation of inbound and outbound bus lanes, Pavement reconstruction and Localised junction entry treatments.

Subsection	Length (m)	Dominant Earthworks Type	Cut (m)		Fill (m)		Ground Conditions	Average Thickness of Made Ground (m)	Additional Notes
			Max	Avg	Max	Avg			
							The Burren Formation comprising a Regionally Important Aquifer – Bedrock productive on a regional scale Groundwater Level recorded from 1.5mBGL to 2.1 mBGL.		

14.3.5.1 Environment Type

The environment across the study area has been categorised in accordance with the IGI Guidelines. It has been classified as:

Type A environment – This is located to the centre and west of the study area which corresponds to the underlying regional poor aquifer which is generally unproductive except for local zones (PI). The Type A environment to the west of the study area represents a passive geological / hydrogeological environment – examples include areas of thick low permeability subsoils, areas underlain by poor aquifers, recharge areas and historically stable geological environments.

Type B environment – This is located to the centre and east of the study area, it corresponds to the underlying regionally important bedrock aquifer which is Karstified. The Type B environment to the east of the study area represents a naturally dynamic hydrogeological environments examples include areas of groundwater discharge areas, areas underlain by regionally important aquifers, nearby spring rises, areas underlain by permeable subsoils.

14.4 Potential Impacts

This section presents potential impacts that may occur due to the Proposed Scheme, in the absence of mitigation. This informs the need for mitigation or monitoring to be proposed (Refer to Section 14.5). Predicted 'residual' impacts considering any proposed mitigation are presented in Section 14.6.

14.4.1 'Do Nothing' Scenario

In the Do Nothing scenario the Proposed Scheme would not be implemented and there would be no resulting impacts on the land, soils, geology and hydrogeology along the route of the Proposed Scheme.

Based on the findings of the assessment the College Road Service Station there is currently an impact on groundwater due to activities occurring in the area. However, this is localised to a limited in extent and only comprises metals which are naturally occurring and occasional low levels of hydrocarbons, hence the current impact is categorised as a negative small to moderate effect on the groundwater quality. Hence the current significance on the Regionally Important Aquifer is considered to be a negative slight/moderate impact to a negative significant/moderate impact.

There is an elevated concentration of cadmium noted in all boreholes under the College Road Service Station (CRSS). Cadmium is recorded in the seepage discharging into Lough Atalia and is likely to originate from the made ground under the CRSS including the area within the boundary of the Proposed Scheme. Also, low levels of hydrocarbons have been recorded in the groundwater under the site and in the seepage on the bank of Lough Atalia. The impact of both of these contaminants on water quality on the shore of the Lough is negative but the area affected is small. Considering the sensitivity of the Lough the significance of this do-nothing impact is negative significant and long-term.

14.4.2 Characteristics of the Proposed Scheme

A detailed description of the Proposed Scheme and construction activities are provided in Chapter 4 (Proposed Scheme Description) and Chapter 5 (Construction) of this EIAR.

This section outlines the key design features, characteristics and construction activities of the Proposed Scheme of relevance to land, soils, geology and hydrogeology.

A Construction Environmental Management Plan (CEMP) is provided in Appendix 5.1 in Volume 4 of this EIAR.

14.4.2.1 Section A – University Road to Eyre Square, Woodquay and Headford Road

- The construction activities in this section will include localised pavement reconstruction including footpath widening and additional pedestrian crossings, localised landscaping works, localised drainage works, localised entry treatments and installation of a bus gate at the entrance of Fisheries Field and the Salmon Weir-bridge.
- Notably, the proposed construction compound has been identified in this section at the carpark at Gaol Road and Galway Cathedral.

14.4.2.2 Section B – Eyre Square, Foster Street, Dock Road, Bothar na Mban, Bothar Ui hEithir and Fairgreen Road

- The generalised construction activities in this section will include localised pavement reconstruction works including road realignment, entry treatment installation, footpath widening and additional pedestrian crossings, upgrading signalised junctions, removal of carriageway space and surfacing of roads;
- The demolition of two residential properties on St Brendan's Avenue; and
- A portion of the existing wall outside the entrance to Galway County Hall will be removed to facilitate junction realignment.

14.4.2.3 Section C – College Road to Dublin Road

- The generalised construction activities Localised pavement reconstruction works including footpath widening, provision of entry treatments, provision of new landscaped areas, new priority pedestrian crossings and the installation of a bus-gate on College Road;
- The realignment and update of the College Road/Lough Atalia Road Junction, with a reduced junction footprint. This will include the removal of the existing traffic islands, and the College Road approach to the junction realigned to route through the existing grassed area between College Road and Lough Atalia Road;

- The works proposed on College Road (between Lough Atalia Road and Moneenageisha) comprise significant carriageway widening on the western side of College Road at the College Road Service Station (Circle K petrol Station) on College Road, this is to facilitate the construction of an additional outbound bus lane and inbound cycle track;
- The works at College Road Service Station to accommodate the Proposed Scheme will involve temporary acquisition of the entire College Road Service Station property. The works will include the complete removal of two of the six underground fuel storage tanks and existing pumping stations and excavation of up to approximately 200m^3 of contaminated soil and stone. Approximately 170m^3 classified as suitable for disposal to a non-hazardous waste facility and 30m^3 suitable for disposal to an inert waste facility;
- The volume of contaminated soil to be disposed of and replaced by clean fill shall be confirmed by verification testing of soil and ground as detailed in the Land Contamination Remedial Strategy (Appendix 14.5 of Volume 4 of this EIAR);
- There will be removal of two existing retaining walls and construction of same at Moneenageisha Court and at Bay View House. This is to accommodate the additional outbound bus lane;
- Surface water drainage gullies will be relocated to the new kerb edge and will connect back to the new drainage network, this drainage network will involve an attenuation tank, petrol interceptor and a drainage pipe. The drainage pipe will drain into Lough Atalia; and
- Installation of inbound and outbound bus lanes, pavement reconstruction and localised junction entry treatments.

14.4.3 Construction Phase

The potential land, soils, geology and hydrogeology impacts during the Construction Phase for the relevant construction activities described in Section 14.4.1 are presented in this Section, along with their impact significance. These potential impacts also relate and interact with other environmental factors which are described within the EIAR. Specific interactions are outlined in Section 14.1.

The Proposed Scheme could have the following potential impacts on the land, soils, geology and hydrogeology as discussed below and summarised in Table 14.25:

- Loss or damage of topsoil;
- Removal of hardstanding and excavation of potentially contaminated soils which could have the following impacts:
  - mobilisation of contamination into the regionally important aquifer; and
  - mobilisation of contamination into the Lough Atalia and Galway Bay Complex SAC;
- Spills from temporary storage of hazardous substances associated with the operation of plant e.g. fuels; and
- Dewatering.

Though the magnitude of the impact may vary depending on the scale of activities and location of the Proposed Scheme relative to the impacted important feature, in order to ensure a robust assessment, only the maximum magnitude or "worst case" of the impact of the Proposed Scheme is considered.

14.4.3.1 Loss or Damage of Topsoil

Topsoil is a non-renewable resource which if removed or damaged can result in a permanent irreversible negative impact. The potential ways in which this can occur as a result of the Proposed Scheme are as follows:

- There is the potential for materials on site to be spilled resulting in the pollution of the topsoil. For example, raw or uncured concrete and grouts, washed down water from exposed aggregate surfaces, cast-in-place concrete from concrete trucks, fuels, lubricants and hydraulic fluids for equipment used on the development site, bitumen and sealants used for waterproofing concrete surfaces can all potentially impact on soils and groundwater during the Construction Phase.
- Materials that are stockpiled incorrectly can be exposed to erosion and weathering which reduces the quality of the resource.
- Excavations in areas of contaminated ground during the construction works may cause mixing of contaminated and clean soil or mobilise pollution contained in the soils into the nearby topsoil.
- Permanent damage of topsoil through waterlogging, sealing, washout of fines and erosion. This would be due to the trafficking of plant, regrading of slopes, laying of hardstanding surfaces and storage of materials in areas not intended to be paved as part of the Proposed Scheme.
- Excavation and disposal of topsoil instead of its reuse or reinstatement.

The impacts of the Proposed Scheme on topsoil will only affect the topsoil within and in the immediate vicinity of the redline boundary. The topsoil within the redline is of low importance as the majority of the soils within the redline boundary are considered to be made ground. In addition, where soils were highlighted as not comprising made ground they are should be recorded as made ground because they are currently covered by roads or pavements etc. Hence all the soil within the Proposed Scheme is considered to be made ground and have a low importance.

Considering the potential impacts above, and dependant on the volume of topsoil that could be impacted, the magnitude of the effect on topsoil has the potential to be negative permanent small to moderate. However, as these soils are low importance the resulting significance of this impact will be an imperceptible to slight.

The impact of the production of excess material for removal off site is discussed in Chapter 17 (Waste & Resources) of this EIAR.

14.4.3.2 Mobilisation of Contamination into the Regionally Important Aquifer

During the construction exposure of locations of contamination and excavation of contaminated soil may potentially lead to contaminants being mobilised during rainfall and washed down into the underlying Regionally Important Aquifer.

One potential sources of contamination relevant to the Proposed Scheme has been identified within the study area, the College Road Service Station. This has been investigated and demonstrated to be currently impacting the Regionally Important Aquifer (refer to Appendix 14.5 of Volume 4 of this EIAR). In addition is it possible that localised 'hot spots' could be uncovered during the works.

Prior to the construction samples of any material to be excavated for reuse or disposal will be tested for contamination. During construction, areas of the site will be stripped of hard standing, and the contaminated soil removed. Ground excavated from these areas will be disposed of to a suitably licensed or permitted sites in accordance with the current Irish waste management legislation.

In addition, at the College Road Service Station two underground fuel tanks and fuel dispensers will be decommissioned. These activities could expose more contamination and allow it to drain down to the aquifer.

Considering the size of the College Road Service Station and that it has already been subject to an investigation the scale of any additional soil contamination is likely to be small. However, the removal of the tanks and decommissioning the fuel dispensers could, if not carried out correctly introduce some fuels to spill (for more information on decommissioning. Refer to Appendix 14.5 of Volume 4 of this EIAR). This could potentially result in an adverse moderate temporary effect on groundwater quality. Hence the overall significance is of this impact is significant/moderate.

The groundwater abstraction (1121NEW005) is located up-hydraulic gradient of the Proposed Scheme and the College Road Service Station. As a result, groundwater abstractions will not be affected. Hence the nature of any effect on groundwater quality will be negligible resulting in an imperceptible impact.

Several groundwater abstractions are shown in the city centre (1121NEW011, 1121NEW014 and 1121NEW015) but are not located directly downstream of the College Road Service Station. However, the Proposed Scheme does pass close to the area of the abstractions (Fairgreen Road). Their use is unknown however they are conservatively assumed to be of medium importance. If contamination was uncovered in that area of the Proposed Scheme it could present a risk to water quality in the abstractions. Groundwater vulnerability is classed as moderate in the area. Figure 14.3 shows they are underlain by till. The ground investigation proved clay (till) approximately 1km to the northeast of the site. Consequently, provided that the clay is not disturbed the abstractions are not considered likely to be susceptible to contamination from the Proposed Scheme. Therefore, the magnitude of any impact is negligible, and the significance will be imperceptible.

Similar to the groundwater abstraction the St Augustine's Well GHA is not located down hydraulic gradient of the College Road Service Station. However, the Proposed Scheme does pass over area between the well and its source (College Road, between the Galway City Council Office and the Galway Greyhound Stadium). Consequently, if contamination was uncovered in that area of the Proposed Scheme it could present a risk to water quality in the well. Groundwater vulnerability is classed as moderate in the area. Figure 14.3 in Volume 3 of this EIAR shows they are underlain by till. The ground investigation proved clay (till) approximately 0.5km to the northeast of the site. Consequently, provided that the clay is not disturbed the well is not considered likely to be susceptible to contamination from the Proposed Scheme. Therefore, the magnitude of any effect is negligible, and the significance of impacts are imperceptible.

14.4.3.3 Mobilisation of Contamination into the SAC

The removal of hardstanding on the central and eastern sections of the Proposed Scheme will result in a small increase in infiltration which could mobilize contamination into the underlying Regionally Important Aquifer, which could increase the amount of contaminants draining to Lough Atalia and Galway Bay Complex SAC. Considering the amount of dilution afforded by Lough Atalia and the short distance between the Proposed Scheme and the Lough the magnitude of this effect is considered to be a small adverse and temporary. However, as Lough Atalia is of extremely high importance, the resulting significance of the impact is considered to be adverse significant and temporary in the absence of mitigation.

14.4.3.4 Temporary Storage of Hazardous Substances

During the construction stage there is a risk of pollution to the groundwater in the Regionally Important Aquifer by the spillage of fuels or chemicals used on the plant operated on site which could then escape to Lough Atalia SAC and Galway Bay Complex or River Corrib SAC.

The risks from hazardous substances are identical to those highlighted above for the mobilization of contamination in the Regionally Important Aquifer (Section 14.4.3.2). Hence the significance of this adverse impact on the Regionally Important Aquifer is deemed to be negative significant/moderate and temporary.

The significance of the impacts on the groundwater abstractions (1121NEW0051121NEW011, 1121NEW014 and 1121NEW015) and St Augustine's Well are considered to be imperceptible considering the presence of low permeability clay (till) beneath the Proposed Scheme protecting the aquifer (See Section 14.4.3.2).

14.4.3.5 Dewatering

Localised pumping of excavations may be required as part of the Construction Phase in order to allow works to be carried out in dry excavations. This could lead to a temporary reversible small change in the groundwater levels and flow within the regionally important aquifer underlying the Proposed Scheme.

Since the pumping is expected to be limited, localised and temporary, the magnitude of this impact is considered to be negligible. As the importance of the Regionally Important Aquifer is high, the resulting significance is imperceptible.

14.4.4 Operational Phase

The impact assessment for the Operational Phase is outlined in terms of impact analysis of the Proposed Scheme on the local environment from a land, soils, geology and hydrogeology perspective. As the surface water drains directly to the Lough Atalia and Galway Bay Complex SAC, this provides a potential pathway for contaminants, this is further assessed in Chapter 13 (Water) of this EIAR.

During the operational phase, the following items have been highlighted that could have a potential impacts the environment:

- Reduction in recharge to the aquifer;
- Impact of the made ground under College Road Service Station on the Regionally Important Aquifer; and
- Contamination of the aquifer from road runoff.

These potential impacts are assessed in detail below and summarised in Table 14.26.

14.4.4.1 Reduction in Recharge to the Regionally Important Aquifer

The centre and eastern sections of the Proposed Scheme will have a limited surface area for aquifer recharge as the Proposed Scheme is mainly comprised of roads and footpaths. Surface water run-off will be collected in surface water drainage systems and will outfall to the Lough Atalia and Galway Bay Complex SAC without draining to ground. Consequently, the Proposed Scheme could reduce recharge to the Regionally Important Aquifer in the centre and east of study area. The areas underlying the Proposed Scheme are generally described as having a relatively low recharge and largely comprise roads which already impede recharge. Consequently, the magnitude of the reduction in recharge is anticipated to be negligible and the significance is imperceptible.

14.4.4.2 Impact of the Made Ground Under College Road Service Station on the Regionally Important Aquifer

The made ground under the College Road Service Station is currently having a small adverse on the groundwater quality under the site and potentially Lough Atalia**.** Consequently, the significance of the do-nothing effect is considered to long-term significant**.** The Proposed Scheme includes the removal of some of the made ground to facilitate the development of the Proposed Scheme and the decommissioning of the tanks and fuel dispensers. The area will then be capped with low permeability road surfacing which will reduce the infiltration. This will permanently remove the source from under the permanently acquired part of the Proposed Scheme and reduce infiltration through any residual soil left. This will comprise a permanent beneficial impact both on the Regionally Important Aquifer

and on Lough Atalia and Galway Bay Complex SAC. The extent of this permanent beneficial impact is rated as minor to major and will depend on the degree of contamination remaining under the adjacent portion of College Road Service Station which is outside of the permanently acquired part of the Proposed Scheme.

14.4.4.3 Contamination of the Aquifer from Road Runoff

Road runoff has the potential to contain small amounts of contamination from motor vehicles that use it. The proposed drainage shall be collected by a sealed system of drains that shall drain to the current surface water system or to Lough Atalia following treatment. Hence the run-off will not drain to the aquifer and consequently, the significance of this permanent negative impact on groundwater quality is considered to be imperceptible.

Table 14.25: Summary of Potential Construction Phase Impacts

Feature	Description	Location	Importance	Impact	Quality	Duration	Scale	Magnitude	Significance
Loss or Damage of Topsoil									
Topsoil	BminDW - Deep well drained (Mainly basic)	Between Lough Atalia and the Dublin Road. There is also one pocket underlying the Wellpark Retail centre. Not likely to be under the Proposed Scheme.	High	Loss or damage of topsoil	Negative	Permanent	Negligible	Negligible	Imperceptible
Alluvium - AlluvMIN	Typically found along current and historic watercourses	Along the River Corrib and its tributaries – just North of Dyke Road. Not likely to be under the Proposed Scheme.	Medium	Loss or damage of fertile soil	Negative	Permanent	Negligible	Negligible	Imperceptible
Marine/Estuarine sediments - MarSed	Typically found along the coast	Adjacent to Lough Atalia Not likely to be under the Proposed Scheme.	Medium	Loss or damage of fertile soil	Negative	Permanent	Negligible	Negligible	Imperceptible
Removal of hardstanding and excavation of potentially contaminated soils									
Regionally Important aquifer	Bedrock which regionally important and is Karstified conduits (Rkc)	East of Saint Brendan's Court; Eyre Square; and Fairgreen Road	High	Loss or damage of proportion of aquifer through pollution.	Negative	Temporary	Local	Moderate	Significant/moderate
Ecologically Sensitive Area	The Galway Bay Complex (Lough Atalia) SAC and pNHA	East of the study area south of the Proposed Scheme at Lough Atalia and Galway Harbour	Extremely High	Damage of SAC through pollution	Negative	Temporary	Local	Small	Significant
Groundwater abstraction (1121NEW005)	Group water Scheme abstraction	North east of the study area	Medium	Impact on water quality	Negative	Temporary	Negligible	Negligible	Imperceptible

Feature	Description	Location	Importance	Impact	Quality	Duration	Scale	Magnitude	Significance
121NEW011 - borehole	Unknown	50m north of Fairgreen Road of the Proposed Scheme	Medium	Impact on water quality	Negative	Temporary	Negligible	Negligible	Imperceptible
1121NEW015 – borehole	Unknown	10m south of Fairgreen Road of the Proposed Scheme	Medium	Impact on water quality	Negative	Temporary	Negligible	Negligible	Imperceptible
1121NEW014 - borehole	Unknown	50m south of Fairgreen Road of the Proposed Scheme	Medium	Impact on water quality	Negative	Temporary	Negligible	Negligible	Imperceptible
St Augustine's Well	Geological Heritage Feature	Approximately 100m east of College Road	High	Pollution of the water in the well	Negative	Temporary	Negligible	Negligible	Imperceptible
Spills from temporary storage of hazardous substances associated with the operation of plant									
Regionally Important aquifer	Bedrock which regionally important and is Karstified conduits (Rkc)	East of Saint Brendan's Court; Eyre Square; and Fairgreen Road	High	Loss or damage of proportion of aquifer through pollution.	Negative	Temporary	Local	Moderate	Significant/moderate
Ecologically Sensitive Area	The Galway Bay Complex (Lough Atalia) SAC and pNHA	East of the study area south of the Proposed Scheme at Lough Atalia and Galway Harbour	Extremely High	Damage of SAC through pollution	Negative	Temporary	Local	Small	Significant
	The Lough Corrib SAC and pNHA	East of the study area south of the Proposed Scheme at Lough Atalia and Galway Harbour	Extremely High	Damage of SAC through pollution	Negative	Temporary	Local	Small	Significant
Groundwater abstraction (1121NEW005)	Group water Scheme abstraction	North east of the study area	Medium	Impact on water quality	Negative	Temporary	Negligible	Negligible	Imperceptible

Feature	Description	Location	Importance	Impact	Quality	Duration	Scale	Magnitude	Significance
121NEW011 - borehole	Unknown	50m north of Fairgreen Road of the Proposed Scheme	Medium	Impact on water quality	Negative	Temporary	Negligible	Negligible	Imperceptible
1121NEW015 – borehole	Unknown	10m south of Fairgreen Road of the Proposed Scheme	Medium	Impact on water quality	Negative	Temporary	Negligible	Negligible	Imperceptible
1121NEW014 - borehole	Unknown	50m south of Fairgreen Road of the Proposed Scheme	Medium	Impact on water quality	Negative	Temporary	Negligible	Negligible	Imperceptible
St Augustine's Well	Geological Heritage Feature	Approximately 100m east of College Rd	High	Pollution of the water in the well	Negative	Temporary	Negligible	Negligible	Imperceptible
Dewatering									
Regionally Important aquifer	Bedrock which regionally important and is Karstified conduits (Rkc)	East of Saint Brendan's Court; Eyre Square; and Fairgreen Road	High	Change to groundwater regime	Negative	Temporary	Local	Negligible	Imperceptible

Table 14.26: Summary of Potential Operational Phase Impacts

Feature	Description	Location	Importance	Impact	Quality	Duration	Scale	Magnitude	Significance
Reduction in recharge to the Regionally Important Aquifer									
Regionally Important aquifer	Bedrock which regionally important and is Karstified conduits (Rkc)	East of St Brendan's Court; Eyre Square; and Fairgreen Road	High	Reduction in recharge	Negative	Permanent	Across the east of the Scheme	Negligible	Imperceptible
Impact of the made ground under College Road Service Station on the Regionally Important Aquifer									
Regionally Important aquifer	Bedrock which regionally important and is Karstified conduits (Rkc)	East of St Brendan's Court; Eyre Square; and Fairgreen Road	High	Loss or damage of proportion of aquifer through pollution	Positive	Permanent	Local	Minor/major	n/a
Ecologically Sensitive Area	The Galway Bay Complex (Lough Atalia) SAC and pNHA	East of the study area south of the Proposed Scheme at Lough Atalia and Galway Harbour	Extremely High	Damage of SAC through pollution	Positive	Permanent	Local	Minor/major	n/a
Contamination of the aquifer from road runoff									

Feature	Description	Location	Importance	Impact	Quality	Duration	Scale	Magnitude	Significance
Regionally Important aquifer	Bedrock which regionally important and is Karstified conduits (Rkc)	East of St Brendan's Court; Eyre Square; and Fairgreen Road	High	Loss or damage of proportion of aquifer through pollution	Negative	Permanent	Across the east of the Scheme	Negligible	Imperceptible

14.5 Mitigation and Monitoring Measures

The following sections outline the mitigation and monitoring measures associated with the significant impacts identified in Section 14.4 for both the Construction and the Operational Phases of the Proposed Scheme. A summary of the pre-mitigation and post-mitigation impacts is contained in Table 14.25.

14.5.1 Construction Phase

14.5.1.1 Mobilisation of Contamination into the Regionally Important Aquifer

The appointed contractor will ensure that excavations shall be kept to a minimum, using shoring or trench boxes where appropriate. For more extensive excavations, a temporary works designer shall be appointed by the appointed contractor to design excavation support measures in accordance with all relevant guidelines that minimises the excavation of contaminated ground.

The appointed contractor will be responsible for regular testing of excavated soils to monitor the suitability of the soil for reuse.

Samples of ground suspected of contamination will be tested for contamination by the appointed contractor during the ground investigation and ground excavated from these areas will be disposed of to a suitably licensed or permitted sites in accordance with the current Irish waste management legislation.

Any dewatering in areas of contaminated ground shall be designed by the appointed contractor to minimise the mobilisation of contaminants into the surrounding environment.

14.5.1.2 Spills from Temporary Storage of Hazardous Substances

Good construction management practices, as outlined in the CIRIA guidance Control of Water Pollution from Construction Sites – Guidance for consultants and contractors (Masters-Williams et al., 2001) will be employed by the appointed contractor to minimise the risk of transmission of hazardous materials as well as pollution of adjacent watercourses and groundwater. The construction management of the site will take account of these recommendations to minimise as far as possible the risk of soil, groundwater and surface water contamination.

Measures to be implemented to minimise the risk of spills and contamination of soils and waters include:

- Employing only competent and experienced workforce, and site-specific training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures;

- Ensure that all areas where liquids (including fuel) are stored, or cleaning is carried out, are in designated impermeable areas that are isolated from the surrounding area and within a secondary containment system, e.g., by a roll-over bund, raised kerb, ramps or stepped access;
- The location of any fuel storage facilities shall be considered in the design of the Construction Compound. These are to be designed in accordance with relevant guidelines and codes of best practice and will be fully bunded;
- Good housekeeping at the site (daily site clean-ups, use of disposal bins, etc.) during the entire Construction Phase;
- All concrete mixing and batching activities will be located in areas away from watercourses and drains;
- Potential pollutants to be adequately secured against vandalism;
- Provision of proper containment of potential pollutants according to codes of best practice;
- Thorough control during the entire Construction Phase to ensure that any spillage is identified at early stage and subsequently effectively contained and managed; and
- Spill kit to be provided and to be kept close to the storage area. Staff to be trained on how to use spill kits correctly.

An Environmental Incident Response Plan will be implemented by the appointed contractor, which will identify the actions to be taken in the event of a pollution incident. It will address such aspects as containment measures, emergency discharge routes, a list of appropriate equipment and clean-up materials and notification procedures to inform the relevant environmental protection authority. Refer to Appendix 5.1 CEMP in Volume 4 of this EIAR.

Sediment control methods are outlined in the Surface Water Management Plan in Appendix 5.1 CEMP in Volume 4 of this EIAR, and these will be implemented by the appointed contractor.

The CEMP also addresses good construction management practices that will be employed to prevent the risk of pollution of the existing land, soils, geology and hydrogeology during construction.

14.5.1.3 Mobilisation of Contamination into the SAC

The mitigation measures presented above in Section 14.5.1.1 for the Regionally Important Aquifer are directly relevant to the SAC. These mitigation measures will reduce the impact from the Proposed Scheme to negative, short-term but negligible hence the significance of the impact will be imperceptible.

14.5.1.4 Monitoring

As detailed in the Land Contamination Remedial Strategy (Appendix 14.5 of Volume 4 of this EIAR) a groundwater and surface water risk assessment shall be carried out by a competent geoenvironmental expert during the detailed design to establish a concentration of cadmium and hydrocarbons in the soil that do not present a risk to the quality of water entering Lough Atalia.

Soil, groundwater and surface water verification testing shall be carried out by the contractor during the construction stage to confirm the findings of the cadmium and hydrocarbon in the groundwater and surface water risk assessment.

14.5.2 Operational Phase

No significant adverse impacts were highlighted hence no mitigation is proposed.

14.5.2.1 Monitoring

No monitoring is proposed for the operational phase.

14.6 Residual Impacts

14.6.1 Construction Phase

With the effective implementation of the above mitigation measures, there will be no significant adverse residual impacts on land, soils, geology or hydrogeology as a result of the construction of the Proposed Scheme.

14.6.2 Operational Phase

Based on the assessment in Section 14.4 it is expected that there will be no significant adverse residual impacts on land, soils, geology and hydrogeology as a result of the operation of the Proposed Scheme.

No significant residual impacts have been identified either in the Construction or Operational Phases of the Proposed Scheme, whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

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Water Services Acts (2007 to 2017)

Chapter 15
Archaeological Cultural Heritage and Architectural Heritage

Contents

15 Archaeological Cultural Heritage and Architectural Heritage

15.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the archaeological, architectural, and cultural heritage impacts associated with the Construction and Operational Phases of the proposed BusConnects Galway: Cross-City Link (University Road to Dublin Road), hereafter referred to as the Proposed Scheme.

This study determines, as far as reasonably possible from existing records, the nature of the archaeological, architectural, and cultural heritage resource in and within the vicinity of the Proposed Scheme using appropriate methods of study. Desk-based assessment is defined as a programme of study of the historic environment, within a specified area or site that addresses agreed research and/or conservation objectives. It consists of an analysis of existing written, graphic, photographic, and electronic information in order to identify the likely heritage assets, their interests and significance and the character of the study area, including appropriate consideration of the settings of heritage assets (CIfA 2014). This leads to the following:

- determining the presence of known archaeological and architectural assets that may be affected by the Proposed Scheme;
- assessment of the likelihood of finding previously unrecorded archaeological and architectural remains during the construction programme;
- determining the effect upon the setting of known cultural heritage sites in the surrounding area; and
- mitigation measures based upon the results of the above research.

The study involved detailed interrogation of the archaeological, architectural and historical background of the Proposed Scheme area within a study area of 50m from the edge of the Scheme. This included information from the Record of Monuments and Places of County Galway, the Record of Protected Structures, National Inventory of Architectural Heritage, the Galway City Development Plan, the topographical files of the National Museum of Ireland, and cartographic and documentary records. Inspection of the aerial photographic coverage of the Proposed Scheme area held by the Ordnance Survey, Bing Maps, and Google Earth has also been carried out, as has a field inspection, in an attempt to identify any known archaeological, architectural, and cultural heritage sites and previously unrecorded features, structures, and portable finds within the Proposed Scheme area.

An impact assessment and a mitigation strategy have been prepared. The impact assessment is undertaken to outline potential adverse effects that the Proposed Scheme may have on the cultural heritage resource, while the mitigation strategy is designed to avoid, reduce or offset such adverse effects. The term 'cultural heritage' can be used as an over-arching term that can be applied to both archaeology and architecture.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Galway City area, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction) of this EIAR. The Proposed Scheme which is described in Chapter 4 (Proposed Scheme Description) of this EIAR has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process have been incorporated, where appropriate.

15.1.1 Legislation and Guidelines

The following legislation, standards and guidelines were consulted as part of the assessment.

- National Monuments Act 1930 to 2014;
- The Planning and Development Act 2000 (as amended);
- Heritage Act, 1995, as amended;
- Guidelines on the Information to be Contained in Environmental Impact Statements. Dublin. Government Publications Office, 2022, EPA;
- Frameworks and Principles for the Protection of the Archaeological Heritage, 1999, (formerly) Department of Arts, Heritage, Gaeltacht and Islands; and
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 2000 and the Local Government (Planning and Development) Act 2000.

15.1.2 Consultation

During scoping and research for the EIAR, a number of statutory and voluntary bodies were consulted to gain further insight into the cultural background of the receiving environment and study area, as follows:

- Department of Culture, Heritage and the Gaeltacht – the Heritage Service and Policy Unit; National Monuments and Historic Properties Section; Record of Monuments and Places; Sites and Monuments Record; Monuments in State Care Database; Preservation Orders; Register of Historic Monuments;
- National Museum of Ireland, Irish Antiquities Division: topographical files of Ireland;
- National Inventory of Architectural Heritage: County Galway; and

- Galway City Council: Planning and Heritage Section.

15.1.3 Rating and Significance of Effects

Each archaeological, architectural and cultural heritage receptor within the study area has been assessed in terms of its sensitivity, the type of potential impact, magnitude of same and the potential significance of the effect/impact.

The quality and type of an impact can be classed as one of the following (as per the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022)):

- Negative Impact: A change which reduces the quality of the environment, for example a change that will detract from or permanently remove an archaeological, architectural or cultural heritage site from the landscape;
- Neutral Impact: A change which does not affect the quality of the environment; or
- Positive Impact: A change which improves the quality of the environment, for example a change that improves or enhances the setting of archaeological, architectural or cultural heritage site.

The below terms are used in relation to the archaeological, architectural and cultural heritage and relate to whether a site will be physically impacted upon or not:

- Direct Impact: Where an archaeological/architectural/cultural heritage feature or site is physically located within the footprint of the proposed development and entails the removal of part, or all, of the monument or feature; and
- Indirect Impact: Where a feature or site of archaeological, architectural or cultural heritage merit or its setting is located in close proximity to the footprint of a development.

The description of effects as defined by the EPA 2022 Guidelines, is as follows -

- Imperceptible: An effect capable of measurement but without noticeable consequences.
- Not significant: An effect which causes noticeable changes in the character of the environment but without noticeable consequences.
- Slight Effects: An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
- Moderate Effects: An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends.
- Significant Effects: An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
- Very Significant: An effect which, by its character, magnitude, duration or intensity significantly alters the majority of a sensitive aspect of the environment.
- Profound Effects: An effect which obliterates sensitive characteristics.

15.2 Methodology

Research for this assessment was undertaken in two phases. The first phase comprised a paper survey of all available archaeological, historical and cartographic sources. The second phase involved a field inspection of the Proposed Scheme.

15.2.1 Paper Survey

- Record of Monuments and Places for County Galway;
- Sites and Monuments Record for County Galway;
- National Monuments in State Care Database;
- Preservation Orders List;
- Register of Historic Monuments;
- Topographical files of the National Museum of Ireland;
- Cartographic and written sources relating to the study area;
- Galway City Council Development Plan, 2017-2023;
- Place name analysis;
- Aerial photographs;
- Excavations Bulletin (1970–2020);
- National Inventory of Architectural Heritage (NIAH): Architectural & Garden Survey; and
- Place name analysis.

Record of Monuments and Places (RMP) is a list of archaeological sites known to the National Monuments Section, which are afforded legal protection under Section 12 of the 1994 National Monuments Act and are published as a record. All recorded monuments are referred to as Archaeological Heritage sites (AH) within this assessment.

Sites and Monuments Record (SMR) holds documentary evidence and field inspections of all known archaeological sites and monuments. Some information is also held about archaeological sites and monuments whose precise location is not known e.g. only a site type and townland are recorded. These are known to the National Monuments Section as ‘un-located sites’ and cannot be afforded legal protection due to lack of locational information. As a result, these are omitted from the Record of Monuments and Places. SMR sites are also listed on a website maintained by the Department of Housing, Local Government and Heritage (DoHLGH) – www.archaeology.ie. All sites included in the SMR are referred to as Archaeological Heritage sites (AH) within this assessment.

National Monuments in State Care Database is a list of all the National Monuments in State guardianship or ownership. Each is assigned a National Monument number whether in guardianship or ownership and has a brief description of the remains of each Monument. Any National Monuments are referred to as Archaeological Heritage sites (AH) within this assessment.

The Minister for the DoHLGH may acquire national monuments by agreement or by compulsory order. The state or local authority may assume guardianship of any national monument (other than dwellings). The owners of national monuments (other than dwellings) may also appoint the Minister or the local authority as guardian of that monument if the state or local authority agrees. Once the site is in ownership or guardianship of the state, it may not be interfered with, without the written consent of the Minister.

Preservation Orders List contains information on Preservation Orders and/or Temporary Preservation Orders, which have been assigned to a site or sites. Sites deemed to be in danger of injury or destruction can be allocated Preservation Orders under the 1930 Act. Preservation Orders make any interference with the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister.

Register of Historic Monuments was established under Section 5 of the 1987 National Monuments Act, which requires the Minister to establish and maintain such a record. Historic monuments and archaeological areas present on the register are afforded statutory protection under the 1987 Act. The register also includes sites under Preservation Orders and Temporary Preservation Orders. All registered monuments are included in the Record of Monuments and Places.

The topographical files of the National Museum of Ireland are the national archive of all known finds recorded by the National Museum. This archive relates primarily to artefacts but also includes references to monuments and unique records of previous excavations. The find spots of artefacts are important sources of information on the discovery of sites of archaeological significance.

Cartographic sources are important in tracing land use development within the Proposed Scheme area as well as providing important topographical information on areas of archaeological potential and the development of buildings.

Cartographic analysis of the following maps has been carried out to identify any topographical anomalies or structures that no longer remain within the landscape:

- Barnaby Gooche, A Plot of the Town of Galway, 1583;
- Captain Brian Fitzwilliam, *The Circuit of the Town of Galway*, 1589;
- John Speed, Plan of Galway from Theatre of the Empire of Great Britain, 1610;
- The Pictorial Map of Galway, 1651;
- Sir William Petty, Down Survey Map, County Galway, c. 1655;
- Michael Logan, *Map of Galway*, 1818; and
- Ordnance Survey maps of County Galway, 1839-1900.

Documentary sources were consulted to gain background information on the archaeological, architectural, and cultural heritage landscape of the Proposed Scheme area.

The **Galway City Council Development Plan** contains a record of all the protected structures and archaeological sites within the city. The Galway City Council Development Plan (2017-2023) was consulted to obtain information on cultural heritage sites in and within the immediate vicinity of the Proposed Scheme area. The development plan includes a Record of Protected Structures (RPS) and Architectural Conservation Areas (ACAs). All protected structures within the study area are listed as Built Heritage sites (BH) within this assessment.

Aerial photographic coverage is an important source of information regarding the precise location of sites and their extent. It also provides initial information on the terrain and its likely potential for archaeology. A number of sources were consulted including aerial photographs held by the Ordnance Survey, Google Earth, and Bing Maps.

Excavations Bulletin is a summary publication that has been produced every year since 1970. This summarises every archaeological excavation that has taken place in Ireland during that year up until 2010 and since 1987 has been edited by Isabel Bennett. This information is vital when examining the archaeological content of any area, which may not have been recorded under the SMR and RMP files. This information is also available online (www.excavations.ie) from 1970–2020.

The National Inventory of Architectural Heritage is a state initiative established under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999 tasked with making a nationwide record of significant local, regional, national and international structures, which in turn provides county councils with a guide as to what structures to list within the Record of Protected Structures. The NIAH have also carried out a nationwide desk-based survey of historic gardens, including demesnes that surround large houses. All NIAH structures are listed as Built Heritage sites (BH) within this assessment.

Place Names are an important part in understanding both the archaeology, history, and cultural heritage of an area. Place names can be used for generations and in some cases have been found to have their root deep in the historical past. The main references used for the place name analysis is *Irish Local Names Explained* by P.W Joyce (1870) and the Place Names Database of Ireland.

15.2.2 Field Inspection

Field inspection is necessary to determine the extent and nature of archaeological, architectural, and historical remains, and can also lead to the identification of previously unrecorded or suspected sites and portable finds through topographical observation and local information.

- The archaeological and architectural field inspection entailed –
- walking the Proposed Scheme and its immediate environs;
- noting and recording the terrain type and land usage;
- noting and recording the presence of features of archaeological, architectural or historical significance;
- verifying the extent and condition of any recorded sites or structures; and

- visually investigating any suspect landscape anomalies to determine the possibility of their being anthropogenic in origin and of archaeological, architectural or cultural heritage significance.

15.3 Baseline Environment

15.3.1 Archaeological and Historical Background

15.3.1.1 Prehistoric Period

Mesolithic Period (6000–4000 BC)

Evidence suggests that Ireland was first occupied during the Mesolithic period, by communities that subsisted on hunting, fishing and foraging. The most common evidence found to show the presence of Mesolithic communities at a site is scatters of worked flint material, a by-product from the production of flint implements. The earliest evidence of human settlement comes from within the old walled town of Galway and dates to the late Mesolithic period. Lithic material of this type was found at the junction of High Street and Cross Street, within the city (Spellissy 1999, 29). There is potential for remains such as fish traps to survive within the prehistoric estuarine silts such as those identified in the Liffey (McQuade 2008) and Shannon estuaries (O' Sullivan 2001).

Neolithic Period (4000–2500 BC)

During the Neolithic period, communities generally became less mobile and their economy became based on the rearing of stock and cereal cultivation. This transition was accompanied with major social change. Agriculture demanded an altering of the physical, forests were rapidly cleared, and field boundaries constructed. There was a greater concern for territory, which saw the construction of large communal ritual monuments called megalithic tombs, which are characteristic of the period. A megalithic tomb is located on the north shore of Oranmore Bay, with other ruined tombs nearby indicating some Neolithic occupation in the area surrounding Galway city. Whilst there are no recorded Neolithic sites located within the vicinity of the Proposed Scheme several artefacts consisting of stone axe heads, dating from this period have been recorded from Galway within the National Museum (NMI Ref.: 1930:76-8; E269:5).

Bronze Age (2500–800 BC)

As with the transition from Mesolithic to Neolithic, the transition into the early Bronze Age was accompanied by changes in society. Megalithic tombs were no longer constructed, and the burial of the individual became more common. Cremated or inhumed bones were often placed in a cist, which is a small stone box set into the ground or a stone-lined grave. These were often accompanied by pottery. There are no recorded Bronze Age sites located within the vicinity of the Proposed Scheme. Similar to the Neolithic period a number of Bronze Age artefacts have been recovered from Galway however, including the River Corrib (NMI Ref.: W.33; F399 F400; 1937:3673-4).

Iron Age (800 BC–AD 500)

Until recently, the dearth of evidence representing the Irish Iron Age made it one of the most enigmatic and least understood periods in Irish prehistory. However, large scale commercial excavations carried out over the past two decades have produced large quantities of new data relating to Iron Age settlement and industry across the country. This raw excavation data is still being analysed and a picture of life during the Iron Age is being assembled (Becker 2012, 1). There is no firmly dated evidence for Iron Age activity within the immediate vicinity of the Proposed Scheme.

Early Medieval Period (AD 500–1100)

A tradition exists of a small fishing village in the location of the present Galway city prior to the Anglo-Norman settlement (AH1). This was known as Ballinshruane (*Baile na Srutháin* 'the town of the streams'). This was presumably so-called because in winter the River Corrib (BH1) overflowed its banks and formed a number of small streams. According to Hardiman (1820), this hamlet was located on one of the islands formed by these streams, in the present location of the church of St Nicholas (RMP GA094-100037), c. 140m south of the Proposed Scheme.

The annals record attacks by the Vikings on the monastic site of Roscam on the eastern outskirts of the present Galway city and on the islands of Lough Corrib. However, the Vikings did not choose to settle in Galway. The study area at this time would have remained within the river course and estuary, which was wider than the current layout. No sites dating to this period are recorded within the immediate proximity of the Proposed Scheme.

Medieval Period (AD 1100–1600)

The medieval town of Galway (AH1) was situated on the eastern side of the mouth of the Galway River (River Corrib, BH1), at the southwest end of a long ridge. The presence of a ford at this location is undoubtedly a key point in understanding why this ridge was selected for a permanent settlement. Also having a seaside location, with benefits in terms of access to food and communication implies that this was an important factor in the selection of a site for settlement by Gaelic Irish and Anglo-Norman alike. The selection of the eastern side of the Galway River (River Corrib, BH1) may have been a matter of strategic significance as not only would the castle have provided control over an important river crossing, but the site would be easier to relieve from the east should it be attacked. The castle was also located in close proximity to where supplies could be landed with ease and also within ready access of the ford.

The first written reference to Galway is the recording by the annals of the building of the castle of *Bun Gaillmhe*, 'the mouth of the [river] Gaillimh' in 1124. This fortification was part of the deliberate encastellation of his lands by *Toirdhealbhach Ó Conchobhair*, King of Connacht, which he pursued in the second quarter of the 12th century and it shows that Galway's strategic position was already recognised. The choice of site was beneficial as it controlled the most convenient crossing from east-west at West Bridge, now known as William O' Brien Bridge/O'Brien's Bridge, c. 230m to the south of the Proposed Scheme.

The Galway River (River Corrib, BH 1) was easily forded and indeed liable at times to dry up almost completely (Mac Niocaill 1984, 1). The castle may have been built on the site of an earlier O'Flaherty *dún* (Spellissy 1999, 30).

The castle was burnt in 1132 by a fleet of Munstermen. It was rebuilt to be burnt again in 1149 by *Toirdealbach Ó Briain*. The presence of a settlement in the vicinity of the castle is suggested by the entry of 1154 which states that the fleet of *Dun Gaillimh* was among those which *Toirdealbach Ua Conchobhair* led northwards to plunder *Tir Conaill* and *Inis Eoghain*. The castle was burnt in 1161 and again in 1170, references which suggest that this structure was of timber. It was destroyed deliberately in 1177 to prevent it falling into the hands of Milo de Cogan (Bradley and Dunne 1990, 73-4). Whilst the annals do not give any indication of the location of the castle, archaeological excavations in the 1990s identified the corner of a probable 13th-century stone castle, along with a medieval hall (RMP GA094-100041) c. 245m to the west on Druid Lane. It is likely that the earlier 12th-century castle was located in the vicinity of this structure near the west end of the present custom house on Flood Street (Delaney 2004, 164; Spellissy 1999, 30).

The next mention of Galway in the annals is in 1230 when the settlement was attacked by Richard de Burgo as part of the Anglo-Norman invasion of Connacht. The attack did not prove successful and de Burgo withdrew, returning two years later in 1232 when he met with greater success and erected a castle. This castle did not last long, being taken in the following year and destroyed. Its replacement suffered a similar fate in 1247, when the annals record the burning of both the town and the castle. The 1247 record is the first mention of the town proper, and it probably consisted of little more than a cluster of cabins nestled in the shadow of the castle (Walsh 2004, 273), although it must have been of sufficient size to warrant being called a town (Walsh 1996, 52). The town is recorded as being burnt again in 1266-7.

The town was established by Richard de Burgo's son Walter who granted legal status of a chartered borough sometime before the early 1270s. A grant of murage provided the right to levy toll on certain specified goods such as hides, fleeces, fish, wine, salt, and cloth coming into the town. The settlement began to be enclosed by walls sometime before 1272. The shape of the enclosed area was dictated largely by the configuration of the end of the ridge on which the settlement was sited. In selecting the appropriate position of for the curtain walls, the burgesses were motivated primarily by considerations of defence and were directly influenced by the topography of the site. The settlement was bounded by water on all sides except to the east; the area where it was most vulnerable to attack. The most obvious solution was to construct a wall across the ridge, similar to the construction of a promontory fort. It is reasonable to suggest that the first phase of work on the defences entailed the construction of this eastern section of town wall. Walter de Burgo founded a Franciscan friary (AH11, BH19) on the now-reclaimed St Stephen's Island in 1296 outside the north gate of the town, both immediately adjacent to the Proposed Scheme at Saint Francis Street/Saint Vincent's Avenue.

The town took the shape of a squat rectangle, c. 390m long and c. 280m wide, with a substantially rounded north-west corner. The exact date by which the town was enclosed by walls cannot be determined with certainty, but considerable sections were in existence by the end of the 14th century and once completed, the town would have been well-protected.

The great gate was possibly erected in 1312, replacing an earlier gate that may have been in existence from at least the early 1270s (MacNiocaill 1984, 1). The size of the enclosed town, at 11ha, was much smaller than many other significant medieval port towns.

It was not until the later part of the medieval period that evidence of developing prosperity begins to emerge from the historical record, as the Galway merchants capitalised on their trading links with ports on Europe's Atlantic seaboard and established the town as a substantial part of the mercantile life in the west of Ireland. The town cultivated a Spanish wine trade, with the wool trade and the growing importance of the fish trade also contributing to the growth of the town. In 1395 the town was given a charter by Richard I, which effectively removed the town from de Burgo control. This grant was followed in November 1396 by a grant of perpetual murage and pavage, and the town's new status was confirmed in 1402 by Henry IV (Bradley and Dunne 1990, 75-6).

During this period and into the 17th century Galway was ruled by an oligarchy. This is defined as a group of families known as the 'tribes' who between them managed every important position of church and state. The wealth which these families generated through mercantile activity was reflected in the splendour of their domestic housing. One such structure is Lynch's Castle (RMP GA094-100043), an urban tower house which was built c. 1500 (Fitzgerald and Walsh 2004, 342). The structure is located c. 85m southwest of the Proposed Scheme at the junction of Shop Street and Upper Abbeygate Street. It preserves in its walls a collection of elaborately moulded and carved windows, coats of arms and other features dating to the 16th century.

By the mid-16th century politics, commerce, and fashion had combined to ensure that Galway developed into an independent outpost. Two fires in 1412 and 1473 resulted in setbacks for the town with extensive destruction of property. The annals record that the fire was caused by lightning and the town was almost completely destroyed. No evidence of these fires has been uncovered during archaeological investigations in the city. The granting of a charter of incorporation in 1484 and the establishment of the local parish church (RMP GA094-100037) as a college the following year, gave the citizens control over their own immediate administrative and ecclesiastical affairs. This resulted in an increase in building works within the town and the immediate environs that continued throughout the 16th century.

Post-Medieval Period (AD 1600–1800)

The 17th century, which witnessed the final reduction of all of Ireland to English authority, was marked by two major conflicts. In 1641 a war between the King and Parliament was sparked off by the rebellion of the Catholics in Ulster and resulted in 11 years of conflict. Galway remained mostly loyal to the English crown during the Gaelic resurgence as a matter of survival, yet by 1642 the city allied itself with the Catholic Confederation of Kilkenny. During the Cromwellian conquest of Ireland, English forces captured the city after a nine-month siege. The capitulation of Galway to the Parliamentary forces in 1653 ended centuries of wealth and almost exclusive local control. The ransacking and Cromwellian confiscations that followed marked the beginning of a long process of decline that would continue for one-and-a-half centuries (Walsh 2004, 280).

The war brought a number of significant topographical changes in Galway. These included the building of two bastioned citadels beside the two principal gates. The east citadel completely blocked access from Shop Street and William Street to the Great Gate and all traffic coming into the town from the east had to go through it. The west citadel was built beside the inner gate of the West Bridge.

The second great conflict of this period was the war between James II and William of Orange of 1689-91. In the late 1680s a passage was broken through the eastern ramparts immediately north of the old Great Gate and its bastion. New gates were inserted in the defences at this point, and the intervening thoroughfare continues in use. The city supported James II (against William of Orange) and was captured by the Williamites after a very short siege following the Battle of Aughrim in 1691.

The Poor Clare Convent, c. 70m to the west of the Proposed Scheme, was founded in 1649 on land granted by the City Corporation. It was burned in 1652 by Cromwell's forces during his siege of the city and destroyed in 1691 by the Williamites. The current convent buildings were constructed in 1825 and the early 20th century.

During the late-18th century and 19th century advances in industrial methods and systems caused a large-scale redevelopment of the docklands area. The banks of the Lower Corrib (BH1) were canalised in c. 1750 from the existing Salmon Weir Bridge (BH 10) to Galway Bay as part of the 'Drainage and navigations scheme of Loughs Carra, Corrib and Mask'. This waterway was known as the 'Long Walk' (BH1) and was the main artery for trade and maritime commerce in Galway City. Development along the west bank progressed at a greater pace with mills and distilleries located in the area. An unclassified mill (AH5) is recorded in the RMP within the vicinity of the Proposed Scheme, c. 70m to the south of the cathedral. The mill is depicted on the 1838 OS map as a tread mill.

During the 19th century a major drainage and navigation scheme was undertaken along the course of the River Corrib (BH 1), including deepening of the riverbed. The Eglinton Canal was constructed between c. 1845 and 1855 to the west of the River Corrib, beginning north of University Road. The canal opened a trade route allowing goods and passengers easy access to the navigable section of the River Corrib and provided power to several mills. The presence of the canal no doubt encouraged the expansion of trade and industry in the locality and is of significant industrial heritage value as well as amenity value (NIAH 30313013). The canal passes under the western terminus of the Wolfe Tone Bridge to enter a large canal basin.

Friar's River, formerly Waterside Canal, (BH1), passes underneath the eastern extent of the existing Salmon Weir Bridge (BH10), and formed part of the industrial landscape of Galway City. The level of the canal was and is maintained by a system of weirs with a set of lock gates located further to the north. These would prevent damage to the canal in the winter months, when the river flooded (Rynne 2006, 355). A large weir (RMP GA094-100057) is located c. 165m to the north of the existing Salmon Weir Bridge (c. 110m north of the Proposed Scheme), which includes a salmon pass. The existing Salmon Weir Bridge, which was built in 1818, was originally named as 'New Bridge'. However, the function of the weir to the north resulted in a new name for the structure.

Persse's Distillery River (BH1), situated within the western portion of the Proposed Scheme, was formed by canalising a tributary of the River Corrib (BH1) in the early 19th century to power the Persse Distillery (RPS 7408), originally located at the NUIG library (BH7). The tributary was further channelled in the mid-19th century from the NUIG campus to the east side of Nun's Island where the Persse Distillery was re-located, c. 88m to the south of the Proposed Scheme (www.galwaywaterways.ie).

15.3.2 Galway City Council Development Plan, 2017-2023

15.3.2.1 Record of Monuments and Places

The Galway City Council Development Plan (2017–2023) recognises the statutory protection afforded to all Record of Monuments and Places (RMP) sites under the National Monuments Legislation (1930–2014). The development plan lists a number of aims and objectives in relation to archaeological heritage (Refer to Appendix 15.1 Legislation Protecting the Archaeological Resource in Volume 4 of this EIAR).

There are 18 archaeological sites and groups of sites within the 50m study area of the Proposed Scheme, all of which are located within the townland of Townparks bar one in the townland of Milestone (Table 15.1). Of these 18, all are recorded monuments but one (AH17) which is a redundant record. A large portion of the Proposed Scheme is situated within the zone of archaeological potential for the historic town of Galway (AH1).

Of the 17 archaeological sites and groups of sites, two are listed on both the RPS and NIAH Survey and a further three are included on the RPS.

Galway Town Defences (AH13) are a National Monument, the Proposed Scheme crosses the site of the defences along Eglington Street and towards the north-eastern end of Williamsgate Street.

Details of individual AH sites can be found in Appendix 15.2 (SMR/RMP sites within the study area) in Volume 4 of this EIAR and are marked on Figure 15.1, and Figure 15.2 in Volume 3 of this EIAR

Table 15.1: RMP/SMR Features, Archaeological Heritage (AH) Sites, Located within the Study Area

AH No.	RMP No.	Classification	Distance from Proposed Scheme	Designation
AH 1	GA094-100	Historic Town of Galway	0m	RMP (ZAP)
AH 2	GA094-103	Prison	0m	RMP (ZAP)
AH 3	GA094-139	Stone sculpture (inside Cathedral)	24m W	RMP
AH 4	GA094-100033	Causeway	34m SW	RMP
AH 5	GA094-103001	Mill - unclassified	0m	RMP

AH No.	RMP No.	Classification	Distance from Proposed Scheme	Designation
AH 6	GA094-100056	Weir - regulating	50m SE	RMP, RPS
AH 7	GA094-102002 GA094-102008 GA094-102009 GA094-102010 GA094-102011 GA094-102012 GA094-102013 GA094-102014 GA094-102015 GA094-102016 GA094-102017 GA094-102018 GA094-102019	Graveyard Tomb – unclassified Memorial stone Tomb – unclassified Tomb – unclassified Tomb – unclassified Tomb – unclassified Tomb – unclassified Graveslab Graveslab Graveslab Graveslab Tomb – unclassified	12m E	RMP, RPS
AH 8	GA094-102001	Church	14m W	RMP
AH 9	GA094-102004 GA094-102005 GA094-102006 GA094-102007	Wall monument Wall monument Inscribed slab Wall monument	32m W	RMP
AH 10	GA094-100047	Water mill - unclassified	44m W	RMP
AH 11	GA094-102	Religious house - Franciscan friars	0m	RMP, RPS, NIAH
AH 12	GA094-100034	Bridge	42m SW	RMP
AH13	GA094-100001	Galway Town Defences	0m	Nat. Mon.
AH 14	GA094-100035	Bridge	0m	RMP
AH 15	GA094-119 GA094-120	Structure Architectural fragment	0m	RMP
AH 16	GA094-138	Architectural fragment (Browne Doorway)	7m SE	RMP, RPS, NIAH
AH 17	GA094-090	Redundant record	0m	-
AH 18	GA094-030001	Boundary stone	38m E	RMP, RPS

15.3.2.2 Record of Protected Structures

The Galway City Council Development Plan (2017–2023) recognises the value of the built heritage to the city and is committed to the protection and enhancement of this heritage by providing measures for the protection of architectural heritage. These include the establishment of a Record of Protected Structures (RPS) and the designation of Architectural Conservation Areas (ACAs). Refer to Appendix 15.3 (Legislation Protecting the Architectural Resource) in Volume 4 of this EIAR.

There are 86 protected structures and groups of protected structures in the Proposed Scheme and its 50m study area. These include the rivers and waterways of Galway, including bridges, walling, embankments, piers and other associated infrastructure (BH1), Galway Cathedral (BH5), remains of the town defences (BH75, BH77, BH83) and numerous residential and commercial buildings, several of which incorporate medieval remains.

Of the 86 individual and groups of protected structures;

- three are also part of a National Monument (Town Defences);
- three are also listed on both the RMP and the NIAH Survey;
- two are listed both as an SMR and on the NIAH Survey;
- another three are also listed on the RMP only;
- 41 are also included on the NIAH Survey only.

Details of individual BH (RPS) sites can be found in Appendix 15.4 (RPS and NIAH Structures within the Study Area) in Volume 4 of this EIAR and are marked on Figure 15.3 and Figure 15.4 in Volume 3 of this EIAR.

Table 15.2: Protected Structures located within the Study Area

BH No.	RPS No.	Name	Distance from Proposed Scheme	Designation
BH1	8501/8601	Rivers and Waterways	0m	RPS, SMR, NIAH
BH3	10304	Gate lodge	0m	RPS, NIAH
BH4	3601	House	18m N	RPS, NIAH
BH5	3602	Galway Cathedral	5m E	RPS, NIAH
BH6	3605	Store/warehouse (Galway Library Services)	0m	RPS, NIAH
BH7	7409	Water mill	14m S	RPS, NIAH
BH8	3608/8501	Harbour/dock/port Rivers and Waterways	27m E	RPS, NIAH
BH9	8501	Mill Race, Rivers and Waterways	0m	RPS, NIAH
BH10	3603/8501	Salmon Weir Bridge, Rivers and Waterways	0m	RPS, SMR, NIAH
BH11	3604/8501	County Club House, Earls Island, Rivers and Waterways	0m	RPS, NIAH
BH12	7201	Church/chapel	0m	RPS, NIAH
BH13	10504	Corrib House Tearoom	42m NE	RPS, NIAH
BH14	10505	House	35m NNW	RPS, NIAH
BH15	2604, 2605, 10506	2 & 3Courthouse Sq, office and Lough Corrib House 5 Waterside	16m NW	RPS, NIAH
BH16	2601	Galway Courthouse	0m	RPS, NIAH

BH No.	RPS No.	Name	Distance from Proposed Scheme	Designation
BH17	2606	Post box	6m W	RPS, NIAH
BH18	2602	Town Hall Theatre	0m	RPS, NIAH
BH19	9601	Church/chapel (St Francis)	0m	RPS, NIAH
BH20	9606	10 St. Francis Street	0m	RPS, NIAH
BH22	213, 215, 216, 218, 221-228 (inc)	21, 23, 25, 29, 36, 38, 40, 42, 46, 48, 50 and 52 Abbeygate Street Upper	33m S	RPS
BH24	3701	1 Eglinton Street	0m	RPS, NIAH
BH25	10809	23, 25 William Street	0m	RPS
BH27	11002	5, 7 Williamsgate Street	0m	RPS, NIAH
BH28	11003	8 Williamsgate Street	0m	RPS, NIAH
BH29	5801	1-5 Merchants Road	0m	RPS, NIAH
BH30	8202	Cut Stone Stores, CIE Land, Queen Street	32m SE	RPS
BH32	8201	Methodist/Presbyterian Church, Queen Street, with burial ground to side and rear	2m SE	RPS, NIAH
BH33	3804	19 Eyre Square	0m	RPS, NIAH
BH34	3803, 3802	16 & 17 Eyre Square	0m	RPS, NIAH
BH37	3801	14, 15 Eyre Square	0m	RPS, NIAH
BH39	3807	Browne Doorway, Eyre Square	7m SE	RPS, RMP, NIAH
BH42	3805	43 Eyre Square	0m	RPS, NIAH
BH43	3806	45 Eyre Square	0m	RPS, NIAH
BH44	3808	Liam Mellows Statue, Eyre Square	0m	RPS, RMP, NIAH
BH45	3809	8 Eyre Square	0m	RPS, NIAH
BH46	10001	Ceannt Station	9m S	RPS, NIAH
BH48	10002	Railway and Ancillary Buildings - train shed	50m SW	RPS, NIAH
BH49	10002	Railway and Ancillary Buildings - foot bridge	38m S	RPS, NIAH
BH50	10002	Railway and Ancillary Buildings - signal box; water tower; turntable	48m S	RPS, NIAH
BH52	4301	Water trough, Forster Street	0m	RPS, NIAH
BH53	4308	St. Patricks Hall, Forster Street	0m	RPS, NIAH
BH54	7803	37 Prospect Hill	0m	RPS, NIAH
BH56	4306	Magdalen Convent & Church,	0m	RPS, NIAH

BH No.	RPS No.	Name	Distance from Proposed Scheme	Designation
		Forster Street		
BH57	4305	48 Forster Street	26m SE	RPS, NIAH
BH58	2301	Former Erasmus Smith Grammar School 1816, 3 College Road	19m NW	RPS, NIAH
BH61	3702	2 Eglinton Street	0m	RPS, NIAH
BH62	10305 & 10306	Houses	0m	RPS, NIAH
BH63	6805	Former nurses' home, UCHG	40m NW	RPS, RMP
BH64	7406	Former Mill, Nuns Island Street	30m S	RPS
BH65	3606	Grave monument associated with Galway Gaol	0m	RPS
BH66	3607	Fisheries Offices, Earls Island	0m	RPS
BH67	10507	Free standing elm-wood sculpture of a leaping salmon	0m	RPS
BH68	9602	Church grounds with cemetery, Medieval stone carvings, architectural fragments and tower building. Site of medieval waterway	11m E	RPS, RMP
BH69	9604	1624 Medieval Doorway with Arms of D'Arcy and Marin Family Medieval hood mouldings. Plaque of Blake Arms	25m W	RPS
BH70	9603	Medieval fragments, doorway, site of medieval waterway, Convent Grounds with Graves	1m S	RPS
BH71	7202	Inscribed stone dated 1816, IHS Cross with name J. Healy	43m S	RPS
BH72	5601	18, 19 Mary Street	0m	RPS
BH73	9605	2 St. Francis Street	0m	RPS
BH75	3703	Site of former C17th bastion, 2 no. Lions Tower Plaques 1. Arms of Galway 2. Arms of DeBathe	0m	RPS, Nat. Mon.
BH76	3901	17 Eyre Street	23m E	RPS
BH77	3903	Site of gate and bastion wall, incorporated into modern building	35m NE	RPS, Nat. Mon
BH78	10801	16, 18, 18a William Street, Commercial building	5m W	RPS
BH79	10803, 10805, 10806, 10808, 10810	20, 22, 24, 26 and 28 William Street	15m SW	RPS

BH No.	RPS No.	Name	Distance from Proposed Scheme	Designation
BH80	10807	27, 29 William Street	6m	RPS
BH81	1903	Section of medieval wall	14m SE	RPS
BH82	1902	Section of medieval wall (x2)	32m SE	RPS
BH83	1901	Section of medieval town wall	42m SE	RPS, Nat. Mon.
BH84	10802	19 William Street	0m	RPS
BH85	11006	15 Williamsgate Street	0m	RPS
BH86	11005	10, 11 Williamsgate Street	0m	RPS
BH87	11004	9 Williamsgate Street	0m	RPS
BH88	302	Two Lime Rendered Rubble-Stone Houses	19m SE	RPS
BH89	11001	1 Williamsgate Street	0m	RPS
BH92	10401	Victoria Place	0m	RPS
BH93	10002	Railway and Ancillary Buildings (Footbridge)	16m SW	RPS
BH94	4302-4304 (inc), 4309	12, 14, 16 and 18 Forster Street	0m	RPS
BH95	4307	St. Patricks Church, Forster Street	26m W	RPS
BH96	7801, 7802	33 and 35 Prospect Hill	3m NW	RPS
BH97	9501-9506 (inc)	1, 2, 3, 4, 5 and 6 St. Brendan's Road, Headford Road	0m	RPS
BH98	2302	Carved Limestone block with blank shield in wall, 6 College Road	0m	RPS
BH99	10603	1 Wellpark Road	0m	RPS
BH100	5202	Pier, Lough Atalia	9m S	RPS
BH101	8406	Boundary Stone - Cloch an Lionsigh (Lynch's Stone)	38m E	RPS, RMP
BH102	2603	House, 1 Courthouse Sq	20m NW	RPS, RMP, NIAH
BH103	220	33 Abbeygate Street Upper	49m S	RPS, NIAH
BH104	10301	Remains of mullioned stone window from site of St. James Chapel c1510	5m NE	RPS, RMP

15.3.2.3 Architectural Conservation Areas (ACAs)

There are eleven architectural conservation areas designated within the Galway City Council Development Plan (2017-2023), three of which are situated within the Proposed Scheme or its study area. The largest of these are the City Core ACA, which the Proposed Scheme encroaches on in the area between Salmon Weir Bridge and Eyre Square, and the Eyre Square ACA which the Proposed Scheme also encroaches on. The remaining ACA, 11-18 University Road, is smaller and is encroached on slightly by the Proposed Scheme on its northern side. ACAs affected by the Proposed Scheme are shown on Figure 15.5 in Volume 3 of this EIAR.

15.3.3 National Inventory of Architectural Heritage

15.3.3.1 Building Survey

The National Inventory of Architectural Heritage survey of Galway was published in 2011, having been carried out in 2008 and 2009. A review of the architectural survey was undertaken as part of this assessment and included buildings within a 50m study area of the Proposed Scheme. There are 61 structures and groups of structures listed on the NIAH building survey, all within the townlands of Townparks and Milestone.

Inclusion in the survey does not result in statutory protection unless they are also included in the RPS. Of the 61 structures, 46 are also listed within the RPS, and five are recorded as either RMP or SMR sites.

Details of individual BH (NIAH) sites can be found in Appendix 15.4 (RPS and NIAH Structures within the Study Area) in Volume 4 of this EIAR and are marked on Diagram 15.3.

Table 15.3: National Inventory of Architectural Heritage (BH) Sites located within the Study Area

BH No.	NIAH Reg.	Name	Distance from Proposed Scheme	Designation
BH1	30319001, 30314076	Rivers and Waterways -Lower Corrib River, Friar's River	0m	RPS, SMR, NIAH
BH2	30313005 – 30313012 (inc)	18, 17, 16, 15, 14, 13, 12 and 11 University Road	0m	NIAH
BH3	30313002	Gate lodge	0m	RPS, NIAH
BH4	30313014	House	18m N	RPS, NIAH
BH5	30313016	Galway Cathedral	5m E	RPS, NIAH
BH6	30313018	Store/warehouse (Galway Library Services)	0m	RPS, NIAH
BH7	30313027	Water mill	14m S	RPS, NIAH

BH No.	NIAH Reg.	Name	Distance from Proposed Scheme	Designation
BH8	30319001	Rivers and Waterways - Harbour/dock/port	27m E	RPS, NIAH
BH9	30313038	Rivers and Waterways - Mill Race	0m	RPS, NIAH
BH10	30313015	Rivers and Waterways -Salmon Weir Bridge,	0m	RPS, SMR, NIAH
BH11	30314048	Rivers and Waterways -County Club House, Earls Island,	0m	RPS, NIAH
BH12	30314014	Church/chapel	0m	RPS, NIAH
BH13	30314005	Corrib House Tearoom	42m NE	RPS, NIAH
BH14	30314006	4 Waterside	35m NNW	RPS, NIAH
BH15	30314007, 30314008, 30314010	2 & 3Courthouse Sq, office and Lough Corrib House 5 Waterside	16m NW	RPS, NIAH
BH16	30314011	Galway Courthouse	0m	RPS, NIAH
BH17	30314002	Post box	6m W	RPS, NIAH
BH18	30314012	Town Hall Theatre	0m	RPS, NIAH
BH19	30314015	Church/chapel (St Francis)	0m	RPS, NIAH
BH20	30314016	10 St. Francis Street	0m	RPS, NIAH
BH21	30314017	1 Eyre Street	0m	NIAH
BH23	30314030	Eglinton Street post office	0m	NIAH
BH24	30314031	1 Eglinton Street	0m	RPS, NIAH
BH25	30314035	27, 29 William Street	0m	RPS, NIAH
BH27	30314034	5, 7 Williamsgate Street	0m	RPS, NIAH
BH28	30314033	8 Williamsgate Street	0m	RPS, NIAH
BH29	30314074, 30314075	3 and 5 Merchants Road	0m	RPS, NIAH
BH31	30314059	1 Merchant's Road	0m	NIAH
BH32	30314060	Methodist/Presbyterian Church, Queen Street, with burial ground to side and rear	2m SE	RPS, NIAH
BH33	30314039	19 Eyre Square	0m	RPS, NIAH
BH34	30314040, 30314041	16 & 17 Eyre Square	0m	RPS, NIAH
BH35	30314038	Eyre House, 21 Eyre Square	0m	NIAH
BH36	30314037	23 Eyre Square	0m	NIAH
BH37	30314042	Meyrick Hotel, 14, 15 Eyre Square	0m	RPS, NIAH

BH No.	NIAH Reg.	Name	Distance from Proposed Scheme	Designation
BH38	30314027	The Galway Hooker, (fountain) Eyre Square	21m SE	NIAH
BH39	30314026	Browne Doorway, Eyre Square	7m SE	RPS, RMP, NIAH
BH40	30314019	41 Rosemary Avenue (Dunnes Stores)	0m	NIAH
BH41	30314020	40 Eyre Square (Dunnes Stores)	0m	NIAH
BH42	30314021	43 Eyre Square	0m	RPS, NIAH
BH43	30314022	45 Eyre Square	0m	RPS, NIAH
BH44	30314023	Liam Mellows Statue, Eyre Square	0m	RPS, RMP, NIAH
BH45	30314028	8 Eyre Square	0m	RPS, NIAH
BH46	30314043	Ceannt Station	9m S	RPS, NIAH
BH47	30314044	Ceannt Station	50m SW	RPS, NIAH
BH48	30314045	Railway and Ancillary Buildings - train shed	38m S	RPS, NIAH
BH49	30314046	Railway and Ancillary Buildings - foot bridge	48m S	RPS, NIAH
BH50	30314047	Railway and Ancillary Buildings - signal box; water tower; turntable	0m	RPS, NIAH
BH51	30314029	19 Forster Street	0m	NIAH
BH52	30314001	Water trough, Forster Street	0m	RPS, NIAH
BH53	30314024	St. Patricks Hall, Forster Street	0m	RPS, NIAH
BH54	30314013	37 Prospect Hill	0m	RPS, NIAH
BH55	30314077	County Hall, Prospect Hill	0m	NIAH
BH56	30314025	Magdalen Convent & Church, Forster Street	0m	RPS, NIAH
BH57	30315005	48 Forster Street	26m SE	RPS, NIAH
BH58	30315003	Yeats College, Former Erasmus Smith Grammar School 1816, 3 College Road	19m NW	RPS, NIAH
BH59	30315002	30 College Road	0m	NIAH
BH60	30313001	Post box, University Road	0m	NIAH
BH61	30314032	2 Eglinton Street	0m	RPS, NIAH
BH62	30313003	19-20 University Road	0m	RPS, NIAH
BH102	30314009	House, 1 Courthouse Sq	20m NW	RPS, RMP, NIAH
BH103	30314078	33 Abbeygate Street Upper	49m S	RPS, NIAH
BH105	30310004	Bohermore Cemetery walls	0m	NIAH

15.3.3.2 Garden Survey

The first edition Ordnance Survey map of County Galway (1838-9) shows the extent of demesne landscapes as shaded portions of land within the study area. These were established as a naturalised landscaped setting for the large houses of the landed gentry.

There are three demesnes depicted on the first edition OS map or listed on the Garden Survey of the National Inventory of Architectural Heritage within a 50m study area around the Proposed Scheme. A demesne associated with a structure marked Belmont (DL1) is depicted on the OS map immediately north of what is now University Road, though is not recorded by the Garden Survey. Demesnes associated with Wellpark House (DL2) and Rinmore House (DL3) lie immediately north and south of Dublin Road respectively, at the eastern extreme of the Proposed Scheme.

Table 15.4: Designed Landscapes (DL) located within the Study Area

BH No.	NIAH Reg.	Name	Distance from Proposed Scheme	Designation
DL1	N/A	Belmont demesne	0m	None
DL2	Survey ID.: 5404	Wellpark House demesne	0m	NIAH
DL3	Survey ID.: 5376	Rinmore House demesne	0m	NIAH

15.3.4 National Museum of Ireland (NMI): Topographical Files

Information on artefact finds from the study area in County Galway have been recorded by the National Museum of Ireland since the late 18th century. Location information relating to these finds is important in establishing prehistoric and historic activity in the study area.

A large number of stray finds dating from the Neolithic period to the post-medieval period have been recovered from Galway City, included a variety of items retrieved from the River Corrib itself. Details of these finds can be found in Appendix 15.5 (Stray Finds within the Study Area) in Volume 4 of this EIAR.

15.3.5 Cultural Heritage Sites

The term ‘cultural heritage’ can be used as an over-arching term that can be applied to both archaeology and architecture. However, it also refers to more ephemeral aspects of the environment, which are often recorded in folklore or tradition or possibly date to a more recent period.

Twelve specific Cultural Heritage sites within the 50m study area around the Proposed Scheme have been identified during the course of this appraisal through the analysis of historic mapping, aerial photography and a field inspection.

In order to reflect the fact that these sites are not subject to specific statutory protection, and are not included on the RMP/SMR, NIAH or RPS they have been listed as Cultural Heritage sites (CH) in Table 15.5 and are shown on Figure 15.5

in Volume 3 of this EIAR. Some of the sites are located within the overall designated ACAs for the City as also shown on Figure 15.5 in Volume 3 of this EIAR.

Table 15.5: Previously Unrecorded sites of Cultural Heritage merit located within the Study Area

CH No.	Name/Type	Description	Distance from Proposed Scheme
CH01	Statue, St. Patrick	Painted statue of St Patrick located on the west side of Newcastle Road, adjacent to BH63	26m east
CH02	Millennium Children's Park	Play area and landscaped greenspace immediately south of University Road, between Eglington Canal and Gaol River	0m
CH03	Street furniture	Broken off cast iron lamp post base, or possible vent pipe, Gaol Road (south)	0m
CH04	Equality Emerging statue	Sculpture by John Behan, located on Earl's Island Northwest of Salmon Weir Bridge.	0m
CH05	Street furniture	Cast iron vent pipe at corner of Williamsgate Street and Eglington Street	0m
CH06	Statue of Oscar Wilde and Eduard Vilde	Statue on William Street, presented to Galway when Estonia joined the EU in 2004.	8m southwest
CH07	Gateposts	Distinctive green painted gateway to No. 44 Forster Street, inscribed 'ARD PATRICK'	0m
CH08	Cannon	2 Russian Cannon, captured by Connaught Rangers during Crimean War and then presented to the regiment in recognition of war achievements. Formerly located at Eyre Square, 'temporarily' re-located to grounds of City Council buildings	11m northwest
CH09	Bridge	Footbridge over Distillery River millrace north of Salmon Weir Bridge. Features a camber-headed arch and tooled stone construction.	7m northeast
CH10	Eyre Square (JFK Memorial Park)	Eyre Square is visible on historic mapping as early as 1651, as a park or garden just outside the town walls on the *Pictorial Map of Galway.* The JFK Memorial Park, as it is officially known remains as a focal point for the City of Galway to this day. A number of BH sites and one AH site are located in and around the park, the designation CH10 refers to the remainder of the park.	0m
CH11	Street furniture	Cobbled road surface to the front of Courthouse Square, plus historic kerbstones in same area	0m
CH12	Lough Atalia dock walls	Forming part of the same overall structure as the protected pier (BH100), although not covered by the RPS record. The walls are constructed of the same stone as the pier,	6m south

CH No.	Name/Type	Description	Distance from Proposed Scheme
		though are of slightly rougher coursing. The walls form part of the industrial heritage of the city.	

15.3.6 Townlands

The townland is an Irish land unit of considerable longevity as many of the units are likely to represent much earlier land divisions. However, the term townland was not used to denote a unit of land until the Civil Survey of 1654. It bears no relation to the modern word 'town' but like the Irish word 'baile' refers to a place. It is possible that the word is derived from the Old English tun land and meant 'the land forming an estate or manor' (Culleton 1999, 174).

Gaelic land ownership required a clear definition of the territories held by each sept and a need for strong, permanent fences around their territories. It is possible that boundaries following ridge tops, streams or bog are more likely to be older in date than those composed of straight lines (ibid. 179).

The vast majority of townlands are referred to in the 17th century when land documentation records begin. Many of the townlands are mapped within the Down Survey of the 1650s, so called as all measurements were carefully 'laid downe' on paper at a scale of forty perches to one inch. Therefore, most are in the context of pre-17th century landscape organisation (McErlean 1983, 315).

In the 19th century, some demesnes, deer parks or large farms were given townland status during the Ordnance Survey and some imprecise townland boundaries in areas such as bogs or lakes, were given more precise definition (ibid.). Larger tracts of land were divided into several townlands, and named Upper, Middle or Lower, as well as Beg and More (small and large) and north, east, south, and west (Culleton 1999, 179). By the time the first Ordnance Survey had been completed a total of 62,000 townlands were recorded in Ireland.

The Proposed Scheme is located within the townlands of Townparks and Milestone, the parish of St Nicholas, and barony of Galway, County Galway.

15.3.7 Place Name Analysis

Townland and topographic names are an invaluable source of information on topography, land ownership and land use within the landscape. They also provide information on history, archaeological monuments and folklore of an area. A place name may refer to a long-forgotten site and may indicate the possibility that the remains of certain sites may still survive below the ground surface. The Ordnance Survey surveyors wrote down townland names in the 1830's and 1840's, when the entire country was mapped for the first time. Some of the townland names in the study area are of Irish origin and through time have been anglicised. The main references used for the place name analysis are Galway: a Summary History by P. Walsh (2004), Irish Local Names Explained by P.W Joyce (1870), and www.logainm.ie.

Galway is believed to have derived its name either from the River Corrib, which was once known as Abhainn na Gaillimhe, the Galway River, or from a mythical character Gailleamh, who drowned in its waters. The earliest reference to the name 'River Corrib' is contained within a document drawn up in 1674 (Walsh 2004, 269).

15.3.8 Summary of Previous Archaeological Investigations

A review of the Excavations Bulletin (1970–2021) revealed that there have been 33 licenced archaeological investigations within the Proposed Scheme and its 50m study area, 16 of which revealed nothing of archaeological significance. These are summarised below in Table 15.6.

Table 15.6: Summary of Previous Archaeological Fieldwork carried out within the Study Area

Licence	Reference	Description	Distance from Proposed Scheme
06E0748	Bennett 2007:619	Monitoring at 2 Francis Street, partly exposed along the south wall was a stone-dressed drain. This drain was covered and left in situ	c. 10m northeast
07E0890	Bennett 2008:572	Testing at Newtownsmith. A total of eight walls were uncovered plus cobbled surfaces, majority appeared to be the remnants of 18th–19th-century buildings. One possible earlier wall.	c. 25m west
97E0223	Bennett 1997:201	Excavation and monitoring of demolition work in advance of rebuilding at the Franciscan Priory, Francis Street (AH8). Post medieval remains and medieval dressed stone fragments in rubble layers.	Immediately adjacent to the west
99E0327	Bennett 1999:295	Testing at 9 Francis Street. No archaeological significance.	Immediately adjacent to the west
07E0100	Bennett 2007:620	Monitoring at 18 Mary Street. Mortared surface preserved in situ.	Immediately adjacent to northwest
-	Bennett 1990:060	Excavation at Eglington Street revealed remains of former Garda barracks, post-med culvert.	c. 10m south
C476; E4354; R260	Bennett 2011:257	Monitoring along Eglington Street revealed a section of the city bastion wall (Lion Tower) (AH14/BH75) and an adjacent foundation (AH13) between the CAO office, Tower House and No. 21 Eglinton Street.	0m
00E0685	Bennett 2000:0388	Testing at 3-5 William Street revealed remains of walls, preserved in situ (BH81).	c. 15m southeast
06E0543	Bennett 2006:803	Testing at Taaffe's Shop, William Street revealed post-med wall and cobbles.	c. 35m south
98E0174	Bennett 1998:247	Testing at 5-7 Eyre Street revealed a post-med cellar and possibly medieval wall.	Immediately adjacent to south
95E0176	Bennett	Excavation at 12-21 Eyre Street revealed remains of	c. 35m east

Licence	Reference	Description	Distance from Proposed Scheme
	1996:152	town defences, medieval pits.	
01E0914	Bennett 2001:506	Testing at 32 Eyre Street. No archaeological significance.	c. 30m northwest
20E0023	Bennett 2020:056	Testing at 33-35 St Brendan's Avenue. No archaeological significance.	c. 32m south
99E0119	Bennett 1999:291	Testing at 33-34 Eyre Square revealed two walls, possibly associated with town defences (AH13).	Immediately adjacent
02E1032	Bennett 2002:0731	Monitoring at 43 Eyre Square. No archaeological significance.	Immediately adjacent to northwest
99E0403	Bennett 1999:911	Investigation at 47 Eyre Square. No report available.	Immediately adjacent to northwest
99E0424	Bennett 1999:298	Testing at 26 Prospect Hill revealed post-med pits.	Immediately adjacent to southeast
00E0184	Bennett 2000:0384	Testing at the former American Hotel at the north corner of Eyre Square. No archaeological significance.	Immediately adjacent to east
13E0354	Bennett 2013:614	Testing at 11 Eyre Square revealed post-med pits	c. 8m northeast
14E0228	Bennett 2014:516	Testing at 11 Forster Street revealed 'Features of archaeological significance', no further information was submitted to excavations.ie.	c. 20m northwest
04E1561	Bennett 2004:0686	Excavation at northern end of Eyre Square revealed extensive post-med structural remains, three gold-plated pins, a section of gold wire, an amber bead, early clay-pipe bowls.	Immediately adjacent to northeast
04E1543	Bennett 2005:601	Testing at 19 Eyre Square revealed post-med cobbles, remains of bank building.	Immediately adjacent to southwest
98E0548	Bennett 1998:246	Testing at 13 Eyre Square (BH37). No archaeological significance.	Immediately adjacent to southeast
98E0087	Bennett 2001:514	Monitoring at Victoria Place (BH92). No archaeological significance.	Immediately adjacent to northeast
-	Bennett 1992:087	Monitoring at Mary Street. No archaeological significance.	0m
05D019, 05R013	Bennett 2005:599	Underwater archaeological assessment at Galway Harbour. No archaeological significance.	c. 15m south
18E0628	Bennett 2020:037	Monitoring at Dock Street, Queen Street & Bothar na Long. No archaeological significance.	Immediately adjacent to southeast
99E0745	Bennett	Testing at The Fairgreen. No archaeological	c. 10m

Licence	Reference	Description	Distance from Proposed Scheme
	1999:292	significance.	southwest
99E0745	Bennett 2001:507	Monitoring at Fairgreen. No archaeological significance.	Immediately adjacent to southwest
18E0549	Bennett 2020:113	Monitoring at The Dean Hotel, Prospect Road. No archaeological significance.	c. 27m north-northeast
99E0149	Bennett 1999:294	Testing at Forster Street/College Road. No archaeological significance.	Immediately adjacent to south
17E0072	Bennett 2017:120	Testing at 47 Forster Street. No archaeological significance.	c. 20m north
07E0819	Bennett 2007:618	Testing at Galway Grammar School, College Road. No archaeological significance.	c. 5m northwest
09E0067	Bennett 2009:416	Monitoring for at Galway Harbour Enterprise Park. No archaeological significance.	Immediately adjacent to southeast

15.3.9 Cartographic Analysis

15.3.9.1 Barnaby Gooche, Plot of the Town of Galway, 1583

This map is a bird's-eye view of the town of Galway taken from the northeast. The map, though not displaying particular cartographic skill, conforms in general to what is known to have been the layout of the town. The town is represented as containing streets complete with houses and is completely enclosed by walls. A single bridge (West Bridge, now William O' Brien's Bridge) is shown crossing the River Corrib, circa 230m to the south of the Proposed Scheme.

A gate is shown in the southwest section of town wall leading to the quays, which are located within the immediate vicinity of the present Wolfe Tone Bridge. No structure is depicted at the site of the existing Salmon Weir Bridge (BH 10). The site of the Franciscan Friary and the abbey church (AH 7/8/11, BH 19/68/69/70) is depicted in a precinct on an island to the north of the main town, on the eastern bank of the river and surrounded on three sides by the Proposed Scheme.

15.3.9.2 Captain Brian Fitzwilliam, Circuit of the Town of Galway, 1589

This is also a birds-eye view of Galway. Again, the town is shown as containing streets full of buildings, enclosed by walls, and the general street layout conforms to what is known of the town at this time. A mill and associated mill race (AH10) border the east bank of the River Corrib at the site of the friary.

15.3.9.3 John Speed, Plan of Galway from Theatre of the Empire of Great Britain, 1610

This is the earliest detailed map of Galway City and it shows a greater degree of accuracy with respect to the street plan than earlier examples. The town is depicted as having a well-developed arrangement of streets, each of which has a line of buildings on each side. The walls of the town are shown as crenelated (although this may be a stylization) and a number of towers and bastions are depicted, including the Lion Tower (BH75). The North Bastion Gate (BH77) is not yet shown. A large bridge is shown crossing the Corrib at the site of the current William O' Brien Bridge. The western banks of the Corrib are shown as largely undeveloped. No bridge is shown at the site of the existing Salmon Weir Bridge (BH 10). The mill and mill race (AH2) are no longer depicted.

15.3.9.4 The Pictorial Map of Galway, 1651

This is a well-known bird's-eye view of the town printed during the reign of Charles II (1660-65). The document must be used with a certain degree of caution as it is possible that features are not necessarily depicted accurately (Diagram 15.1) and the map should not be relied upon to show each individual plot. It seems more likely that the principal buildings and streets were drawn, and the remainder of the space was filled with general impressions of the buildings in the city, rather than by detailed survey. The map's detailed indices record the names and locations of numerous features and places, which may otherwise have remained unknown. The site of William O'Brien Bridge is shown as being occupied by an elaborate bridge structure, complete with entrance gates and nine spans. The site of the existing Salmon Weir Bridge (BH 10) is not shown in this map; however, a salmon weir (AH6) is depicted to its south. The site of the Franciscan Friary and the abbey church (AH 7/8/11, BH 19/68/69/70) is depicted, along with a mill race and potential associated structure. The town walls are shown in more detail, including the Lion Tower (BH75), and the North Bastion Gate (BH77) is now shown.

Outside the walls the area to the east occupied by the eastern portion of the Proposed Scheme is depicted as more open agricultural land, though with some signs of development, including a formal garden/park in the approximate location of what is now Eyre Square.

15.3.9.5 Sir William Petty, Down Survey Map, County Galway, circa 1655

The Down Survey maps were compiled at a scale of 40 perches to one inch (the modern equivalent of 1:50,000) and represent the first systematic mapping of a large area on such a scale attempted anywhere. The barony maps of Galway were destroyed in 1711 and no copies survive. On the county map the walls of Galway City are clearly depicted, along with a structure to the northeast likely to represent the Franciscan Friary and the abbey church (AH 7/8/11, BH 19/68/69/70).

15.3.9.6 Thomas Phillip, Map of Galway, 1685

The detail of this map (Diagram 15.1) depicts the walled city at the south of the Proposed Scheme, with its street pattern that is still recognisable in the present-day road layout. The area to the east outside the walls remains relatively undeveloped.

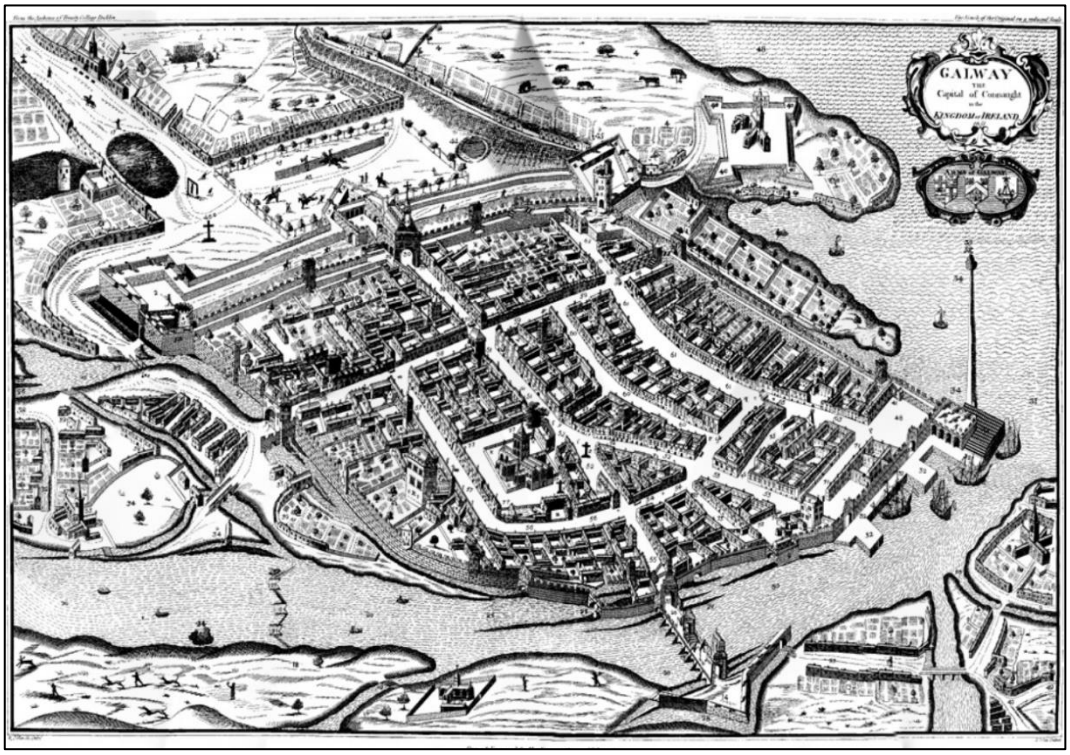


Diagram 15.1: Extract from the Pictorial Map of Galway (1651), the Proposed Scheme passes through the area on the left of the map

15.3.9.7 Michael Logan, Map of Galway, 1818

This map was produced to accompany Hardiman's *The History of the Town and County of Galway*, published in 1820 (Diagram 15.2). This shows the city in plan form, rather than pictorially as a bird's-eye view. The line of the town walls continues to be illustrated on this map, though this does not necessarily imply that the walls were still extant at the time. 'New Bridge' is marked at the location of the existing Salmon Weir Bridge (BH10). The county gaol (AH2, BH65) and town gaol are depicted in the western portion of the Proposed Scheme. The courthouse (BH 16) is annotated to the north-east of the site. A distillery is marked within the grounds of the Franciscan Friary, as is the abbey church (AH 7/8/11, BH 19/68/69/70). The salmon weir (AH6) is depicted to the southeast of the Proposed Scheme. Further east, the street plan is again recognisable as approximating its current layout and has spread east beyond the confines of the town walls. Eyre Square is depicted as 'Meyrick Square'/'Fair Green' and a 'Corn and Potato Market' is marked at adjacent to its northern end. Roads corresponding to the present-day Prospect Hill and Forster Street are shown leading northeast, lined with buildings, though the areas in between remain open.

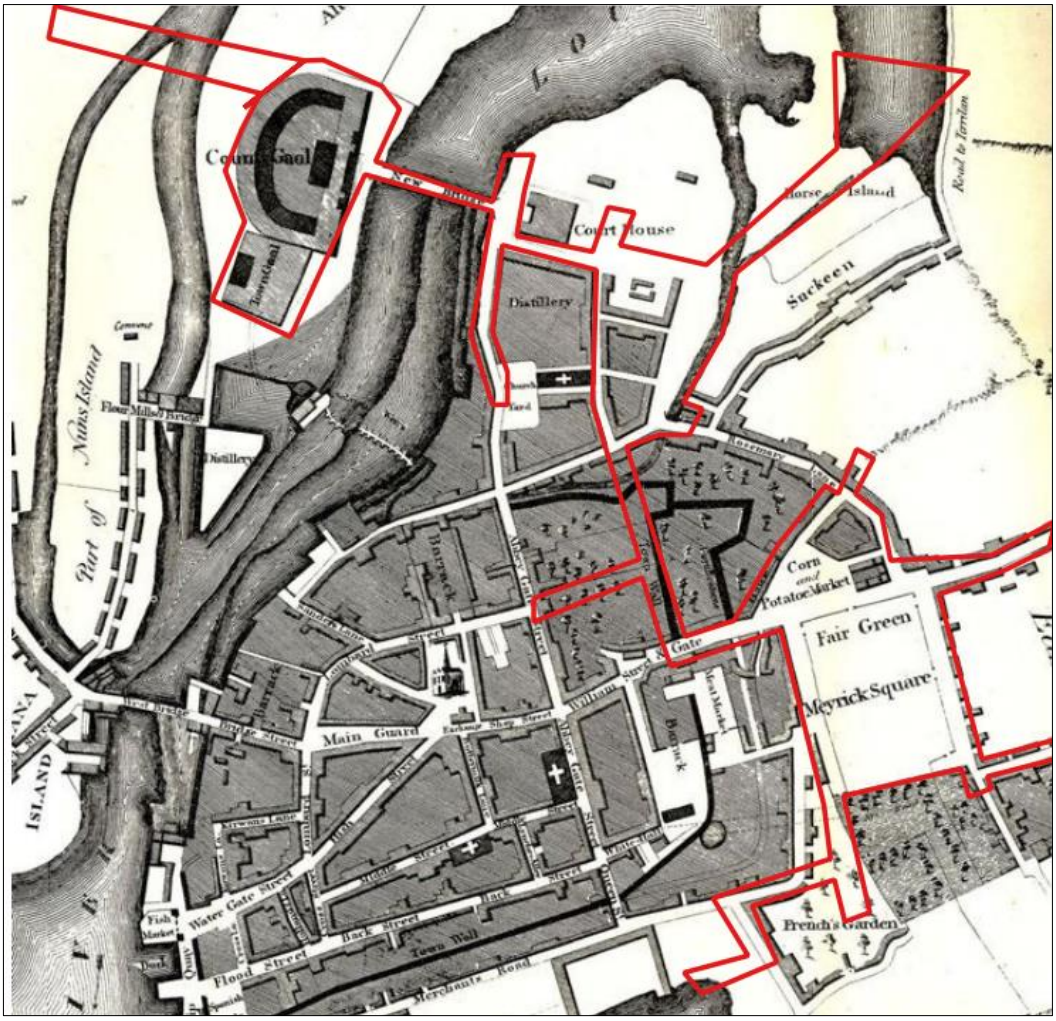


Diagram 15.2: Extract from Logan's Map of Galway (1818) showing the approximate location of the central portion of the Proposed Scheme

15.3.9.8 First Edition Ordnance Survey Map, 1838, scale 1:10,560

This is the first accurate depiction of the landscape containing the Proposed Scheme area (Diagram 15.3). The town walls are no longer marked in their entirety, though the Lion Tower (BH75) is depicted. A graveyard (AH7) is annotated within the grounds of the friary (AH 7/8/11, BH 19/68/69/70) and the Town Hall (BH18) is annotated as the Town Court House on this map. The town centre closely resembles its current layout, many of the AH and BH sites are now depicted and marked including the County Gaol (AH2) in detail with a tread mill (AH5), two governors' houses and a solitary confinement cell shown, the New Bridge (BH10), Erasmus Smith's College (BH58) and St. Patricks Chapel (BH95/BH53). Eyre Square is now marked as such and many of the clusters of BH sites which represent housing terraces such as BH22 and BH97 are now present. Whilst development has spread further from the town centre, outlying terraces such as BH2 are not yet present.

The River Corrib and its waterways (BH1) have been utilised for a variety of industrial purposes including a tannery, flour mill, distillery, brewery and a tuck mill.

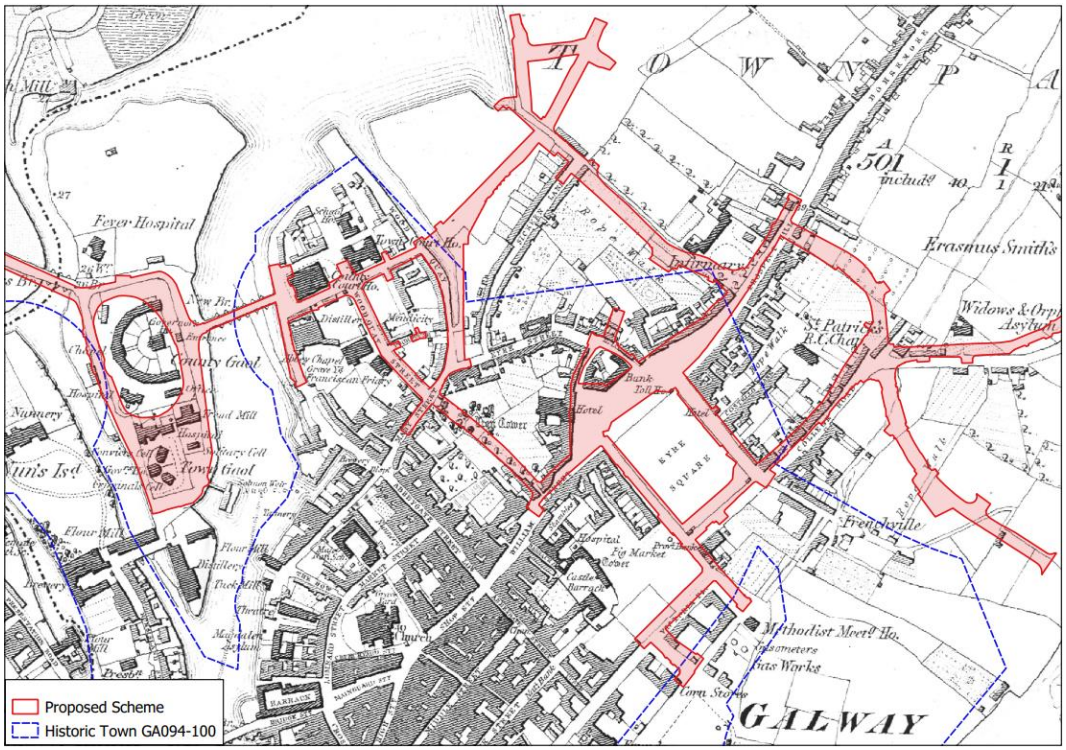


Diagram 15.3: Extract from the first Edition OS Map (1838) showing the Location of the Proposed Scheme

15.3.9.9 Ordnance Survey Map, 1872, scale 1: 1,056

By the time this map was prepared, the mill race, also known as the Persse's Distillery River, (BH9) that passes beneath the western portion of the existing Salmon Weir Bridge (BH10) has been constructed. This led to the embankment of the west side of the River Corrib (BH1) and several structures, now protected (BH 11/66), are depicted on the newly reclaimed land, and the salmon weir (AH6) is shown in detail. Further development has taken place within the town centre, which is shown in more detail, as are many of the structures comprising the BH sites, such as the Town Hall and Courthouse (BH18 and BH16) and the Lions Tower (BH75) and section of the wall of the North Gate Bastion (BH77). Development has also spread further outwards, and most of the terrace at the western end of the Proposed Scheme (BH2) is now present.

15.3.9.10 Ordnance Survey Map, 1900, scale 1: 2,500

This map is not as detailed as the 1872 OS map, for example the area of the present-day Galway Cathedral (BH5) is annotated simply 'County Gaol', with none of the individual structures depicted within its boundaries. This is typical of much of the main portion of the town, though new buildings or configurations of existing ones are shown, for example the General Post Office (BH23) is shown for

the first time and Eyre Square is shown in more detail than previously with a number of hotels marked around it's bordering streets.

The Galway & Clifden Branch of the Midland Great Western Railway is now depicted and traverses the Proposed Scheme area at its northern extreme and Ceannt Station (BH46) and its infrastructure (BH48, BH49, BH50, BH93) is shown, though not named as such.

The Proposed Scheme area appears largely conforming to its present-day layout.

15.3.10 Aerial Photographic Analysis

Inspection of the aerial photographic coverage of the Proposed Scheme area held by the Ordnance Survey (1995-2013), Google Earth (2003-2021) and Bing Maps did not reveal any previously unknown archaeological, architectural or cultural heritage features. This is due to the developed and urban nature of the landscape containing the Scheme area.

15.3.11 Field Inspection

The field inspection sought to assess the footprint of the Proposed Scheme, its previous and current land use, the topography and any additional information relevant to the report. During the field investigation the Proposed Scheme and its immediate surrounding environs were inspected. The results of the field inspection are presented below, section by section running broadly from west to east. Typically, sites within 10m of the Proposed Scheme are discussed, although more significant sites within 20m with a clear line of sight to the Proposed Scheme are also presented. The remainder of the study area was also assessed; however, sites outside of those described above are not presented in further detail here as they will not be impacted by the Proposed Scheme.

15.3.11.1 University Road

This section comprises the western extreme of the Proposed Scheme, from the junction of University Road and Newcastle Road to the Eglington Canal. This section is a main road bounded by Newcastle Road to the west, terraced houses to the south and the grounds of The National University of Ireland Galway (formerly Belmont demesne) to the north. The road crosses the Eglington Canal and Gaol River as it approaches Galway Cathedral. The Millennium Children's Park lies to the south at this point.

Table 15.7: Summary of Field Inspection, University Road

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH62	Ros Geal Student Residence	c.11m south	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
			
BH2	11-18 University Road  Row of terraced houses forming 11-18 University Road ACA. The houses lie outside the Proposed Scheme area, but the northern side of the ACA falls within the redline of the Proposed Scheme.	0m	NIAH/ACA
BH60	Wall-mounted post box, good condition, moderate wear and tear around door 	0m	NIAH
BH3	Gate Lodge/Alumni Office, at entrance to South Campus (NUI Galway)	2m east	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
			

15.3.11.2 Rivers and Waterways

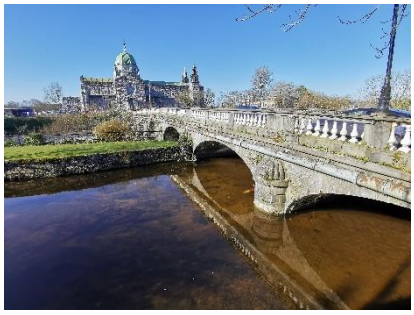
This section comprises sites and/or infrastructure associated with, from west to east, the Eglington Canal, Gaol River, Distillery River, River Corrib, Friars River, Commercial Dock and Lough Atalia.

Table 15.8: Summary of Field Inspection, Rivers and Waterways

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH1	BH1 is the collective designation for river/waterway infrastructure falling under RPS 8501 and 8601, the latter being the River Corrib and its stone pillars and embankments specifically.	0m	RPS
BH1.1	 Eglington Canal facing SSW from bridge, Millennium Park on the left.  Culvert on southeast side of Eglington Canal bridge, facing east	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
CH02	Millenium Childrens Park, icluding landscaped area along east bank of Eglington Canal (see top photo, BH1 above).	0m	-
BH1.2	Beggar's Bridge features extensions to increase the width of the bridge. It appears that original bridge survives underneath. Elevations of bridge feature a pecked appearance to mimic that of tooled stone  Extension on southwest side of Beggar's Bridge, over Gaol River.	0m	RPS
BH1.3/BH9	Distillery River. Mill race running along eastern side of Earls Island, feeding into River Corrib at southern end of the island, close to former Pearse Distillery. Sides of mill race are overgrown but mix of assumed bedrock, stone block walls and modern concrete and rendering.  Distillery River, facing south towards Salmon Weir Bridge from footbridge	0m	RPS
CH09	Footbridge over western millrace at Salmon Weir Bridge which features a camber-headed arch and tooled stone construction.	6m east	-
BH1.4	River Corrib.	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Stone embankments on western bank of River Corrib, facing north from Salmon Weir Bridge.  Section of salmon weir dividing River Corrib from Friars River (foreground), facing northwest.		
BH10	Salmon Weir Bridge. Features cast-iron lamps springing from coping which appear to be original gas-type lights, no longer in use. Coping features some inscribed or carved graffiti, lettering and names. Some areas of broken coping or occasional coping block missing.  Possible eel trap infrastructure to southern side of bridge with corrugated-iron	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	processing building (above).  Southern face of bridge, crossing Friars River in foreground. Cathedral in background.		
BH100	19th century stone pier, northern end of Lough Atalia. 	9m south	RPS
CH12	Lough Atalia dock walls, part of same structure as BH100, although not included in RPS designation. Rough masonry construction.  Pier BH100 with dock wall CH12 in foreground.	6m south	-

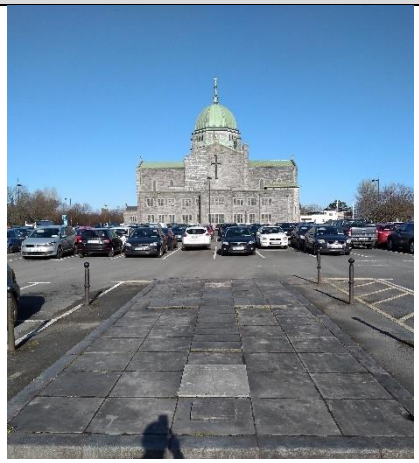
15.3.11.3 Earl's Island

This section comprises the portion of the Proposed Scheme on Earl's Island between Beggar's Bridge (Gaol River) and Salmon Weir Bridge (River Corrib). The area is dominated by Galway Cathedral which occupies the northern portion of this section, the southern portion comprising a car park. Green space along the eastern bank of the Gaol River borders the area to the west, with historic buildings

to the north and south. The Distillery River mill race and historic buildings on the western bank of the River Corrib lie to the east and southeast, largely screened from the Proposed Scheme by mature trees along the south-eastern boundary.

Table 15.9: Summary of Field Inspection, Earl's Island

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH5	Galway Cathedral. Built during the 1960's, cruciform cathedral with a mix of architectural styles and distinctive copper-capped dome roof. Dominating feature in local landscape.  Cathedral from southeast	5m east	RPS
AH2	Site of Galway Gaol. The cathedral is built on the site and no above ground remains associated with the prison survive within the Proposed Scheme, with the exception of BH65 (see below).	0m	RMP
AH5	Site of mill. The site lies within the car park of the cathedral and no above ground remains survive within the Proposed Scheme.	0m	RMP
BH6	Island House. Early 19th century warehouse, now offices. Well preserved and retains much of original character.  Facing southwest	0m	RPS
BH65	Memorial located within the cathedral carpark. Plaques commemorate all those who died or were executed at Galway Gaol and specifically one Myles Joyce, an innocent man executed at the gaol in 1882.	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 		
CH03	Lower portion of a probable cast-iron vent pipe (or possibly a map post base but unclear) on Gaol Road (south). Cast-iron construction consisting of an ornate pedestal featuring a moulded plinth with foundry name (hidden) surmounted by a fluted dado with moulded band under a fluted cornice which supports a moulded base to a plain shaft. Shaft is broken.	0m	-

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing southwest		
BH66	Includes two 19th century buildings (now Fisheries offices), gateway from Gaol Road and piers. The main structures are set back several metres from the Proposed Scheme, however the gateway immediately abuts the boundary.  Access bridge over Distillery River, facing southeast  Gateway off Gaol Road, facing south	0m	RPS
BH11	County Club House. Tudor revival style, reached by a gateway off Gaol Road and access bridge over Distillery River mill		

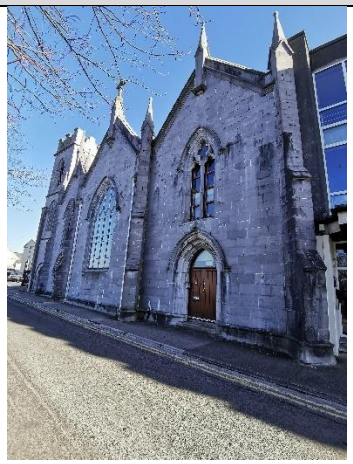
Constraint No.	Description	Distance from Proposed Scheme	Designation
	race. As with BH66 the gateway immediately abuts the Proposed Scheme although the main house is set back some distance from the boundary. Largely screened from it by mature trees.  Facing northeast  Gateway off Gaol Road, facing southeast		

15.3.11.4 Newtownsmith/Waterside

This section comprises the c. 125m portion of the Proposed Scheme lying mainly along Newtownsmith, with a short section of Waterside to the north of Salmon Weir Bridge. The area is bounded by the Friars River branch of the River Corrib to the west and is linked to Earls Island by the Salmon Weir Bridge. Galway Courthouse and the Convent of Mercy lie to the east, with modern redevelopment to the southeast. The section lies within the historic town of Galway.

Table 15.10: Summary of Field Inspection, Newtownsmith/Waterside

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH12	Convent of Mercy. 19th century R.C. chapel fronting onto Newtownsmith.	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing northeast		
BH67	Wooden sculpture of leaping salmon, currently located at eastern end of Salmon Weir Bridge. Moderate weathering and some evidence of repair.  Facing northwest	0m	RPS

15.3.11.5 St Vincent's Avenue

This section comprises the portion of the Proposed Scheme along St. Vincent's Avenue from Newtownsmith/Waterside to Wood Quay. The historic buildings of Galway Courthouse and the Town Hall Theatre lie along the northern side of the area, with the boundary wall of the present-day Franciscan abbey to the south in the western half of the area. The eastern half is bounded to the south by more recent redevelopment. The section lies within the historic town of Galway.

Table 15.11: Summary of Field Inspection, St Vincent's Avenue

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH16/CH11	Galway Courthouse. Square limestone bollards are present along the kerb directly in front of courthouse and feature chamfered corners which taper upwards. A significant amount of historic stone paving and kerbing (CH11) still in situ in the area around BH16 and BH18 (see below).  Front of courthouse, facing southwest, post box BH17 is visible in the foreground.	0m	RPS
BH17	Post box located in front of courthouse (see above). Pillar type, good condition.	6m west	RPS
BH18/CH11	Town Hall Theatre, formally Town Hall. Design of the front elevation mirrors that of the courthouse opposite, the remainder of the building is less grand. Road surface to the front on Courthouse Square is cobbled (CH11).  Front elevation and cobbled road surface, facing southeast  From St. Vincent's Avenue, facing north	0m	RPS

15.3.11.6 St. Francis Street/ Mary Street

This section comprises the portion of the Proposed Scheme along St. Francis Street from St. Vincent's Avenue to Mary Street/Eglinton Street/Daly's Place and includes a short section of Mary Street. The majority of the sites in this section are associated with the Franciscan Abbey and Convent of Mercy. The southern end of this section falls within the City Core ACA. The northern portion of this section is bounded by the Franciscan abbey and a modern school building to the west and east respectively, the southern portion by a mix of modern and historic terraced buildings on both sides. The section lies within the historic town of Galway, the southern end of St Francis Street also falls within the City Core ACA, as does St Mary's Street.

Table 15.12: Summary of Field Inspection, St. Francis Street/ Mary Street

Constraint No.	Description	Distance from Proposed Scheme	Designation
AH11	Site of Franciscan abbey, established in 1296. Present-day courthouse (BH16) is built on the site of the original abbey. The present-day abbey was built in the early 19th century, renovated in the 1970s. All the original buildings have been demolished or completely rebuilt, although a number of architectural fragments survive (BH70).  Cloister of modern abbey which immediately abuts Proposed Scheme along St. Vincent's Avenue, architectural fragments are situated along northern wall. Facing northeast.	0m	RMP
BH70	BH70 comprises the convent/abbey grounds including a small graveyard, a doorway and medieval architectural fragments from the earlier abbey and convent buildings. Some of these are incorporated into northern wall of modern cloister, other smaller fragments merely placed/stored there. At the northeastern end of the cloister, a cellar/tunnel apparently runs under St Francis Street.	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Medieval architectural fragments/features  Graveyard, facing southeast  Tunnel under St. Francis Street, facing ENE  Doorway (BH69) incorporated into present-day abbey building, facing south. The doorway lies c. 25m from the		

Constraint No.	Description	Distance from Proposed Scheme	Designation
	Proposed Scheme but is noted here as a component of BH70.		
AH8	AH8 is an earlier iteration of the present-day Franciscan church (BH19 below). The church was originally built in 1660 at this site, and was rebuilt in the 18th and 19th centuries. Remnants survive as architectural fragments (BH70) and a doorway (BH69/70)	0m	SMR
BH19	The present-day Franciscan Church fronts onto St. Francis Street and features an imposing neo-classical portico.  Franciscan church fronting onto St. Francis Street, facing southwest	0m	RPS
BH20	19th century terraced house, now in use as solicitors offices. Timber sash windows and notable doorway.  Facing southwest	0m	RPS
BH72	18-19 Mary Street, 3-storey buildings with dormer to 19. Now in use as commercial properties.  Facing southwest	0m	RPS, ACA
BH73	No. 2 St. Francis Street, 19th century commercial building	0m	RPS, ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing east		

15.3.11.7 St Anthony's Place/Court Lane

This section comprises the portion of the Proposed Scheme at the junction of St Anthony's Place and Court Lane, two narrow side streets between St Francis Street and Wood Quay.

Table 15.13: Summary of Field Inspection, St Anthony's Place/Court Lane

Constraint No.	Description	Distance from Proposed Scheme	Designation
AH15	Structure and architectural fragment. Curved section of lower wall (bottom right of image below) has been interpreted as remains of a dovecote though this is unlikely given the continued line of the wall to the northwest. Lower wall certainly older than the upper portion. Crude cross carved into stone approximately hallway up wall at south-eastern end.  Facing north	0m	RMP

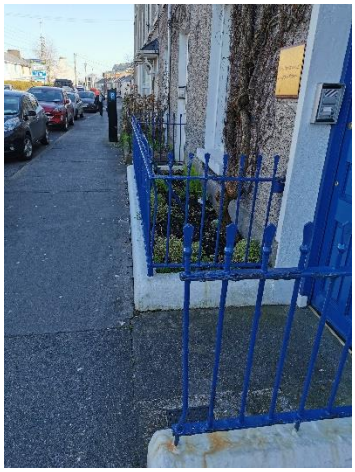
Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Possible windowsill fragment incorporated into wall  Cross at south-eastern end of wall		

15.3.11.8 Daly's Place/Wood Quay/Walsh's Terrace

This section comprises the portion of the Proposed Scheme from Mary Street /Eglinton Street/Daly's Place to Walsh's Terrace/ Dyke Road/ O'Donoghue's Terrace/ St. Brendan's Avenue. The majority of this section, along Wood Quay, forms a more open space than the surrounding streets, lined with a number of historic buildings. The section lies within the historic town of Galway and the southern end of Wood Quay also falls within the City Core ACA, as does Daly's Place.

Table 15.14: Summary of Field Inspection, Daly's Place/Wood Quay/Walsh's Terrace

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH21	19th century house and shop, now Grafton Barbers.	0m	NIAH

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing south		
BH97	Row of 6 19th century terraced houses, southernmost now in use as insurance brokers office  Facing southeast  Detail of railings	0m	RPS

15.3.11.9 Eglington Street

This section comprises the portion of the Proposed Scheme along the entire length of Eglington Street, predominantly occupied by commercial properties, occupying both historic and more modern buildings. The south-eastern end of the street is dominated by the 19th century department store building currently occupied by

Brown Thomas, as well as by the 19th century *An Post* building. This section falls wholly within both the historic town of Galway and the City Core ACA.

Table 15.15: Summary of Field Inspection, Eglington Street

Constraint No.	Description	Distance from Proposed Scheme	Designation
AH14	Site of bridge, no above ground remains identified.	0m	RMP
BH75/AH13	Site of 17th century bastion (Lions Tower, BH75). RPS records 2 'Lions Tower Plaques' bearing family coats of arms. These are currently incorporated into the north-western and south-eastern corners of the building occupying the site, at floor level of the first storey (Trespass). The bastion formed part of the town defences (AH13), the course of which runs along Eglington Street, though no other upstanding remains are present at this location.  Northwestern plaque  Southeastern plaque	0m	RPS, ACA
BH23	Galway general post office. 19th century post office building with tiled facade, still in use as post office.	0m	NIAH, ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing northwest		
BH24	Purpose built 19th century department store, still in use as such today (Brown Thomas), occupying a corner site at the junction of Eglington Street and Williams Street. Visible from Eyre Square and forming a significant landmark.  Facing west	0m	RPS, ACA
BH61	19th century public house and restaurant, now Cellar Bar and sushi restaurant. Occupying corner site at junction of Eglington Street and Williamsgate Street, curved design mirrors that of BH924 opposite.  Facing northeast	0m	RPS, ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Two cast-iron grids in footpath directly adjacent to BH61 and represent either a grid over a lightwell to a basement or an enlarged opening to a cellar or chute to allow goods into basement from street front.		

15.3.11.10 Williams Street/Williamsgate Street

This section comprises the portion of the Proposed Scheme lying along Williamsgate Street to the north-western corner of Eyre Square, as well as the northernmost c. 20m of Williams Street, which comprises a cobbled (modern) pedestrianised area. Both streets are lined with commercial properties, many of which occupy historic commercial buildings or former houses. The south-western portion of this section falls within the City Core ACA and the north-eastern portion within the Eyre Square ACA, and the section lies wholly within the historic town.

Table 15.16: Summary of Field Inspection, Williams Street/Williamsgate Street

Constraint No.	Description	Distance from Proposed Scheme	Designation
CH06	Statue of Oscar Wilde and Eduard Vilde.	8m southwest	ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing north		
BH25/BH80	Large 18th century house, now divided and refurbished, occupied by commercial premises. Symmetrical design with round windows in centre. Sits slightly behind neighbouring building to the northeast. (Note, two separate RPS numbers have been assigned to this structure, apparently one for each division, hence two BH numbers).  Facing southeast	1m northwest	RPS, ACA
BH84	18th century corner building, now Galway Camera Shop. Decorative mouldings of Claddagh rings on three sides, as well as 'Estd 1750'. A moulded decorative arch on the southwestern elevation surrounds a clock and the legend 'Dublin Time'. Clock face is marked 'Galway Camera', so unlikely to be original.  Facing east.	0m	RPS, ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH85	19th century building, now Whelan's Pharmacy  Facing south	0m	RPS
CH05	Probable vent pipe at southwest end of Williamsgate Street. Cast-iron construction consisting of an ornate pedestal (featuring a moulded plinth surmounted by a fluted dado with moulded cornice) which supports a moulded base to a plain shaft. Shaft appears to display a modern extension to above eaves of surrounding buildings which suggests that it is a vent pipe for the sewer.  Base of pipe, facing northeast	0m	ACA
BH86	Fallers jewellers, established 1879. 19th century commercial building 	0m	RPS, ACA
BH87	19th century commercial building, now Galway Bakery Company coffee shop and restaurant. Possible timber sash windows to upper storeys.	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing south		
BH28	Early 19th century commercial building, now Hanly and Co.  Facing north	0m	RPS, ACA
BH27	Logue's, early 19th century commercial building, timber sash windows. Shop front is notable for fluted pilasters.  Facing south	0m	RPS
AH13	This is the second location at which the Proposed Scheme crosses the course of the town defences, though again, no upstanding remains are present at this point.	0m	Nat. Mon.
BH89	19th century commercial building, now CEX and Permanent TSB. An archway at southwest corner gives access to Ballalley Lane.	1m southeast	RPS, ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing southeast		

15.3.11.11 North of Eyre Square

This section comprises the portion of the Proposed Scheme along the northern side of Eyre Square, as well as Rosemary Avenue and the eastern c. 60m of Eyre Street. The section is lined with modern and historic buildings, the junction of Rosemary Avenue and Eyre Street being dominated by the Corrib Shopping centre. Rosemary Avenue is relatively narrow, widening out into a pedestrianised area as it reaches the northern corner of Eyre Square. Along the northern side of the square are wide, tree-lined pedestrian pathways and a series of large historic buildings forming a key part of the character of the square. All sites in this section fall within the historic town and the Eyre Square ACA.

Table 15.17: Summary of Field Inspection, North of Eyre Square

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH40	Dunnes Stores, early 20th century commercial building. Distinctively simpler style than nearby classical designs.  Facing northwest	0m	NIAH, ACA
BH41	Early 20th century commercial building. Grander style contrasts with BH40 opposite, with distinctive arched upper window.	0m	NIAH, ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing northwest		
BH42	Bank of Ireland. Early 19th century bank building forming landmark feature of northern side of Eyre Square. Various historic fabric features remain, including parapet clock, sash windows and railings.  Facing northwest	0m	RPS, ACA
BH43	Hibernian House. 19th century former County Club building, now offices. Imposing grandiose style with Tuscan style portico, again forming a landmark feature at this location.  Facing northwest	0m	RPS, ACA
BH44	Liam Mellows Statue, Eyre Square  Facing northeast	0m	RPS, ACA

15.3.11.12 Eyre Square

This section comprises the portion of the Proposed Scheme along the three remaining sides of Eyre Square (east, west and south). The JFK Memorial Park occupies the centre of the square, bordered by mature trees and manicured hedges. The roads forming this section of the scheme border the park. To the east and south these roads are relatively wide, two-lane main roads, to the west a narrower, largely pedestrianised road with limited vehicular access. Historic buildings comprising terraced houses and pubs, as well as larger buildings border the square on all sides, the imposing Hardiman Hotel dominating the area on the south side. All sites in this section fall within the historic town and the Eyre Square ACA.

Table 15.18: Summary of Field Inspection, Eyre Square

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH38	The Galway Hooker. Fountain with stylised sculpture of the sails of a Galway hooker (ship), erected in 1984.  Facing northwest	20m southeast	NIAH, ACA
BH39/AH16	The Browne Doorway. A key feature of Eyre Square comprising a classical style Jacobean era doorway, relocated from its original building in 1905 to serve as an entrance to Eyre Square. A stone information plaque was unveiled in 2012. The structure is fenced off with clear panels.  Facing southeast	8m southeast	RPS, RMP, ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Plaque to north of doorway		
CH10	CH10 comprises the JFK Memorial Park (Eyre Square) and those features not encompassed by BH38/39 and AH16, including the Padraic O'Conaire statue and a bust of John. F. Kennedy, as well as the park itself.	0m	ACA
BH45	O'Connell's pub. 19th century house, now in use as a public house. Historic pub frontage including stained glass panels.  Facing northeast	0m	RPS, ACA
BH36	19th century terraced house. Relatively understated by comparison to the grander buildings on Eyre square but retains timber sash windows and iron railings, as well as an insulation passageway to a potential cellar to northeast under footpath.  Facing northwest	0m	NIAH, ACA
BH35	Eyre House. 19th century end terrace house, now Hidden Hearing clinic. Retains	0m	NIAH, ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
	timber sash windows and timber door, railings and mouldings around doors and windows. Insulation passageway to a potential cellar to northeast under footpath.  Facing southeast		
BH34	Pair of early 19th century terraced houses, now in use as offices. Coal chute into a cellar on footpath with a decorative cast-iron cover (details are very eroded due to wear from foot traffic). No other such features were observed during field inspection. Distinctive limestone façade and elaborate doorway.  Facing southeast 	0m	RPS, ACA

Constraint No.	Description	Distance from Proposed Scheme	Designation
	Insulation passageway, facing southwest. Coal chute cover visible in footpath at right of image		
BH37	19th century hotel, formerly a railway hotel, more recently the Meyrick and now the Hardiman. Largely freestanding, the hotel dominates the southern side of Eyre Square. Surrounded by insulation passageways to its basement level to street fronts. Most of these insulation passageways are now built up and roofed. Very likely that active cellars extend under footpaths.  Facing southeast	0m	RPS, ACA

15.3.11.13 Victoria Place/Merchant's Road/Forthill Street/Queen Street

This section comprises the portion of the Proposed Scheme between the southern corner of Eyre Square and Queen Street, comprising a series of narrower streets lined with largely early to late 20th century buildings except for Victoria Place which includes a number of older structures. The land to the immediate south of Queen Street is currently undergoing redevelopment.

Table 15.19: Summary of Field Inspection, Victoria Place/Merchant's Road/Forthill Street/Queen Street/Dock Road

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH92	Victoria House. Late 19th century house, now in use as offices. Timber sash windows and stone headed arched and pillared doorway. Archway at southern corner leads to pedestrian access.	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing east		
BH31	Early 19th century house, now Arran Island Ferries. Relatively simple stone façade and doorway.	0m	NIAH
BH32	United Methodist Presbyterian Church and Schoolhouse. Distinctive asymmetrical design, it may be that the schoolhouse at the eastern side is a later addition to the church. Schoolhouse has first floor doorway, reached by external staircase.  Facing southeast	2m southeast	RPS
BH29	1-5 Merchants Road. The eastern majority is an early 19th century commercial building (a stone over an arched doorway bears the date 1825 and initials HC). An Art Deco façade was added and the westernmost property, No. 5, constructed (also in Art Deco style) in the early-mid 20th century. 	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	Art Deco façade at northeastern end of range, facing southwest		

15.3.11.14 Station Road/Forster Street

This section comprises the portion of the Proposed Scheme along Forster Street from the eastern corner of Eyre Square and Station Road, including a short section of Station Road, to the junction with College Road at Galway City Hall. The historic Ceannt Station buildings lie immediately south of the junction between Forster Street, Station Road and Frenchville Lane, including a retaining wall that projects into the proposed scheme boundaries (BH47). Forster Street itself is lined with a mix of historic and modern buildings, including several pubs and hotels/hostels along the portion of Forster Street south of the junction with Fairgreen Road. North of this junction the section becomes predominantly residential, with the exception of the Magdalen Convent and City Council buildings. A stone wall enclosing the former convent lines the route along the northern side of the street. Only the western extreme of this section lies within the historic town, as well as within the Eyre Square ACA.

Table 15.20: Summary of Field Inspection, Station Road/Forster Street

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH47	Retaining wall along northern side of Station Road, opposite Ceannt Station. Wall constructed of roughly dressed limestone with rounded stone coping. C. 80m long.  Facing southeast	0m	NIAH
BH46	Ceannt Station. 19th century station building. Classical design mirrors former railway hotel (BH37), to which it is attached.	9m south	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing west		
BH94	Terrace comprising Nos. 12, 14, 16 and 18 Forster Street, the former three being 3-storey commercial buildings, the latter a 5-storey hotel.  Facing east	0-5m southeast	RPS
BH51	Recorded on the NIAH as an early 19th century house BH51 but is no longer extant, having been demolished by the time of the field inspection. The site is now occupied by a shipping container housing a street food restaurant.  Facing west	0m	N/A
BH53, BH95	19th century R.C. Church (St Patrick's Parish Church), now converted to use as a parish hall. Enclosed from Forster Street by wrought iron gates and railings which abut the boundary of the Proposed Scheme, the building itself is set back	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	some distance from the boundary. The new St Patrick's Church (BH95) lies to the northeast but is screened from the Proposed Scheme by buildings and mature trees.  Former St. Patrick's Parish Church, facing northwest  Gates onto Forster Street, facing southeast  Modern St. Patrick's Church, facing northeast		
BH52	Stone horse-trough, now functioning as a flower bed and forming a nostalgic element to the surrounding street furniture. Inscribed with the letters 'CSRCA', although it is possible that one or both 'C's are actually 'G's.	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing northwest		
BH56	Former mid-20th century Magdalene convent, now an archive. The building itself is partially screened from the Proposed Scheme by the enclosing rubblestone wall which forms the boundary of the Proposed Scheme along Forster Street, and is itself part of the record.  Facing north  Blocked up entranceway in wall, facing north	0m	RPS
CH07	Distinctive green painted gateway to No. 44 Forster Street, inscribed 'ARD PATRICK'.  Facing south	0m	-
BH98	Carved Limestone block with blank shield in wall along south side of Forster Street.	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing south		
CH08	Pair of Russian cannons, captured by the Connaught Rangers during the Crimean War. Relocated from Eyre Square to their current site in the grounds of Galway City Council buildings.  Facing southwest		

15.3.11.15 Prospect Hill

This section comprises the portion of the Proposed Scheme along Prospect Hill from the northern corner of Eyre Square to the junction with St. Bridget's Place. All sites in this section are clustered towards its northern end, where a number of historic terraced buildings line the route. The south-western half of the section has been subject to greater redevelopment, with a number of large modern commercial structures, interspersed with surviving historic terraced houses and shops. The modern County Hall building dominates the central portion of this section. Bóthar Na mBan joins Prospect Hill to Walshe's Terrace and forms a part of the proposed scheme, although no constraints are present along this road. The same is true of Bóthar Bhreandain Uí Eithir which connects Prospect Hill to Forster Street. Only the south-western extreme of Prospect Hill falls within the historic town and the Eyre Square ACA.

Table 15.21: Summary of Field Inspection, Prospect Hill

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH55	Late 20th century Galway County Council buildings incorporate salvaged opening surrounds of an 18th century infirmary that formerly occupied the site.  Facing north  Salvaged stone surrounds in modern wall.	0m	NIAH
BH54/BH96	Terrace of three early 19th century houses, the southwestern two of which (BH96) are now the Western Hotel, the northeastern (BH54) is the offices of Keane Mahoney Smith. All are recorded on the RPS, only BH54 is also on the NIAH, hence dual BH designations.  Facing northeast	0m	RPS

15.3.11.16 College Road

This section comprises the portion of the Proposed Scheme along College Road from Galway City Hall to the junction with Dublin Road. Only two sites are located in this section. The southern portion of this section is bordered to the northwest by the City Council `buildings, set in grassy, tree-lined grounds surrounded by a low stone wall. To the north of this is the historic Yeats College building. Beyond this, and on the southeast side of the road, the route is lined with residential buildings, including terraced and detached 19th century houses, interspersed with more modern buildings. This continues along the remainder of the section, interrupted only by the Sportsground (Connaught Rugby Club and greyhound track) and a petrol station.

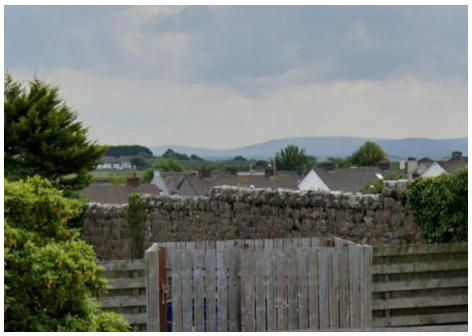
Table 15.22: Summary of Field Inspection, College Road

Constraint No.	Description	Distance From Proposed Scheme	Designation
BH58	Yeats College, formerly Erasmus Smith Grammar School 1816. Retains original character with many classical design features and forms a landmark on the eastern approach to Galway City.  Facing northwest	20m west	RPS
BH59	Distinctive early 19th century detached house retaining much of its original character, and complimenting BH58 further down College Road to the southwest. Garden wall with iron railings to the front forms the boundary of Proposed Scheme.  Facing east	0m	NIAH

15.3.11.17 Moneenageisha Court

This section comprises the portion of the Proposed Scheme occupying Moneenageisha Court, a cul-de-sac on the south side of Moneenageisha Road. The section is lined by a terrace of six modern houses to the south and a low modern wall to the north, separating it from the dual carriageway.

Table 15.23: Summary of Field Inspection, Moneenageisha Court

Constraint No.	Description	Distance From Proposed Scheme	Designation
BH105	Bohermore Cemetery walls. Enclosing wall and gates of Bohermore Cemetery, erected c.1860. Coursed rock-faced limestone enclosing walls with coping. Western end of this section of the abuts the walls on the eastern side of the cemetery, forming the boundary of the Proposed Scheme.  Facing south	0m	NIAH

15.3.11.18 Dublin Road/Wellpark Road

This section comprises the portion of the Proposed Scheme along Dublin Road from the major intersection with Wellpark Road/College Road. The section is bordered to the north by the Wellpark Retail Centre and to the south by greenspace at the northern end of Lough Atalia.

Table 15.24: Summary of Field Inspection, Dublin Road/Wellpark Road

Constraint No.	Description	Distance from Proposed Scheme	Designation
BH99	18th/19th century cottage with attached rubblestone enclosing wall to east and west, low plastered wall to front along Wellpark Road, forming the boundary of Proposed Scheme.	0m	RPS

Constraint No.	Description	Distance from Proposed Scheme	Designation
	 Facing northwest		

Most streets appear to have a sewer line with potential for the sewer itself (inverted drop profile with a round arch and sides tapering downwards to a narrow channel or box culvert featuring flat or round arches) to be of archaeological or historical significance. Other structures associated with the sewer; manholes, culverts, drains etc also have the potential to be of historic significance. There is also the potential for historic surfaces to exist beneath modern road and footpath levels.

15.3.12 Conclusions

The Proposed Scheme follows existing roadways, traversing the city centre from University Road in the west to Dublin Road in the east. The central portion of the Scheme occupies the north-eastern area of the archaeological zone of notification for the historic town of Galway (GA094-100, AH1), which is a recorded monument.

There are 18 further archaeological sites and groups of sites recorded within 50m of the Proposed Scheme, 17 are recorded on the Record of Monuments and Places (RMP). The last (AH17) is a redundant record. Of these RMP sites and groups of sites, two are additionally listed on both the RPS and NIAH Survey and a further three are included on the RPS. One, Galway Town Defences (AH13), is also a National Monument. The Proposed Scheme crosses the route of the town defences along Eglington Street and towards the north-eastern end of Williamsgate Street.

There are 86 protected structures and groups of protected structures within the Proposed Scheme and its study area. These include the rivers and waterways of Galway, (and associated bridges, walling, embankments, piers, and other infrastructure (BH1), Galway Cathedral (BH5), remains of the town defences (BH75, BH77, BH83) and numerous residential and commercial buildings, several of which incorporate medieval remains.

Of the 86 individual and groups of protected structures, three are also part of a National Monument (Town Defences), three are also listed on both the RMP and the NIAH Survey; two are listed both as an SMR and on the NIAH; three are also listed on the RMP only and 41 are included on the NIAH Survey.

An analysis of historic mapping has shown the town of Galway as an important settlement since at least the late medieval period, and a recognisable street pattern is discernible from relatively early in the post-medieval period. Development continues throughout the post-medieval period, spreading beyond the historic core into the areas occupied by the eastern and western portions of the Proposed Scheme by the end of the 19th century.

Previous archaeological excavations within the Proposed Scheme and its immediate vicinity have demonstrated the survival of post-medieval and medieval remains below street level, and several protected structures incorporate medieval remains into their fabric.

Aside from the archaeological and built heritage features discussed above, twelve purely cultural heritage sites have been identified within, or within the vicinity of the Proposed Scheme. Arguably the most significant of these consists of the JFK Memorial Park (Eyre Square), which, whilst a number of protected sites are present in and immediately bordering the park, is not subject to specific statutory protection itself, other than lying within the Eyre Square ACA. Eyre Square is visible on historic mapping as early as 1651 and remains an important cultural focus point for the city.

The remaining eleven cultural heritage sites were identified during a field inspection and consist of smaller sites such as statues and street furniture, as well as a footbridge and the dock walls at the northern end of Lough Atalia, associated with BH100. The field inspection also established that one NIAH structure, a 19th century house at No. 19 Forster Street (BH51), is no longer extant having been demolished, apparently relatively recently. The site is now occupied by a shipping container housing a street food restaurant.

15.4 Characteristics of the Proposed Scheme

Currently, Galway City experiences congestion problems partially as a result of over reliance on the private car and lack of alternative modes of transport which impacts upon the journey time reliability of existing public transport services and limits the available road space for introducing bus and cycle lanes (GTS Appendix B, Modelling and Appraisal Report, 2016).

The Proposed Scheme includes:

- Creation of a public transport corridor linking the western and eastern suburbs of Galway City, through the city centre core;
- Facilitation of improved pedestrian, cyclist and bus accessibility and movement;
- Reduce car accessibility through the city centre;
- Infrastructural works at certain roads and junctions; and
- Improvements to the public realm at a number of locations within the city centre, including Eyre Square (north), Woodquay and in the vicinity of Galway Cathedral.

The upgrade or replacement of underground services and structures will also be required at certain locations.

15.5 Potential Effects

15.5.1 Do Nothing Scenario

If the Proposed Scheme were not to proceed, there would be no effect upon the archaeological, architectural or cultural heritage resource.

15.5.2 Construction/Operation Phase

General guidance on the approach to impact assessment and the cultural heritage resource is provided in Appendix 15.6 of Volume 4 of this EIAR.

15.5.2.1 Archaeological Heritage

Potential impacts on the archaeological resource during the construction/operation phases are outlined in Table 15.25 below, along with mitigation measures and residual impacts after the implementation of those measures. Detailed descriptions of mitigation measures can be found in section 15.6 below.

Table 15.25: Summary of Potential Impacts upon Archaeological Heritage

AH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
AH1	Historic Town of Galway	Construction: Direct negative	Potential for negative impact upon previously unrecorded features which may survive beneath current ground level, resulting from ground disturbances within the boundaries of the historic town.	Significant	Archaeological monitoring	Imperceptible to slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
AH2	Prison	Construction: Direct negative	Potential for negative impact upon previously unrecorded features which may survive beneath current	Moderate	Archaeological monitoring	Imperceptible to slight negative

AH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
			ground level, resulting from ground disturbances within in the area surrounding Galway Cathedral.			
		Operation: Neutral	N/A	N/A	N/A	Neutral
AH5	Mill	Construction: Direct negative	Potential for negative impact upon previously unrecorded features which may survive beneath current ground level, resulting from ground disturbances within in the area surrounding Galway Cathedral.	Moderate	Archaeological monitoring	Imperceptible to slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
AH11	Religious house - Franciscan friars	Construction: Direct negative	Potential for negative impact upon previously unrecorded features which may survive beneath current ground level, resulting from ground disturbances within St Francis Street, St Vincent's Avenue and Newtownsmith.	Moderate	Archaeological monitoring	Imperceptible to slight negative
		Operation:	N/A	N/A	N/A	Neutral

AH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
		Neutral				
AH13	Galway Town Defenses	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on known sites of town defenses on Eglington Street and Williamsgate Street, as well as on previously unrecorded features which may survive beneath current ground level in these areas.	Very Significant	Ministerial Consent. Archaeological monitoring	Slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
AH14	Bridge	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on known site of a bridge on Eglington Street as well as on previously unrecorded features which may survive beneath current ground level in this area	Significant	Archaeological monitoring	Imperceptible to slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
AH15	Structure and Architectural fragment	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on known site of a	Significant	Archaeological monitoring	Imperceptible to slight negative

AH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
			bridge on Eglington Street as well as on previously unrecorded features which may survive beneath current ground level in this area			
		Operation: Neutral	N/A	N/A	N/A	Neutral
AH16 (BH39)	The Browne Doorway, Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Moderate	Full written and photographic record	Imperceptible to slight negative
AH3, AH4, AH6, AH7, AH8, AH9, AH10, AH12, AH15, AH18	Various	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: No Impact	N/A	N/A	N/A	Neutral

There is a potential for ground disturbances associated with the Proposed Scheme to result in direct negative effects on previously unrecorded features or deposits that have the potential to survive beneath the current ground level, including cellars (in use or otherwise) that may extend beyond the footprint of the buildings.

The laying of a new outfall into Lough Atalia may result in direct negative effects on previously unrecorded underwater/maritime features or deposits.

Effects, prior to the application of mitigation measures, will range from moderate to significantly negative, dependant on the nature, extent and significance of any such archaeological remains.

15.5.2.2 Architectural Heritage

Potential impacts on the architectural resource during the construction/operation phase are outlined in Table 15.26 below, along with mitigation measures and residual impacts after the implementation of those measures. Detailed descriptions of mitigation measures can be found in section 15.6 below.

Table 15.26: Summary of Potential Impacts upon Architectural Heritage

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
BH1.1	Bridge over Eglington Canal	Construction: Direct negative	Potential for negative impact on historic fabric of bridge resulting from works on bridge surface	Slight-Moderate	Hoard off historic fabric during construction,	Neutral
		Operation: Neutral	N/A	N/A	N/A	Neutral
BH1.2	Gaol River and Beggar's Bridge	Construction: Direct negative	Potential for negative impact on historic fabric of bridge resulting from works on bridge surface	Slight	Hoard off historic fabric during construction,	Neutral
		Operation: Neutral	N/A	N/A	N/A	Neutral
BH1.3	Distillery River Bridge	Construction: Direct negative	Potential for negative impact on historic fabric of bridge resulting from works on bridge surface	Slight	Hoard off historic fabric during construction	Neutral
		Operation: Neutral	N/A	N/A	N/A	Neutral

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
BH10	Salmon Weir Bridge	Construction: Direct negative	Potential for negative impact on historic fabric of bridge resulting from works on bridge surface	Slight	Hoard off historic fabric during construction	Neutral
		Operation: Neutral	N/A	N/A	N/A	Neutral
BH44	Liam Mellows Statue, Eyre Square	Construction: Direct negative	Potential for negative impact resulting from ground disturbances in the area surrounding the statue	Very Significant	Hoarding in-situ during works. If hoarding in-situ is not possible, careful removal and re-installation in consultation with Galway City Council	Imperceptible to slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
BH47	Ceannt Station retaining wall	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on Station Road	Significant	Full written and photographic record	Slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
BH52	Water trough, Forster Street	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on Forster	Very Significant	Hoarding in-situ during works. If hoarding in-situ is not possible,	Imperceptible to slight negative

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
			Street		careful removal and re-installation in consultation with Galway City Council	
		Operation: Neutral	N/A	N/A	N/A	Neutral
BH65	Grave monument associated with Galway Gaol	Construction: Direct negative	Potential for negative impact resulting from ground disturbances in cathedral car park	Very Significant	Hoarding in-situ	Imperceptible to slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
BH67	Free standing elm-wood sculpture of a leaping salmon	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on Waterside	Very Significant	Hoarding in-situ during works. If hoarding in-situ is not possible, careful removal and re-installation in consultation with Galway City Council	Imperceptible to slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
BH75	Site of former C17th bastion, 2 no. Lions Tower Plaques 1. Arms of Galway 2. Arms of	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on known site of bastion on Eglington	Very Significant	Ministerial Consent. Archaeological monitoring	Imperceptible to slight negative

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
	DeBathe		Street, as well as on previously unrecorded features which may survive beneath current ground level.			
		Operation: Neutral	N/A	N/A	N/A	Neutral
BH1.5	Rivers and Waterways (Commercial Dock)	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH3	Gate lodge, University Road	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as	Slight	No mitigation deemed necessary	Slight negative

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
			installation of new street furniture			
BH5	Galway Cathedral	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH6	Store/ warehouse (Galway Library Services)	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Imperceptible	No mitigation deemed necessary	Imperceptible negative

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
BH16	Galway Courthouse	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Imperceptible	No mitigation deemed necessary	Imperceptible negative
BH17	Post box, Courthouse Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH18	Town Hall Theatre	Construction: No impact	N/A	N/A	N/A	Neutral

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH19	Church/ chapel (St Francis)	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH32	Methodist/ Presbyterian Church, Queen Street, with burial ground to side and rear	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as	Slight	No mitigation deemed necessary	Slight negative

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
			installation of new street furniture			
BH34	16 & 17 Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH35	Eyre House, 21 Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
BH36	23 Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH37	14, 15 Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH38	The Galway Hooker, (fountain) Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH39 (AH16)	Browne Doorway, Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Significant	Full written and photographic record	Imperceptible to slight negative
BH40	41 Rosemary Avenue (Dunnes Stores)	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as	Moderate	No mitigation deemed necessary	Moderate negative

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
			installation of new street furniture			
BH41	40 Eyre Square (Dunnes Stores)	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Moderate	No mitigation deemed necessary	Moderate negative
BH42	43 Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Moderate	No mitigation deemed necessary	Moderate negative

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
BH43	45 Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Moderate	No mitigation deemed necessary	Moderate negative
BH45	8 Eyre Square	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH89	1 Williamsgate Street	Construction: No impact	N/A	N/A	N/A	Neutral

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH100	Lough Atalia Pier	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation greenway and cycle track/footpath	Slight	No mitigation deemed necessary	Slight negative
BH105	Bohermore Cemetery walls	Construction: No impact	N/A	N/A	N/A	Neutral

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
BH2, BH4, BH7, BH8, BH9, BH11, BH12, BH13, BH14, BH15, BH20, BH21, BH22, BH23, BH24, BH25, BH27, BH28, BH29, BH30, BH31, BH33, BH46, BH48, BH49, BH50, BH53, BH54, BH55, BH56, BH57, BH58, BH59, BH60, BH61, BH62, BH63, BH64, BH66, BH68,	Various	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: No impact	N/A	N/A	N/A	Neutral

BH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
BH69, BH70, BH71, BH72, BH73, BH76, BH77, BH78, BH79, BH80, BH81, BH82, BH83, BH84, BH85, BH86, BH87, BH88, BH92, BH93, BH94, BH95, BH96, BH97, BH98, BH99, BH101, BH102, BH103, BH104						

15.5.2.3 Architectural Conservation Areas

During construction and operation, works associated with the Proposed Scheme may result in a significant direct negative impact on the Eyre Square ACA, and a slight direct negative impact on the City Core ACA. These will be due to extensive alterations to the carriageways surrounding Eyre Square, particularly to the north, in the case of the former. In the case of the latter, alterations to carriageway along Mary Street/Eglington Street/Williamsgate Street and the northern end of Williams Street, whilst less extensive than in the Eyre Square ACA, still have the potential to alter the setting of the City Core ACA to a smaller degree.

15.5.2.4 Cultural Heritage

Potential impacts on the cultural heritage resource during the construction/operation phases are outlined in Table 15.27 below, along with mitigation measures and residual impacts after the implementation of those measures. Detailed descriptions of mitigation measures can be found in Section 15.6.

Table 15.27: Summary of Potential Impacts upon Cultural Heritage

CH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
CH03	Broken off cast iron lamp post base, or possible vent pipe, Gaol Road (south)	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on Gaol Road	Significant	Hoarding in-situ during works. If hoarding in-situ is not possible, then careful removal and re-installation	Imperceptible to slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
CH04	Equality Emerging statue	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on Earls Island	Significant	Hoarding in-situ during works. If hoarding in-situ is not possible, then careful removal and re-installation	Imperceptible to slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
CH05	Cast iron vent pipe at corner of Williamsgate Street and Eglington Street	Construction: Direct negative	Potential for negative impact resulting from ground disturbances	Significant	Hoarding in-situ during works. If hoarding in-situ is not possible, then careful removal and re-installation	Imperceptible to slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
CH10	Eyre Square (JFK Memorial Park)	Construction: Direct negative	Potential for negative impact resulting from ground disturbances on all sides of square	Significant	Full written and photographic record	Imperceptible to slight negative

CH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
		Operation: Indirect significant	Negative visual effects may occur in relation to the reorganization of carriage ways and associated signage, road markings etc.	Significant	Full written and photographic record	Slight negative
CH11	Historic cobbles, kerbs and bollards present in much of the area around Courthouse Square, Waterside, St. Vincent's Avenue	Construction: Direct negative	Potential for negative impact resulting from ground disturbances	Significant	Full written and photographic record Careful removal for storage and potential re-use in consultation with Galway City Council	Slight negative
		Operation: Neutral	N/A	N/A	N/A	Neutral
CH06	Statue of Oscar Wilde and Eduard Vilde	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative

CH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
CH09	Bridge	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of new street furniture	Slight	No mitigation deemed necessary	Slight negative
CH12	Lough Atalia dock walls	Construction: Direct negative	Potential for damage to wall caused by works to rear of wall to install concrete in order to construct cycle track / footpath. Damage may also occur during the resetting of loose stones.	Significant	Hoarding off of wall during construction and all works supervised by an archaeologist. The methodology for repair of dock wall to be agreed in advance with Galway City Council	Moderate positive
		Operation: Indirect negative	Potential for negative impact to setting through long-term alterations to surroundings such as installation of greenway and cycle track/ footpath	Slight	No mitigation deemed necessary	Slight negative

CH No	Description	Impact Phase and Type	Potential Impact Level and Assessment	Potential Significance of Effect	Mitigation Measures	Potential Residual Impacts
CH01, CH02, CH07, CH08	Various	Construction: No impact	N/A	N/A	N/A	Neutral
		Operation: No impact	N/A	N/A	N/A	Neutral

15.5.2.5 Demesne Landscapes

There will be no constructional or operational impact on any of the three demesne landscapes within the study area (DL1, DL2, DL3).

15.6 Mitigation and Monitoring Measures

General guidance on the approach to mitigation measures and the cultural heritage resource is provided in Appendix 15.7 of Volume 4 of this EIAR.

15.6.1 Construction Phase

15.6.1.1 Archaeological Heritage

- Works impacting the sites of the National Monument, comprising Galway Town Defences (AH13/BH75), will require Ministerial Consent.
- A wade survey and underwater archaeological assessment of the area surrounding the new outfall towards the northern end of Lough Atalia will be carried out by a suitably qualified archaeologist under licence to the DoHLGH. If any features of archaeological potential are identified by the survey and assessment further archaeological mitigation may be required, such as preservation in-situ or by record.
- All ground disturbances associated with the Proposed Scheme will be monitored by a suitably qualified archaeologist. If any features of archaeological potential are discovered during the course of the works further archaeological mitigation may be required, such as preservation in-situ or by record. Any further mitigation will require approval from the National Monuments Service of the DoHLGH.

15.6.1.2 Architectural Heritage

- Works impacting the National Monument comprising Galway Town Defences (AH13/BH75) will require Ministerial Consent.
- All statues/historic street furniture (BH44, BH52, BH67) and works along historic bridges, which fall within the Proposed Scheme area will require hoarding during construction to protect from potential damage during ground disturbances. If hoarding in-situ is not possible, the statues/street furniture will

require careful removal by a conservation specialist to be stored securely and re-installed at an appropriate location, in consultation with the Galway Heritage Officer.

- Grave monument BH65 falls wholly within the Proposed Scheme area and will require hoarding to prevent damage during groundworks.
- BH47 (Ceannt Station – a short section of retaining wall). To be subject to a full written and measured survey prior to construction going ahead.

15.6.1.3 Cultural Heritage

- Where cultural heritage sites such as statues/historic street furniture (CH03, CH04, CH05) fall within the Proposed Scheme area they will require hoarding during works to protect from potential damage during ground disturbances. If hoarding in-situ is not possible, the items will require careful removal by a conservation specialist to be stored securely and re-installed at an appropriate location, in consultation with the Galway Heritage Officer.
- A cobbled road surface to the front of Town Hall Theatre and historic paving/kerbing and bollards along St Vincent's Street/Waterside/Courthouse Square (CH11) fall within the Proposed Scheme area. These features will be recorded and photographed before being lifted under supervision of a suitably qualified conservation specialist, for secure storage and re-use (where appropriate), in consultation with the Galway Heritage Officer.
- A full written and photographic record will be made of Eyre Square (CH10) and its current character and landscape layout. This will be carried out by a suitably qualified professional.
- Lough Atlia dock walls (CH12) will be hoarded off during construction and all excavation works to the rear of the wall supervised by an archaeologist. The methodology for repair of the dock wall will be agreed in advance with Galway Heritage Officer.

15.6.2 Operation Phase

15.6.2.1 Archaeological Heritage

- A full written and photographic record will be made of AH16 and its current character and landscape layout. This will be carried out by a suitably qualified professional.

15.6.2.2 Architectural Heritage

No mitigation is deemed necessary.

15.6.2.3 Cultural Heritage

No mitigation is deemed necessary.

15.7 Residual Impacts

15.7.1 Construction Phase

Following the completion of mitigation measures there will be no significant residual Construction Phase impacts upon the archaeological, architectural or cultural heritage resource.

15.7.2 Operational Phase

Following the completion of mitigation measures there will be no significant negative residual Operation Phase impacts upon the archaeological, architectural or cultural heritage resource. As a whole historic landscape, the reduction of traffic within the city centre as a result of the Proposed Scheme going ahead, has the potential to result in a slight to moderate positive residual impact in relation to the setting and conservation of the archaeological, architectural and cultural heritage resource.

No significant residual impacts have been identified either in the Construction or Operational phase of the Proposed Scheme, whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

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15.8.2 Cartographic Sources

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Captain Brian Fitzwilliam, *The Circuit of the Town of Galway*, 1589;

John Speed, *Plan of Galway from Theatre of the Empire of Great Britain*, 1610;

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Sir William Petty, *Down Survey Map, County Galway*, c. 1655;

Michael Logan, *Map of Galway*, 1818

Ordnance Survey maps of County Galway, 1839-1900.

15.8.3 Electronic Sources

www.excavations.ie – Summary of archaeological excavation from 1970–2021.

www.archaeology.ie – DoHLGH website listing all SMR/RMP sites.

www.osiemaps.ie – Ordnance Survey aerial photographs dating to 1995-2013 and 6-inch/25-inch OS maps.

www.heritagemaps.ie – The Heritage Council web-based spatial data viewer which focuses on the built, cultural and natural heritage.

www.buildingsofireland.ie – Website listing the results of the NIAH building and garden survey for Dublin

www.googleearth.com – Satellite imagery of the Proposed Scheme area.

www.bingmaps.com – Website containing aerial photographic datasets

www.booksulster.com/library/plnm/placenamesC.php - Contains the text from Irish Local Names Explained by P.W Joyce (1870).

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Chapter 16
Landscape (Townscape) & Visual

Contents

16 Landscape (Townscape) & Visual

16.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the potential landscape (townscape) and visual impacts associated with the Construction and Operational Phases of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) hereafter referred to as the Proposed Scheme.

For the purpose of this assessment the term 'townscape' is used instead of 'landscape', as it more accurately describes the context of the receiving environment, in that it is '*the landscape within the built-up area, including the buildings, the relationship between them, the different types of urban open spaces, including green spaces, and the relationship between buildings and open spaces'* (Guidelines for Landscape and Visual Impact Assessment, Third Edition (LI/IEMA, 2013).

The site of the Proposed Scheme is located within Galway City Centre, which is a predominantly urban/city environment with a number of significant natural landscape features (Corrib River, Lough Adalia, trees etc.), urban streets and spaces.

During the Construction Phase, the potential townscape and visual impacts associated with the implementation of the Proposed Scheme have been assessed. This included streetscape disturbance, impacts on property boundaries, removal of trees and vegetation, traffic issues and the general visual intrusion of construction activities due to utility diversions, road resurfacing and road realignments.

During the Operational Phase, the potential townscape and visual impacts associated with changes to the physical layout of the street, alteration of views and the visual character and changes to the urban realm have been assessed.

The assessment has been carried out according to best practice and guidelines relating to townscape and visual assessment, and in the context of similar large-scale infrastructural projects.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure on this key corridor through Galway city centre, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor.

The design of the Proposed Scheme has evolved through the application of a comprehensive design iteration process with particular emphasis on minimising the potential for environmental impacts where practicable whilst ensuring the objectives of the Proposed Scheme are maintained.

In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development programme has been incorporated where appropriate.

16.2 Methodology

16.2.1 Introduction

Townscape, has two separate but closely related aspects. The first is visual impact, i.e. the extent to which new development can be seen in the landscape/townscape environment. The second is impact on the townscape character, i.e. effects of new development on the fabric or structure of the townscape.

The visual impact assessment considers visual receptors in the vicinity of the Proposed Scheme. The majority of receptors involve cultural and heritage properties, community facilities, e.g. churches, amenities and recreational facilities, open spaces, walkways, and other views within the environment are considered.

Townscape character is derived from the appearance of the land and built environment, and takes account of natural and man-made features such as topography, landform, vegetation, land uses and built environment and their interaction to create specific patterns that are distinctive to particular localities. Therefore, aspects such as townscape character and designations are also considered in the description of the receiving environment.

16.2.2 Study Area

The Proposed Scheme, BusConnects Galway Cross-City Link (University Road to Dublin Road), is a public transport corridor linking the western and eastern suburbs of Galway through the city centre, focused on improving public transport. For ease of reference, the scheme is broken into three sections during the construction stage of the project.

- Section A – University Road to Eyre Square, Woodquay and Headford Road. Commencing at the junction of the R864 Newcastle Road and follow the R863 University Road, passing Galway Cathedral crossing the Salmon Weir Bridge. It includes Gaol Road and car park to the south of Galway Cathedral, Newtownsmith/Waterside, St. Vincent's Avenue/Walsh's Terrace, St. Francis Street/Eglinton Street/Williamsgate Street, Woodquay/Daly's Place/Mary Street and Dyke Road/Headford Road.
- Section B – Eyre Square to Dock Road, Bóthar na mBan to College Road. It includes Bóthar na mBan, Prospect Hill, Eyre Square, Victoria Place, Merchant's Road, Queen Street, Fairgreen Road and Bóthar Uí hÉithir.
- Section C – College Road to Dublin Road, which included Forster Street, College Road, Lough Atalia Road, Moneenageisha junction and Dublin Road (R338).

Priority for buses will be provided along the entire route, consisting of a mix of dedicated bus lanes and virtual bus priority provided through traffic management measures, particularly constrained locations.

The primary landscape / townscape and visual study area is limited to the core road / street corridors of the route. As such, the primary study area is a boundary

to boundary road / street corridor along the Proposed Scheme, which takes in immediately adjoining landscapes, including open spaces, parks, gardens, and other land use areas, together with amenity, landscape / townscape and visual planning considerations. The study area is expanded where required, to incorporate wider movement or traffic implications or potential indirect effects.

16.2.3 Relevant Guidelines, Policy and Legislation

The assessment has been carried out with reference to the following legalisation, policy and guidelines:

16.2.3.1 Legislation

- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the EIA Directive);
- Planning and Development Act 2000, as amended;
- Planning and Development Regulations 2001, as amended; and
- European Landscape Convention 2000.

16.2.3.2 Policy

- Galway City Council Development Plan (GCDP), 2017-2023, Galway City Council (2017);
- Galway Transport Strategy, Galway City Council (2016); and
- Galway Public Realm Strategy, Galway City Council (2019).

16.2.3.3 Guidelines

- Guidelines on the information to be contained in Environmental Impact Assessment Reports, EPA (2022);
- Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects – Overarching Technical Document (PE-ENV-01101), TII (2020)
- Landscape Institute and the Institute of Environmental Management and Assessment (IEMA) Guidelines for Landscape and Visual Impact Assessment (hereafter referred to as the GLVIA) 3rd edition (Landscape Institute and IEMA 2013);
- Landscape Institute Technical Information Note 05/2017 (Revised 2018) on Townscape Character Assessment (hereafter referred to as the TCA) (Landscape Institute 2018);
- Guidelines for treatment of tourism in an Environmental Impact Statement (Fáilte Ireland, 2011);
- Landscape Institute Technical Advice Note 06/19 (Landscape Institute, 2019).

16.2.3.4 Data Collection and Collation

Data collection and collation is based on initial desk studies, supported by full route walkover and augmented by further specific site reviews, along the corridor

of the Proposed Scheme, together with the selection and preparation of verified Photomontages of the Proposed Scheme in Volume 3 of this EIAR.

Desk studies, which allow for identification of designated and potential significant/sensitive areas, involved a review of:

- Historical and current mapping and aerial photography (e.g. Ordnance Survey Ireland, topographic survey, google earth, google maps);
- Mapping of the Proposed Scheme;
- General Arrangement Drawings;
- Review of baseline information, including road infrastructure audits, arborist survey and impact assessment reports.
- Other reports and documents relating to the baseline environment, including other chapters of this EIAR and in particular, Chapter 4, (Proposed Scheme Description), Chapter 5 (Construction), Chapter 12 (Biodiversity), and Chapter 15 (Archaeological Cultural Heritage and Architectural Heritage).

Site-based studies, which allow for verification of desk study findings and for analysis of current conditions in the baseline environment, involved:

- Full walkover surveys of the route of the Proposed Scheme;
- Selection of locations for verified Photomontages of the Proposed Scheme.

The information collected in the desk study and field surveys has been collated and presented in Section 16.3 of this Chapter.

The publicly available datasets listed in Table 16.1 have been consulted in the analysis of the baseline environment.

Table 16.1: Publicly Available Datasets

Source	Name	Description	Version
Ordnance Survey Ireland (OSI)	Geohive	Current and historical mapping	Accessed 2022
OSI	Geohive	Historical aerial imagery	Accessed 2022
Google	Google Maps	Mapping and aerial imagery	Accessed 2022
Microsoft	Bing	Mapping and aerial imagery	Accessed 2022
EPA	EPA Maps	Environmental datasets	Accessed 2022
National Parks and Wildlife Service (NPWS)	NPWS Maps and Data	Datasets provides information on national parks, protected sites and nature reserves	Accessed 2022
Department of Culture, Heritage and the Gaeltacht (DCHG)	Historic Environment Viewer	Database provides access to National Monuments Service Sites and Monuments Record (SMR) and the National Inventory of Architectural Heritage (NIAH)	Accessed 2022

16.2.4 Appraisal Method for the Assessment of Impacts

The methodology used for the townscape and visual assessment entailed:

- A desktop study of the site in relation to its overall context locally, regionally and nationally.
- Visiting the site and its environs in 2021 and 2022 to assess the following:
  - Quality and type of views in the area.
  - The extent of the visual envelope, i.e. the potential area of visibility of the site in the surrounding townscape.
  - The character and quality of the surrounding townscape.

Following a review of the Proposed Scheme, desktop study and visit to the site, a number of key reference viewpoints in the surrounding environs were identified, photographed and surveyed for the purpose of preparing photomontages to help illustrate the visual effects of the Proposed Scheme. They have been chosen to reflect a range of distances, directions and sensitivity, and are illustrated on Figures 16.1.1.1 to 16.1.19.2 of Volume 3 of this EIAR. A cumulative assessment of other significant planned or permitted (but not yet constructed) developments has also been prepared in relation to townscape and visual effects in Section 16.5 - this includes elements of the Galway Transport Strategy such as the Salmon Weir Pedestrian and Cycle Bridge.

The overall design of the Proposed Scheme was part of an iterative design process informed by the potential townscape and visual effects, with embedded mitigation within the design.

16.2.5 Significance of Impacts

The significance criteria as set out in the Guidelines on the information to be contained in Environmental Impact Assessment Reports, EPA (2022) have been used for the purpose of this assessment, see Diagram 16.1.

The significance of townscape is considered against its designation (i.e. national, county, local, etc.). Where not designated or otherwise protected, the townscape is considered as being of local significance. Therefore, townscape assessments take account of the receiving environment, its character and features, as well as landscape planning designations and listings.

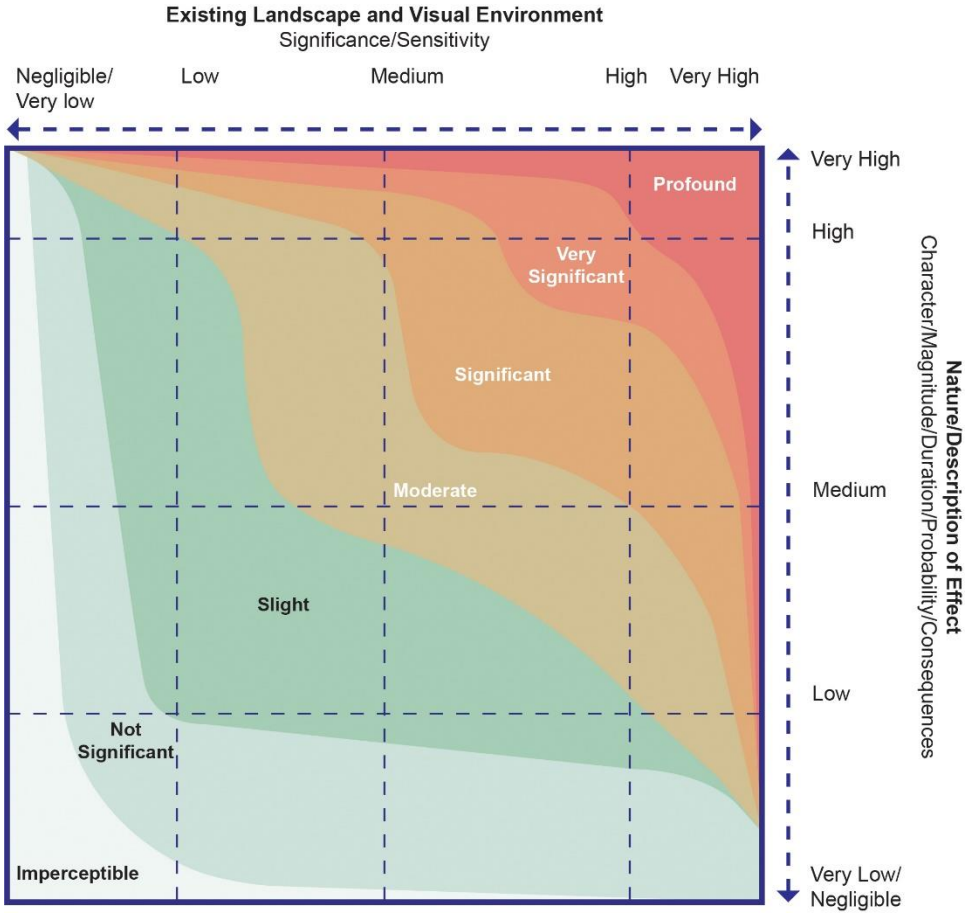

Diagram 16.1: Classification of Significance of Effects (adapted from Figure 3.4 of EPA guidelines, 2022)

These impacts[1], which in quality may be positive, neutral or negative/adverse, are described as follows:

- **Imperceptible**: An effect capable of measurement but without noticeable consequences;
- **Not significant**: An effect which causes noticeable changes in the character of the environment but without noticeable consequences;
- **Slight**: An effect which causes noticeable changes in the character of the environment without affecting its sensitivities;
- **Moderate**: An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends;
- **Significant**: An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment;
- **Very Significant**: An effect which, by its character, magnitude, duration or intensity significantly alters the majority of a sensitive aspect of the environment;
- **Profound**: An effect which obliterates sensitive characteristics.

1 It should be noted that throughout this chapter of the EIA Report, the terms impact and effect are interchangeable and should be read to have the same meaning.

- In terms of **duration,** effects are considered as follows:
- **Brief**: lasting up to one day
- **Temporary**: lasting up to one year
- **Short-term**: lasting one to seven years
- **Medium-term**: lasting seven to fifteen years
- **Long-term**: lasting fifteen to sixty years
- **Permanent**: lasting over sixty years

There were no limitations or constraints in carrying out the assessment.

16.2.6 Tourism and Recreation

Fáilte Ireland published Guidelines in 2011 on the treatment of tourism in an Environmental Impact Assessment, noting that there are two interactions between tourism and the environment, namely impacts caused by tourism projects and impacts affecting tourism (e.g. the quality of a destination or a tourism activity). The Guidelines note that the assessment of effects on tourism should be treated as a specialist sub-section of the topic 'Population and Human Health', with particular elements being considered, as appropriate within other sections, e.g. Landscape, Flora and Fauna and Cultural Heritage etc. The effects of the Proposed Scheme on Tourism and Recreation is addressed in Chapter 10 (Population) and Chapter 11 (Human Health) of this EIAR.

Chapter 3 of the Fáilte Ireland Guidelines lists the reasons why tourists visit and enjoy Ireland. Aspects of relevance to this 'Landscape' section of the EIAR would include any potential impact on 'beautiful scenery'; 'nature, wildlife and flora' (considered with Biodiversity); and 'good range of attractions' (considered with Biodiversity and Archaeology, Architectural and Cultural Heritage).

For elements of relevance to this section of the EIAR, the Guidelines note that particular attention needs to be paid to effects on:

- views from existing tourism facilities, touring routes and walking trails;
- physical access to and visibility of habitats; and
- damage to sites and structures of cultural, historical, archaeological or architectural significance and to their contexts or settings.

16.3 Baseline Environment

The site and study area are located in Galway City Centre, see Diagram 16.2.

The Proposed Scheme is c. 6.7km long from University Road, through Galway City Centre, along College Road to the Dublin Road to the north of Lough Atalia. It includes a wide variety of suburban and city landscape, townscape and visual features from streetscape boundary and public realm features, to residential and mixed-use zonings, historic landscapes and boundaries, to biodiversity and heritage assets.

The majority of the works associated with the Proposed Scheme will include improvements to the existing roadway, pedestrian facilities and public spaces.

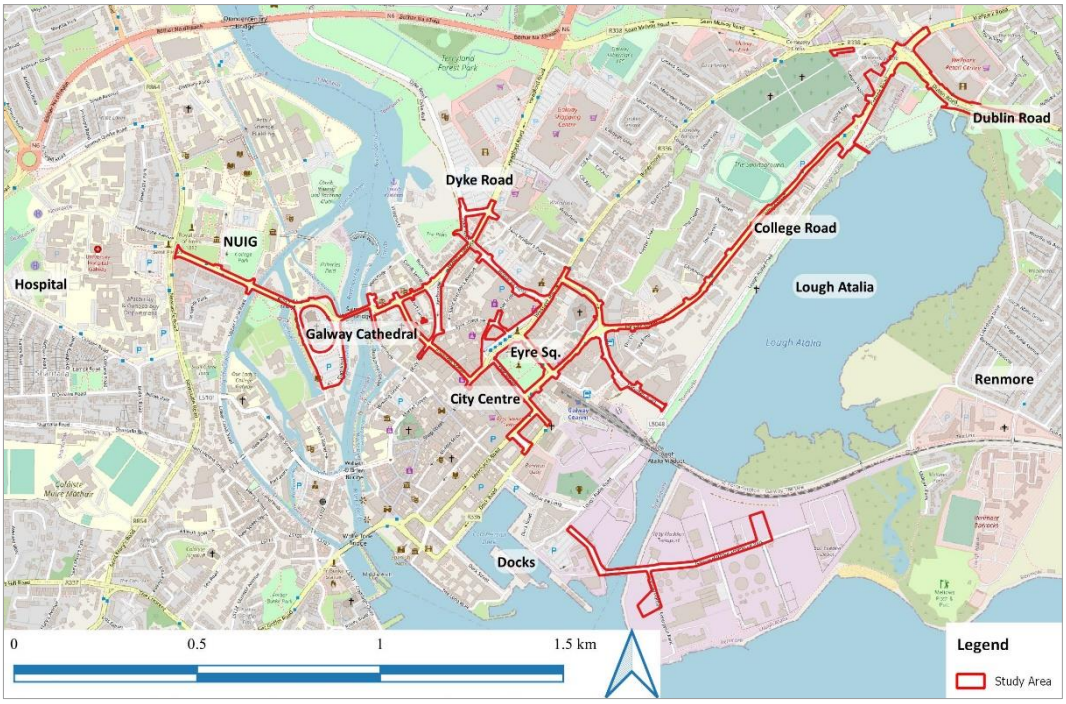

Diagram 16.2: Study Area/Site Boundary

16.3.1 City Context

Also known as 'City of the Tribes', Galway/Gallimh is a city characterised by stone and water, with Galway Bay, the River Corrib, the various historic canals and Lough Atalia strongly defining the character of the City Centre. The City has been shaped by previous generations of people leaving a rich built and natural heritage.

The city centre is situated between Galway Harbour to the south and Lough Corrib to the north. The lower River Corrib and a number of rivers, canals and mill races run from north to south through its centre. It has a unique townscape character which has developed over many centuries.

Galway takes its name from Gallimh meaning 'stony river', which continues to exert a strong influence on the character and identity of the city.

Galway is a busy, thriving core city centre and is a popular tourist destination. Galway's landscape/townscape provides distinctiveness and continuity and is an important contributor to quality of life for people in the city and the economy. The city's heritage and sites covered by ecological designations form important components of the city's landscape.

Galway's city centre is strongly influenced by its grid/block-like street structure, aligned in a southwest to northeast direction, taking their direction from the original medieval town structure which entered Galway from the northeast.

The landscape within the city is low-lying generally being lower that 15m above ordnance datum (AOD).

Around Galway Cathedral and Salmon Weir bridge, the area is strongly influenced by its waterbodies, which include the lower River Corrib and connected rivers, canals and millraces. Historically, these waterbodies supported its economy as an important trading port and fishing town. The waterways have a valuable role in terms of visual amenity, recreation, leisure, pedestrian network, ecology and heritage. The fast-flowing lower River Corrib is contrasted with the slow flowing canals and mill races, which run parallel.

There are a number of prominent and distinctive visual features adjoining or close to the Proposed Scheme area which include the following:

- NUI Galway with the Quadrangle (Protected Structure RPS. 10303) and Gate Lodge (RPS. 10304), to the north of University Road. The university grounds are bounded by an ashlar stone wall and line of mature and semi-mature trees providing filtered views into the university's ground from University Road (see Diagram 16.3);

Diagram 16.3: University Road with NUIG on left and Galway Cathedral as focal point

- Galway Cathedral (Protected Structure (RPS. 3602)), built in the late 1950s in cut ashlar limestone with copper roof and dome, is a prominent landmark in the city skyline, and particularly along University Road, Earls Island and Salmon Weir Bridge (refer to Diagram 16.4);

Diagram 16.4: Salmon Weir Bridge with Galway Cathedral

- The network of Galway Waterways flowing at varying speeds from a north to south direction and its network of islands and bridges. Galway Waterways (including bridges, walling, embankments, piers and other associated infrastructure) are all Protected Structures (RPS. 8501) in the Galway City Development Plan (GCDP);
- Salmon Weir Bridge, with two-way traffic c.7m wide, and narrow (c. 1.2m) pedestrian footpaths on both sides, with balustrade parapets, is a protected structure (RPS. 3603), see Diagram 16.4 above; immediately downstream, the permitted new Salmon Weir Pedestrian and Cycle Bridge has commenced construction and will provide enhance pedestrian and cyclist connectivity across the River Corrib.
- Galway Courthouse (Protected Structure (RPS. 2601)), whose western elevation is aligned on the Salmon Weir Bridge;
- Franciscan Friary, Mercy Convent, Fr. Daly Chapel (Protected Structure (RPS. 7201)) complex on Newtownsmith;
- A number of Architectural Conservation Areas (ACAs) including The City Core, Eyre Square and 11-18 University Road; and
- Urban streetscape, buildings, walls and boundaries, streets, open spaces and trees (refer to Diagrams 16.5 to 16.9).

As part of the assessment process a series of 19 no. representative viewpoints along the route of the Proposed Scheme were identified and photographed with photomontages prepared and provided in Volume 3 of this EIAR to illustrate the existing visual environment and Proposed Scheme to assist with the assessment of visual impacts (in Section 16.4).

Within the city there are distinctive areas, which have specific functions or characteristics that contribute to the diversity, economic vibrancy and character of the city. The City Centre area is particularly important, as it reflects to a large extent the unique and vibrant image of Galway, with a medieval townscape, a waterways setting, hosting a strong arts and cultural heritage.

The city is an important tourist destination and is known for hosting numerous festivals, celebrations and events.

There are a number of distinct land uses within the immediate environs of the Proposed Scheme site including:

- Institutional, educational, community and civic uses – University Hospital Galway to immediately east of University Road/Newcastle Road Junction, NUI Galway University Campus (north of University Road) with its large student and staff numbers which exert a significant influence of pedestrian, cycle, and vehicular traffic in the area. Galway Cathedral on Earls Island is a focal building within the city. A coach parking/set-down area along Gaol Road brings high footfall of tourists into the area, walking across the Salmon Weir bridge into the city centre. There is a large public surface level car park to the south of the Cathedral;
- Residential uses – there are urban residential dwellings fronting onto the majority of the streets within the Study Area;
- Recreational uses – there is a network of well used pedestrian walkways along the embankment between the lower River Corrib and waterways, amenity and park spaces including Millennium Park, Waterside, Dyke Road, Eyre Square, The Sportsground on College Road and Lough Atalia;
- Commercial/retail/leisure uses – the core of the city lies to the south of the Proposed Scheme with high volumes of people and vehicular traffic accessing the area.

Diagram 16.5: Woodquay

Diagram 16.6: Bóthar na mBan

Diagram 16.7: Prospect Hill looking to Eyre Square

Diagram 16.8: College Road

Diagram 16.9: Dublin Road

16.3.2 Townscape Character

There is no landscape/townscape character assessment available for Galway City, however the Proposed Scheme sits to the north of the City Centre crossing the Galway Waterways corridor, linking the western city environs, NUIG, and eastern city environs see Diagram 16.9. The city centre core is urban in nature with 2-5 storey buildings with retail, commercial, institutional and residential uses. The River Corrib, Canals and open spaces (Eyre Square, Millennium Park) are important and sensitive landscape features. Outside of the city centre, the areas surrounding the route are more residential in character with 2-3 storey buildings. There are important institutional and community uses along University Road including NUIG and Galway Cathedral.

Galway City Centre is negatively influenced by busy vehicular traffic, with congestion affecting the character of the urban environment, impacting on quality of life of residents and the safety of all roads. In places, there is an overdominance of vehicular traffic and parking, with narrow footpaths for pedestrians and limited space for cyclists.

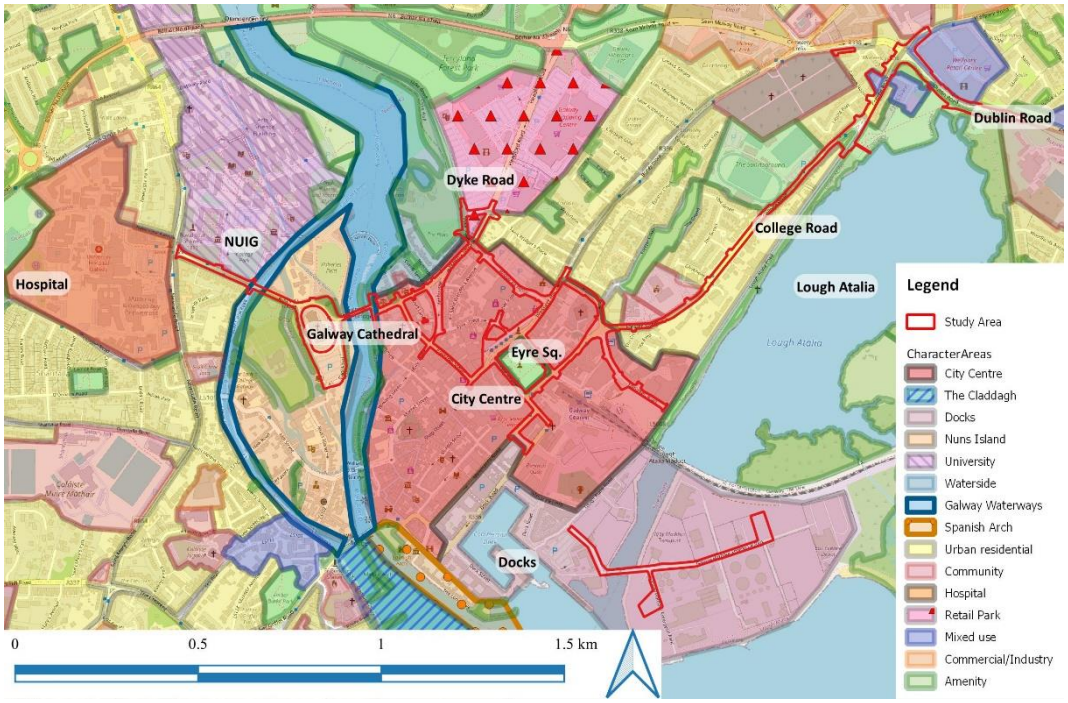

Diagram 16.10: Galway Townscape Character Areas

16.3.3 Townscape Significance and Sensitivity

The site and immediate environs are fully within the Galway City Council Development Plan 2017-2023 (GCDP), which has a number of relevant policies and objectives related to the city townscape.

Chapter 3 of the GCDP sets out policies and objectives in relation to **Transportation.** Policy 3.3 seeks to '*Continue to progress a sustainable transport solution for the city through the implementation of measures included in the Galway Transport Strategy (GTS)'*. The route of this Proposed Scheme is illustrated in Figure 3.2 (p.43) of the GCDP. Measures to improve walking and cycling with in the city are outlined in Policy 3.6.

Chapter 4 of the GCDP sets out the policies and objectives in relation to Natural Heritage, Recreation and Amenity. Policy 4.1 states *'A key aim is to provide a green network that allows for the sustainable use, management and protection of natural heritage, recreation amenity areas, parks and open spaces'*. The network includes:

- **protected spaces** (i.e. SACs, SPAs, NHAs, pNHAs and local biodiversity areas) - the River Corrib is part of the Lough Corrib SAC (Site code 000297);
- **blue spaces** (Coastal area, River Corrib, canals and other waterways such as Lough Atalia);
- **green spaces** (citywide and city centre parks and neighbourhood parks, including Millennium Children's Park, Woodquay);
- **community spaces** (greenways, recreational facilities and playgrounds, and protected views of special amenity value and interest); and

- **open spaces** (which includes institutional open space, recreation and amenity zoned lands and high amenity land, including NUIG grounds, Eyre Square, Courthouse Square and Woodquay).

Policy 4.1 also seeks to:-

- *'Improve accessibility to the City Parks, recreation and amenity areas and facilities and include for sustainable modes of transport, including the measures proposed in the Galway Transport Strategy;*
- *Enhance linkages and connectivity within the green network.'*

Section 4.4.1 **Urban Woodland Parks and Trees** and Policy 4.4.1 seeks to *'integrate existing trees and hedgerows where appropriate and require tree planting as part of new development'* and *'prepare and implement a plan which identifies suitable parts of the road and street network for the planting of trees'*.

Section 4.5.1 **Greenways and Public Rights of Way** promotes the development of such linkages.

Amenity open spaces and amenity walkway are illustrated in Diagram 16.11.

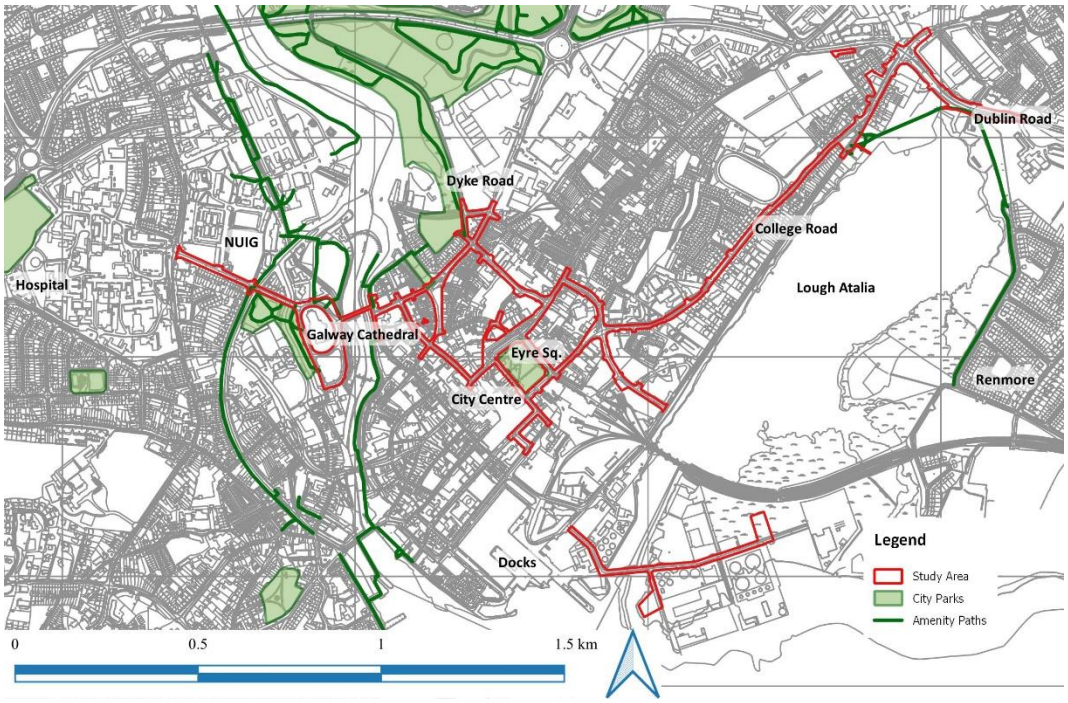

Diagram 16.11: Parks and Amenity Routes

Section 4.5.3: Views of Special Amenity Value and Interest, identifies panoramic (V.1 to V.9) and linear protected views (V.10 to V.19). The locations of the views relevant to the Proposed Scheme are shown on Diagram 16.12 and are listed in Table 16.2.

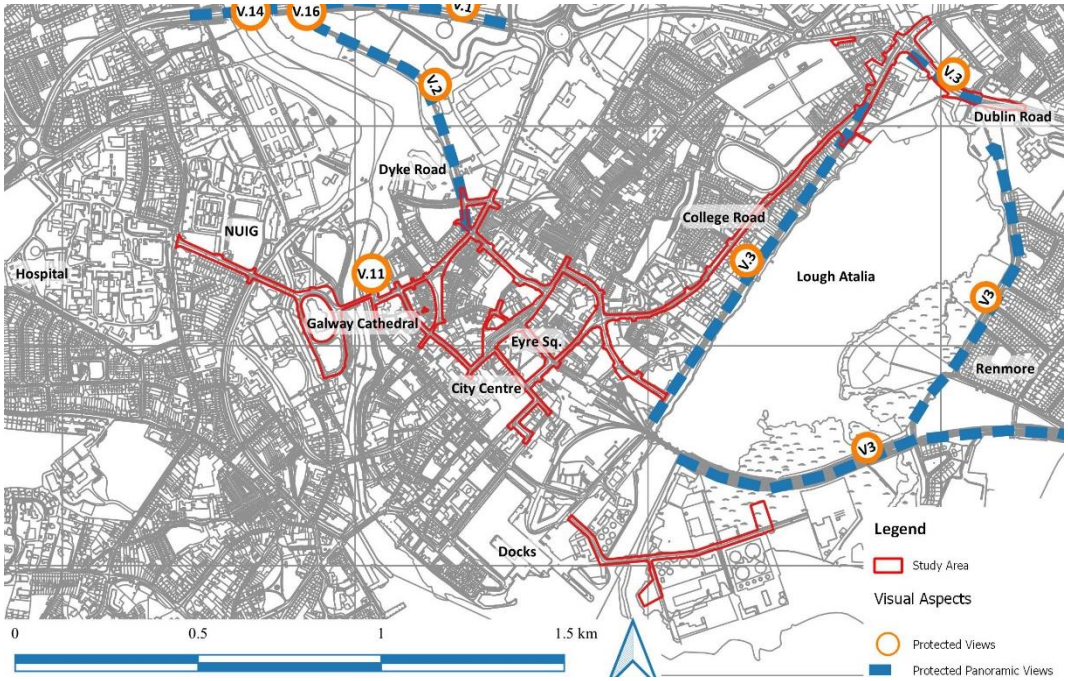

Diagram 16.12: Protected Linear and Panoramic Views

Table 16.2: Selected Panoramic Protected Views and Linear Protected Views

Linear Protected Views	
V.2	Views from Dyke Road and Coolagh Road encompassing the River Corrib and Coolagh fen
V.3	Seascape views of Lough Atalia from Lough Atalia Road, College Road, Dublin Road and Lakeshore Drive
V.11	Views from Waterside of the River Corrib

Galway's city centre, tree lined riverside walks (River Corrib and canals) and open spaces (Millennium Park, Eyre Square and Lough Atalia) are all important in contributing to the character and visitor destination experience for tourists to the City.

There is no sensitivity analysis within GCDP, however for the purposes of this assessment it is considered that the area is of **High Value** and **High Sensitivity**, given its location, context and setting within the city.

The Galway Transport Strategy (GTS) (Galway City Council, 2016) seeks to integrate sustainable landuse and transportation while maximising the potential for pedestrian access and movement in the city centre and includes the Proposed Scheme. The GTS also identifies a City Centre Public Transport Interchange at Eyre Square/Fairgreen and number of measures to improve the public realm and pedestrian accessibility in the study area.

The Galway Public Realm Strategy (Galway City Council, 2019) seeks to '*create a high quality public realm, made possible by reducing the dominance and upgrading the quality of the physical fabric, hard and soft.*

There are also a number of opportunities to create new space out of existing highway and parking areas', including the streets and spaces associated with the Proposed Scheme.

16.4 Potential Impacts

16.4.1 Characteristics of the Proposed Scheme

A detailed description of the Proposed Scheme and the construction strategy is provided in Chapter 4 (Proposed Scheme Description) and Chapter 5 (Construction) of this EIAR respectively.

The key characteristics of the Proposed Scheme of particular relevance to the townscape and visual assessment are described in the following under Construction Phase and Operational Phase.

The description of the characteristics of the Proposed Scheme is based on the project drawings and details, refer to Figures BCG-GA-00-00 to BCG-GA-00-13 in Volume 3 of the EIAR for the full set of drawings.

Consideration of the potential landscape (townscape) and visual impacts have been important in defining the Proposed Scheme design. Following initial assessment of impacts, availability of additional information, as well as public consultation, suggestions and recommendations from local residents, community groups and stakeholders, the scheme has undergone iterative design development with the aim of minimising potential negative impacts as far as practicable. This process has also helped define suitable improvements to the public realm, including:-

- Remodelling of several streets, junctions, raised traffic tables and crossing points along the route;
- Footpath widening works, new pedestrian crossings, creation of additional pedestrianised areas;
- Removal of car parking from areas including south of Galway Cathedral (converted to bus set-down/pickup facility) and Woodquay;
- Reorganisation of on-street parking along the route, including alterations to taxi parking at Eyre Square and Prospect Hill;
- Creation of bus only access across the existing Salmon Weir bridge, along Eglinton Street and Forster Street, and bus gate on College Road;
- New bus lanes along streets including Saint Vincent's Avenue, Saint Francis Street, Headford Road (outbound), College Road and the Old Dublin Road;
- Acquisition of a number of properties and land along the route, including 2no. dwellings at Bóthar na mBan, part of fuel garage on College Road, part of landscape area in Moneenageisha Court and along the Old Dublin Road, required to allow for widened streets to accommodate bus/car, cycle and pedestrian traffic; and,
- General public realm upgrade along the whole route.

16.4.2 Do Nothing Scenario

With respect to Landscape (Townscape) and Visual, the 'Do Nothing' scenario means that the Proposed Scheme would not proceed and associated changes to the Landscape (Townscape) and Visual environment would not arise. Therefore, landscapes / townscapes and properties along the Proposed Scheme would not experience the negative impacts that are associated with the Proposed Scheme and their existing setting would experience little or no change in the short to medium-term. Nevertheless, given the urban context of the Proposed Scheme it is considered likely that the road corridor of the Proposed Scheme will continue to experience pressure for reallocation of carriageway space and associated traffic movements in direct response to the increasing demand for alternative modes of transport (i.e. away from private car).

There would be ongoing negative Landscape (Townscape) and Visual impacts under the 'Do Nothing' scenario.

16.4.3 Construction Phase

The most significant effects on the townscape and visual environment will be during the construction phase the Proposed Scheme, which is likely to last circa 18 - 24 months will give rise to temporary or short-term townscape streetscape and visual impacts through the following:-

- Site mobilisation and establishment, fencing and hoarding of construction compound and works areas;
- Site demolition, including removal of boundaries, kerbs, verges, surfaces, landscape areas, trees and plantings – including boundary fences, walls and plantings;
- Site activity and visual disturbance from general construction works and operation of construction machinery both within the site and at the construction compound;
- Amendment and adaption of existing road network throughout, including surfacing, kerbs, footpaths, drainage, lighting, service / utility features, road markings, etc.;
- Amendment and adaption of existing junctions throughout, including surfacing, kerbs, footpaths, traffic controls, lighting, cycle facilities, road markings, etc.;
- Amendment and adaption of areas of existing verges, roadside tree planting and boundaries;
- New boundaries to match the existing will be established on the setback line to match the existing boundary. The construction and provision of the new boundaries is to take account of the location of existing trees, other plantings, gradients, drainage, property features and access arrangements so as to minimise additional indirect effects.
- Where feasible, existing railings, gates, cut stone walls and / or piers (or where appropriate, elements of same) to be removed will be reinstated on the new setback boundary line, subject to discussion with landowner;
- Proposals for the treatment of the public realm within the streetscape effected by the Proposed Scheme have regard to the existing character of the street or

location, to emerging policies, objectives and proposals for the public realm and to opportunities for enhancement of the public realm and the streetscape. Proposals have regard to historic details and features, to the quality of existing and proposed materials, to the reduction of clutter, ease of legibility, and management and maintenance requirements;

- Landscape proposals have regard to the recommendations of Biodiversity (Chapter 12) in relation to opportunities for enhancement of biodiversity and of Water (Chapter 10) in relation to opportunities for incorporation of Sustainable Urban Drainage Systems (SuDS); and
- Decommissioning of works areas and construction compound.
- A detailed description of the construction of the Proposed Scheme is provided in Chapter 5 (Construction) of this EIAR.

16.4.3.1 Townscape effects during Construction

Impacts from removal of existing Trees and Vegetation

To facilitate the construction of the Proposed Scheme, it will be necessary to remove 59 no. trees within the Proposed Scheme area, as outlined in Table 16.3, drawings BCG-LA-01-01 to BCG-LA-01-13 and Arboricultural Impact Assessment.

Table 16.3: Effects on Trees

Area	Removal of trees/vegetation
Section A - University Road to Eyre Square	3no. semi-mature street trees (1no. Hornbeam and 2no. Lime) in the car park to the south of Galway Cathedral; 1no. mature poplar to the south west of Galway Cathedral to be removed due to the proximity of development; 1no. mature street tree (Mountain Ash) on Headford Road/Woodquay junction. 1no. semi-mature street tree (Maple) on Dyke Road.
Section B – Eyre Square to Dock Road, Bóthar na mBan to College Road	1no. semi-mature street trees (Fastigiate Oak) in drop-off area at Prospect Hill;
Section C – College Road to Dublin Road	3no. semi-mature street trees (2no. Purple Maple and 1no. Prunus) at Forster Street/College Road; 6no. semi-mature trees (1no. Ash and 5no. Mountain Ash) and section of existing hedge (Viburnum opulus, c.1.6m high, c. 28m long) at the junction of College Road and Lough Atalia Road; 5no. semi-mature trees (4no. Maple and 1no. Cherry) and hedging/shrubbery (Privet and Fuchsia) along College Road at Gleann Noinin apartment scheme and adjoining residential property; 24no. semi-mature ornamental hedging trees (Lombardy Poplar and Cupressus macrocarpa grown as a hedge and topped) at Moneenageisha Court; 1no. semi mature Crab Apple and 1 no.

Area	Removal of trees/vegetation
	Bird Cherry in the southern end of Moneenageisha Court to facilitate relocated car parking. 10no. semi-mature trees (Alder/Birch) and under canopy shrubs to the south of the G Hotel on the Dublin Road. 2no. young/early mature trees (1no. Poplar and 1no. Birch) at the Brothers of Charity on the Dublin Road.

The removal of these trees and vegetation has the potential to give rise to localised negative, significant and long-term effects on the immediate environs.

As part of the proposed public realm scheme 186 new street trees will be planted, which has the potential to give rise to positive and long-term effects.

Impacts on Residential Properties

The Proposed Scheme will require the permanent acquisition from 2no. residential properties at the junction of Bóthar na mBan and Headford Road in Section 1, to allow for a widened street width and changes to areas of landscape and hard surfacing. These are two storey, end of terrace, properties with boundary walls and gardens, including:

- 5/6 Headford Road
- 20 Saint Brendan's Avenue

Their acquisition and demolition has the potential to be negative, very significant and long- term in effect.

There are residential properties along most of the streets along the route of the Proposed Scheme. The townscape / streetscape and visual effect of the Construction Phase on these properties has the potential to be significant, negative and short-term.

The removal of the line of trees at Moneenageisha Court will result in opening up views of the College/Dublin/Moneenageisha Road junction. The existing boundary wall will be demolished to facilitate the bus lane and wide footpaths on College Road. The townscape / streetscape and visual effect of the Construction Phase on these properties has the potential to be significant, negative and short-term.

Amenity Designations

There are a number of designated amenity areas located along the route. These are important to Galway's residents and tourists visiting the city. Due to the nature of the proposed works largely within the existing street corridors, direct impacts on amenity areas are limited. There will be localised, effects arising from construction activities upon the streets adjoining Millennium Park, Woodquay, Dyke Road, Eyre Square, College Road/Lough Atalia junction and Lough Atalia at the Dublin Road.

The townscape / streetscape effect of the Construction Phase has the potential to be negative, significant and short-term.

Townscape Character

The construction works will not alter the overall townscape character of Galway city centre and approach roads, however, the works will involve substantial changes and activity which will detract from sections of streetscape character as construction progresses along the route of the Proposed Scheme. The magnitude of change in the baseline environment is high/very high.

The townscape/streetscape effect of the Construction Phase will be negative, significant and short-term.

16.4.3.2 Visual Effects during Construction

Construction Activity and Contractor's Compounds

There will be a requirement for temporary hoarding/fencing, temporary traffic management/diversions, parking, deliveries, lighting etc. during the construction phase, with the location of the main contractor compounds to the south of the Galway Cathedral and within Galway Harbour Docks (within an existing stone surfaced set down area).

These activities have the potential to give rise to locally significant, negative and short-term effects on the immediate environs and views in the area.

Alterations to ground levels utilising soils and materials on site

There will be a requirement to construct foundations along the route of the Proposed Scheme. This will require localised changes to ground levels, part demolition of footpaths/kerbs/road carriageways, and removal of excess spoil off-site, resulting in the potential for locally significant, negative and short-term effects on the immediate environs.

16.4.4 Operational Phase

The Operational Phase of the Proposed Scheme has the potential to give rise to townscape streetscape and visual effects through the following:

- Alterations in the physical and visual character of the corridor of the existing streets and spaces;
- Changes in traffic, pedestrian and cycle movements;
- Modification of areas of private property and boundaries in a limited number of locations at Bóthar na mBan and College Road; and
- Adjustments to other areas/boundaries.

These effects may be temporary, short-term, medium-term, long-term or permanent.

16.4.4.1 Townscape Character Impacts

The site of the Proposed Scheme is part of an established and continually evolving urban city centre setting that includes retail, commercial, institutional and residential development, amenity areas, open spaces and streets. Galway's city centre is sensitive and is rich in natural and built heritage. The Proposed Scheme will alter the townscape character and visual environment along its length.

Notwithstanding the sensitivity of the existing townscape environment, it is considered that given the nature of the Proposed Scheme it will not adversely alter the inherent quality of the townscape, its significance, or value.

The widening of pedestrian footpaths, creation of new pedestrian crossings, urban spaces, reduction in vehicular traffic and new tree planting will bring positive benefits to the character of the city. Changes in street corridors, including in traffic signalisation, signage, and in carriageway allocation and traffic movements are a common and regular aspect of active road and traffic management for urban roads and streets. Therefore, such changes may also be considered as part and parcel of any urban streetscape environment.

The provision of an enhanced pedestrian and cycle environment has the potential to have a significant, positive, and permanent effect on the townscape character providing better, universally accessible connectivity into and through the city centre.

All aspects of the Proposed Scheme within public areas will revert to on-going management and maintenance in accordance with normal operational practices. This will include hard and soft landscape / townscape works and townscape measures, new and reinstated tree and other planting, new and reinstated surfacing and paving, etc.

16.4.4.2 Visual Impacts

The assessment of visual impacts has been assisted through the use of comparative photomontages which serves to identify impacts upon the visual environment. The photomontages are important in illustrating the impact of the proposed scheme from sensitive and protected views.

A series of 19 photomontages of the Proposed Scheme have been prepared and provided in Volume 3 of this EIAR to assist with the assessment of visual impacts from representative viewpoints along the route and include views along University Road, Galway Cathedral/Salmon Weir Bridge, Woodquay, Bóthar na mBan, Prospect Hill/Eyre Square, Forster Street, College Road and Dublin Road.

The locations of the representative viewpoints are illustrated on Figure 16.1.0.

The potential visual impacts from the representative viewpoints as a result of the Proposed Scheme are outlined in Table 16.4.

Table 16.4: Representative Viewpoint Locations and Visual Impact Assessment

Photomontage Location	Baseline Sensitivity	Magnitude of change	Visual impact rating
University Road – View to NUIG Entrance (see **Figure 16.1.1.2**)	High	Medium	Moderate, positive and long-term
University Road – View to Millennium Park from Galway Cathedral (see **Figure 16.1.2.2**)	High	Medium	Moderate, positive and long-term
University Road – View to Salmon Weir Bridge from Galway Cathedral/Gaol Road (see **Figure 16.1.3.2**)	High	High	Significant, positive and long-term
Galway Cathedral – View from Gaol Road (see **Figure 16.1.4.2**)	High	High	Significant, positive and long-term
Salmon Weir Bridge – View to Galway Cathedral (see **Figure 16.1.5.2**)	High	Medium	Moderate, positive and long-term
Newtownsmith – View to Courthouse and Newtownsmith (see **Figure 16.1.6.2**)	High	Medium	Moderate, positive and long-term
Woodquay – View towards Woodquay Street (see **Figure 16.1.7.2**)	High	High	Significant, positive and long-term
Dyke Road – View to Bóthar na mBan (see **Figure 16.1.8.2**)	High	High	Moderate, negative and long-term
Bóthar na mBan – View toward Headford Road (see **Figure 16.1.9.2**)	High	High	Moderate, negative and long-term
Eglinton Street – View northwest along street (see **Figure 16.1.10.2**)	High	Medium	Slight, positive and long-term
Eyre Square – View northeast (see **Figure 16.1.11.2**)	High	High	Significant, positive and long-term
Prospect Hill – View towards Eyre Square (see **Figure 16.1.12.2**)	High	Medium	Moderate, positive and long-term
Bohermore Road – View towards Prospect Hill and Eyre Square (see **Figure 16.1.13.2**)	Medium	Medium	Moderate, positive and long term
Victoria Place – View towards Eyre Square (see **Figure 16.1.14.2**)	Medium	Medium	Moderate, positive and long-term
Forster Street – View towards Fairgreen (see **Figure 16.1.15.2**)	High	High	Significant, positive and long-term
College Road – View towards proposed bus gate (see **Figure 16.1.16.2**)	Medium	Medium	Moderate, positive and long-term
College Road – View towards Lough Atalia Road (see **Figure 16.1.17.2**)	High	High	Moderate, positive and long-term
Lough Atalia Road – View towards Moneenageisha Junction (see **Figure 16.1.18.2**)	High	High	Moderate, negative and long-term
Old Dublin Road – View towards Moneenageisha Junction (see **Figure 16.1.19.2**)	High	Medium	Slight, negative and long-term

The potential visual impacts on visual receptors as a result of the Proposed Scheme are outlined in Table 16.5.

Table 16.5: Visual Receptors and Visual Impact Assessment

Visual receptors	Baseline Sensitivity	Magnitude of change	Visual impact rating
Architectural Conservation Areas			
University Road	High	Medium	Moderate, positive and long-term
The City Core (Eglinton Steet)	High	Medium	Moderate, positive and long-term
Eyre Square	High	Medium	Moderate, positive and long-term
Amenity Designations			
Millennium Park	High	Low	Neutral and long-term
River Corrib and Waterways	High	Low	Neutral and long-term
Eyre Square	High	Medium	Moderate, positive and long-term
Lough Atalia walk	High	Low	Slight, negative and long-term
Protected Views			
V.2 - Views from Dyke Road and Coolagh Road encompassing the River Corrib and Coolagh fen	High	Low	Slight, positive and long-term
V.3 - Seascape views of Lough Atalia from Lough Atalia Road, College Road, Dublin Road and Lakeshore Drive	High	Low	Slight, negative and long-term
V.11 - Views from Waterside of the River Corrib	High	Low	Imperceptible, neutral and long-term
Residential Properties			
Residential properties along, fronting and viewing the Proposed Scheme along its length. Visual effects will arise from the general change in the road corridor, public realm and traffic patterns.	High	Low	Moderate, positive and long-term
Moneenageisha Court	High	Medium	Moderate, negative and long-term
Non-residential Properties			
Commercial and retail properties along, fronting and viewing the Proposed Scheme along its length. Visual effects will arise from the general change in the road corridor, public realm, traffic patterns, changes to boundaries and vegetation.	Medium	Low	Moderate, positive and long-term
NUIG entrance on University Road	High	Low	Moderate, positive and long-term
Galway Cathedral	High	Low	Moderate, positive and long-term

Visual receptors	Baseline Sensitivity	Magnitude of change	Visual impact rating
Galway Courthouse/Town Hall Theatre	High	Low	Slight, positive and long-term
Circle K fuel garage	Low	Medium	Moderate, negative and long-term
G Hotel	Medium	Low	Slight, negative and medium-term

16.4.4.3 Benefits

Following the effective implementation of measures as part of the Proposed Scheme, there will be beneficial effects to the fabric and character of the receiving townscape, particularly in the reallocation of space to pedestrian, cycle and public transport and in particular pedestrianisation of Newtownsmith, Gaol Road (east of Galway Cathedral), Woodquay Street, Eyre Square/Prospect Hill, Forster Street/Fairgreen,

These include new or improved footpath and cycle routes, improved or more visually appealing hard surfacing, street furniture and planting, following the Galway Public Realm Strategy (Galway City Council, 2019).

186 no. new street trees will be planted as part of the Proposed Scheme, which along with low-level planters, will provide beneficial urban greening measures within the city centre.

16.5 Mitigation and Monitoring Measures

Given the nature of the Proposed Scheme, consideration of mitigation was a significant aspect during the design stage. As such, the Proposed Scheme incorporates a number of design elements to minimise the townscape and visual effects.

16.5.1.1 Construction Phase

Consideration was given to the avoidance of significant townscape and visual impacts during the design stage for the Proposed Scheme. Nevertheless, all construction projects give rise to some degree of unavoidable townscape and visual impacts.

Prior to the commencement of works, the appointed contractor will prepare a detailed Construction Environmental Management Plan (CEMP). The purpose of the CEMP is to ensure good working practices are implemented on site, including the mitigation measures set out in this chapter, thereby minimising and managing any potential negative environmental effects.

In addition to the management of all construction works in accordance to best methodologies and practice, the following measures are proposed for the mitigation of landscape/townscape and visual impacts:

- Retained existing trees, planting, features etc. will be protected with temporary protective fencing at the boundary of proposed works areas. Existing trees along will be protected with fencing in accordance with BS5837:2012: Trees in relation to Construction and TII's Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub.
- Where existing trees, hedges, and/or plantings are removed from temporary acquisition areas, new planting and paving will be provided in replacement of those removed. In general, unless not feasible or practicable, new plant species will match that of those removed. Replacement plant sizes will be that readily available and therefore, is unlikely to match the maturity of plants removed (especially in the case of trees or larger plants). However, being of the same or similar species, maturity similar to that of the existing can be achieved in time.
- New boundaries to match the existing will be established on the setback line to match the existing boundary. The construction and provision of the new boundaries is to take account of the location of existing trees, other plantings, gradients, drainage, property features and access arrangements so as to minimise additional indirect effects.
- The Proposed Scheme will provide for the planting of new street trees both for mitigation of tree removal and for overall enhancement of streetscape environment. Species selected shall be appropriate to the urban street environment and to the characteristics of the specific location. This measure is applied along the full length of the Proposed Scheme.
- Proposals for the treatment of the public realm within the streetscape effected by the Proposed Scheme will have regard to the existing character of the street or location, Galway Public Realm Strategy and to opportunities for enhancement of the public realm and the streetscape. Proposals will have regard to historic details and features, to the quality of existing and proposed materials, to the reduction of clutter, ease of legibility, and management and maintenance requirements.

16.5.1.2 Operational Phase

The design process of the Proposed Scheme has considered the potential for negative landscape / townscape and visual effects. Opportunities to avoid, reduce or remediate these have been taken wherever feasible, and landscape measures are integrated within the design as far as possible. It should be noted, that wherever feasible, the Proposed Scheme proposes improvements of the townscape / streetscape along the full length of the route. Therefore, while no mitigation or monitoring measures are proposed for the Operational Phase, the scheme will become established and increasingly integrated within its landscape (townscape) setting, and the potential negative operational effects will be reduced.

16.5.1.3 Monitoring

The works will have continuous monitoring under the Construction Environmental Management Plan to ensure adequate protection of trees, built heritage features., amenity and public realm areas outside of the construction works.

Any construction within close proximity to the retained trees will be undertaken in accordance with approved method statements prepared by the construction contractor under the direct supervision of a suitably qualified consultant Arboriculturist. Therefore, during the construction works, a professionally qualified Arboriculturist is recommended to be retained by the principal contractor or site manager to monitor and advice on any works within the root protection area (RPA) of retained trees to ensure successful retention and planning compliance.

Copies of the retention/tree protection plan and BS 5837:2012: Trees in relation to construction, will be kept available on-site during development. All works will be in accordance with these documents.

On the completion of the construction works, all trees and vegetation retained is to be reviewed by the project Arboriculturist and any necessary remedial tree surgery works required to promote health and safety are to be implemented.

16.6 Residual Impacts

16.6.1 Construction Phase

The loss of 59 early mature and mature trees during construction works will give rise to localised significant, negative and short-term townscape and visual effects. The planting of 186 new street trees will give rise to positive and long-term effects.

16.6.2 Operational Phase

Once operational the Proposed Scheme will have a permanent and significant effect on this sensitive urban townscape setting in Galway City. The improved connectivity and accessibility for pedestrians and cyclists linking the Galway City Centre to western and eastern city environs will improve people's experience of moving through this part of the city.

16.7 References

Environmental Protection Agency. (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Transport Infrastructure Ireland. (2020) Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects – Overarching Technical Document (PE-ENV-01101), TII (2020)

Galway City Council. (2017) Galway City Development Plan 2017-2023.

Galway City Council. (2019) Galway Public Realm Strategy 2019.

Galway City Council & Galway County Council. (2016) Galway Transport Strategy.

Guidelines for Landscape and Visual Impact Assessment, Third Edition (LI/IEMA, 2013)

Planning and Development Act 2000, as amended.

Planning and Development Regulations 2001, as amended.

European Landscape Convention 2000.

Chapter 17
Waste & Resources

Contents

17 Waste & Resources

17.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) has considered the impacts on waste and resources associated with the Construction and Operational Phases of the Proposed Scheme.

The potential impacts associated with the development of the Proposed Scheme during the Construction Phase have been assessed. This includes the creation and management of surplus materials due to construction activities such as utility diversions, road resurfacing and road realignments.

The potential impacts associated with surplus materials from ongoing road infrastructure maintenance during the Operational Phase have been assessed.

The assessment has been carried out according to best practice and guidelines relating to waste and resources assessment, and having regard to other similar large-scale road, rail and transportation projects.

Demolition, site clearance, excavation and construction are activities which will take place during the Construction Phase which are likely to generate surplus materials. In recent years there has been a shift in focus on best practice waste management and waste minimisation in construction and an increase in the reuse of construction by-products in projects.

During the Operational Phase maintenance activities are likely to generate surplus materials. These are included in this assessment.

Key aspects of the Proposed Scheme relevant to this waste and resources assessment are set out in Chapter 5 (Construction) and include:

- Construction and reconstitution of cycleways, footpaths, road widening and urban realm improvements;
- Removal of trees, concrete kerbs, walls and fences;
- Removal of small retaining walls;
- New street furniture, including traffic lights and bus stops, and landscaping works;
- Removal of boundary walls and fences;
- Minor utility diversions and / or protections will be required; and
- Excavation of pavements and carriageways.

A summary of the surplus materials arising from excavation, demolition, construction and operation of the Proposed Scheme is presented in Section 17.4.

The design of the Proposed Scheme has evolved through the application of a comprehensive design iteration process with particular emphasis on minimising the potential for environmental impacts where practicable whilst ensuring the objectives of the Proposed Scheme are maintained.

17.1.1 Sustainable Resource and Waste Management Principles

17.1.1.1 Circular Economy

The principal objective of sustainable resource and waste management is to use resources more efficiently, where the value of products, material and resources is maintained in the economy for as long as possible such that the generation of waste is minimised. To achieve resource efficiency there is a need to move from a traditional linear economy to a circular economy (refer to Diagram 17.1).

Diagram 17.1: A Simplified Model of the Circular Economy for Materials and Energy (European Environment Agency (EEA) 2016)

The Department of Communications, Climate Action and Environment's (DCCAE) A Waste Action Plan for a Circular Economy – Ireland's National Waste Policy 2020 – 2025 (hereafter referred to as the National Waste Action Plan) (DCCAE 2020) notes that:

'In a circular economy the value of products and materials is maintained for as long as possible; waste and resource use are minimised, and resources are kept within the economy when a product has reached the end of its life, to be used again and again to create further value.'

The European Union (EU) Circular Economy Action Plan (European Commission 2020) notes that:

'the EU needs to accelerate the transition towards a regenerative growth model that gives back to the planet more than it takes, advance towards keeping its resource consumption within planetary boundaries, and therefore strive to reduce its consumption footprint and double its circular material use rate in the coming decade.'

Where residual waste generation is unavoidable it will be dealt with in a way that follows the waste hierarchy as illustrated in Diagram 17.2 and set out in Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2009 on waste and repealing certain Directives and Directive 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (hereafter referred to as the Waste Framework Directive). The Government of Ireland released a Whole Government Circular Economy Strategy 2022-2023 (Government of Ireland 2021), setting out a policy framework for transitioning to a circular economy, measures to reduce the circularity gap, raise awareness and support investment into circular initiatives and identify barriers.

17.1.1.2 The Waste Hierarchy

The waste hierarchy supports the need to achieve efficient use of material resources, minimise the amount of waste produced (or otherwise increase its value as a resource) and reduce, as far as possible, the amount of waste that is disposed to landfill.

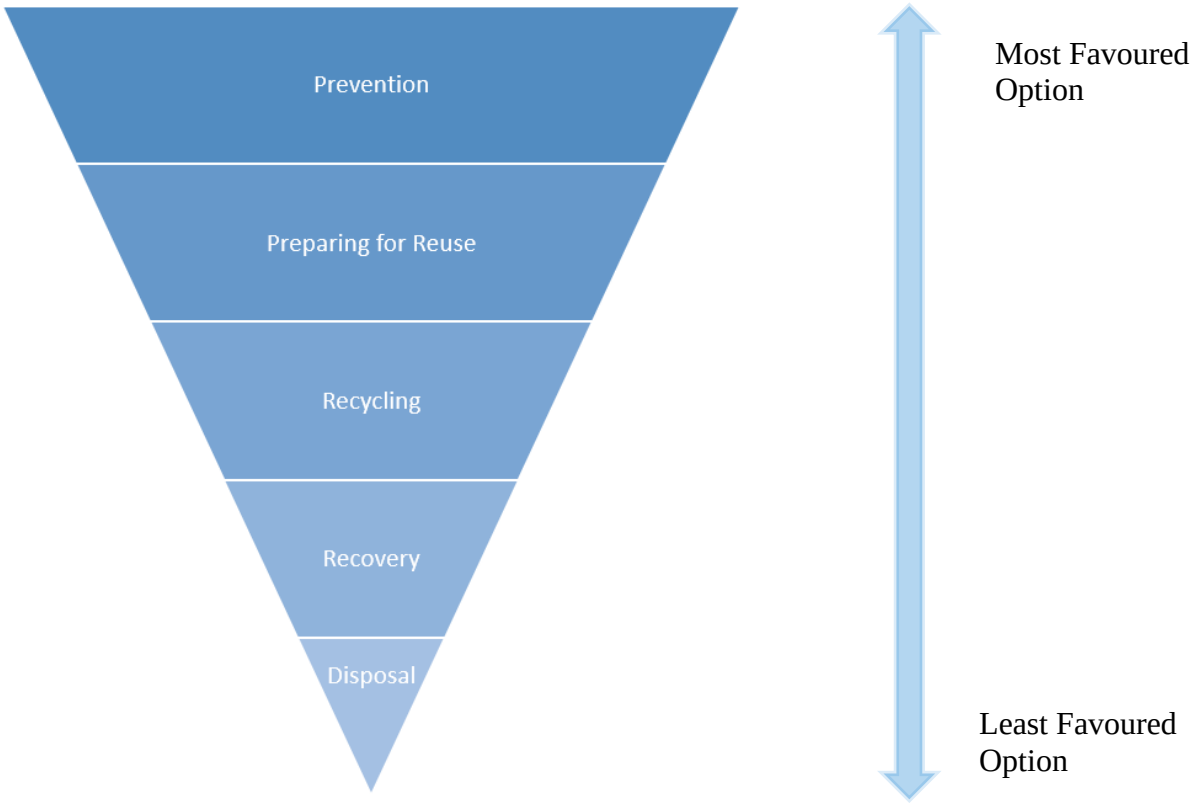

Diagram 17.2: Waste Hierarchy (Waste Framework Directive, 2018)

The consideration of resources in the context of this assessment includes a review of the potential for beneficial reuse of materials arising from the construction of

the Proposed Scheme (e.g. excavated soil and stones, concrete or bitumen containing material).

Other topics related to waste and resource management, such as Construction Phase traffic impacts, water quality impact and mineral resources are considered in the following chapters of this EIAR:

- Construction Phase traffic impacts Chapter 6 (Traffic & Transport);
- Water quality and pollution risk are considered in Chapter 13 (Water); and
- Mineral resources are considered in Chapter 18 (Material Assets) and Chapter 14 (Land, Soils, Geology & Hydrogeology).

If excavated material is not required for the construction of the Proposed Scheme the contractor may undertake a study of suitable end uses including other construction projects beyond the Proposed Scheme, with priority to be given to activities which are higher up the waste hierarchy. The material would then be considered as a resource for re-use beyond the Proposed Scheme in so far as is reasonably practicable, and may be notified to the Environmental Protection Agency (EPA) as a by-product, as appropriate.

17.2 Methodology

This section presents the study area and appraisal method for the assessment of impacts on waste and resources.

17.2.1 Study Area

The study area for waste and resources generation assessment from the Proposed Scheme comprises the areas and activities within the Proposed Scheme boundary (including Construction Compounds and temporary land take).

Waste from the Proposed Scheme could be accepted at sites nationally and internationally (that are suitably licensed or permitted for the waste volume and type), for treatment, recovery and disposal. However, as waste management planning in Ireland takes place on a regional basis, the study area generally for waste treatment, recovery and disposal comprises Galway and the Connacht-Ulster Waste Region (CUWR) (refer to Figure 17.1 and 17.2 in Volume 3 of this EIAR). The CUWR consists of the following nine local authority regions:

- Cavan County Council;
- Donegal County Council;
- Galway City Council;
- Galway County Council;
- Leitrim County Council;
- Mayo County Council;
- Monaghan County Council;
- Roscommon County Council; and
- Sligo County Council.

Where data is available at a local authority or regional level, it has been used to inform the baseline information (see Section 17.3). National data is used where it is the only data available.

17.2.2 Relevant Guidelines, Policy and Legislation

The following guidelines and policy documents were considered when undertaking the waste and resources assessment:

- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (EPA 2021a);
- Circular Economy Programme 2021-2027 (EPA 2021b);
- Ireland's First Whole-of-Government Circular Economy Strategy- Public Consultation on the Proposed Publication of the Strategy (Department for Environment, Climate & Communications (DECC 2021);
- Construction & Demolition Waste, Soil and Stone Recovery / Disposal Capacity – Updated report 2020 (Regional Waste Management Offices 2020);
- A new Circular Economy Action Plan for a Cleaner and More Competitive Europe (European Commission 2020);
- Whole of Government Circular Economy Strategy 2022 – 2023: Living more, Using Less (Government of Ireland 2021);
- Environmental Protection Agency (EPA) National Waste Statistics for Ireland (EPA 2021c and EPA 2021d);
- A Waste Action Plan for a Circular Economy, Ireland's National Waste Policy 2020-2025 (Department of Communications, Climate Action and Environment (DCCAE 2020);
- Consultation on the Transposition of the Circular Economy Waste Package (DCCAE 2019);
- EU Construction and Demolition Waste Protocol and Guidelines (European Commission 2018);
- Transport Infrastructure Ireland (TII) The Management of Waste from National Road Construction Projects. Standard GE-ENV-01101 (TII 2017);
- Connacht Ulster Region Waste Management Plan (Connacht-Ulster Waste Region (CUWR 2016);
- Circular Economy Action Plan (European Commission 2015);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022);
- Waste Classification – List of Waste and Determining if Waste is Hazardous or non-Hazardous (EPA 2015a); and
- Specification for Road Works Series 600 - Earthworks (including Erratum No. 1, dated June 2013). Standard CC-SPW-00600 (hereafter referred to as the TII Earthworks Standard) (TII 2013a).

Directives and Legislation

- Waste Framework Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste;

- S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2020 (hereafter referred to as the Waste Directive Regulations);
- S.I. No. 86/2008 - Waste Management (Facility Permit and Registration) Regulations 2008, as amended;
- S.I. No. 821/2007 - Waste Management (Facility Permit and Registration) Regulations 2007;
- S.I. No. 820/2007 - Waste Management (Collection Permit) Regulations 2007, as amended;
- S.I. No. 419/2007 - Waste Management (Shipments of Waste) Regulations 2007;
- Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (hereafter referred to as the Landfill Directive); and
- Number 10 of 1996 - Waste Management Act 1996 Revised (hereafter referred to as the Waste Management Act 1996).

A summary of key policy and legislation is included in Appendix 17.1 Legislation and Policy in Volume 4 of this EIAR.

17.2.3 Data Collection and Collation

17.2.3.1 Desk Study

A desk study was undertaken which comprised the following tasks:

- Review of relevant policy and legislation which creates the legal framework for waste and resource management in Ireland;
- Review of the estimated surplus materials and by-product generation for the Construction Phase of the Proposed Scheme and subsequently incorporated into the development of the EIAR;
- Review of Operational Phase waste (i.e., associated with carriageway maintenance);
- Review of the Proposed Scheme design during development of the EIAR to identify appropriate mitigation and move waste management up the waste hierarchy through implementation of best practice where possible;
- Types, quantities and management of construction and demolition (C&D) waste arisings generated in Ireland and the relevant Local Authority and CUWR jurisdictions were reviewed;
- Types, quantities and management of commercial and industrial waste generated in Ireland (EPA 2021c) and CUWR jurisdictions (Regional Waste Management Offices 2020) were reviewed; and
- Availability (type and capacity) of waste infrastructure within each of the local authority jurisdictions through which the Proposed Scheme will pass and also in the CUWR (CUWR 2016) were obtained.

17.2.3.2 Waste Generation Phases

A summary of both phases of the Proposed Scheme and the source of surplus materials considered in this assessment is set out in Diagram 17.3.

For the purpose of the Proposed Scheme bituminous materials have been quantified and assessed under the excavation activities.

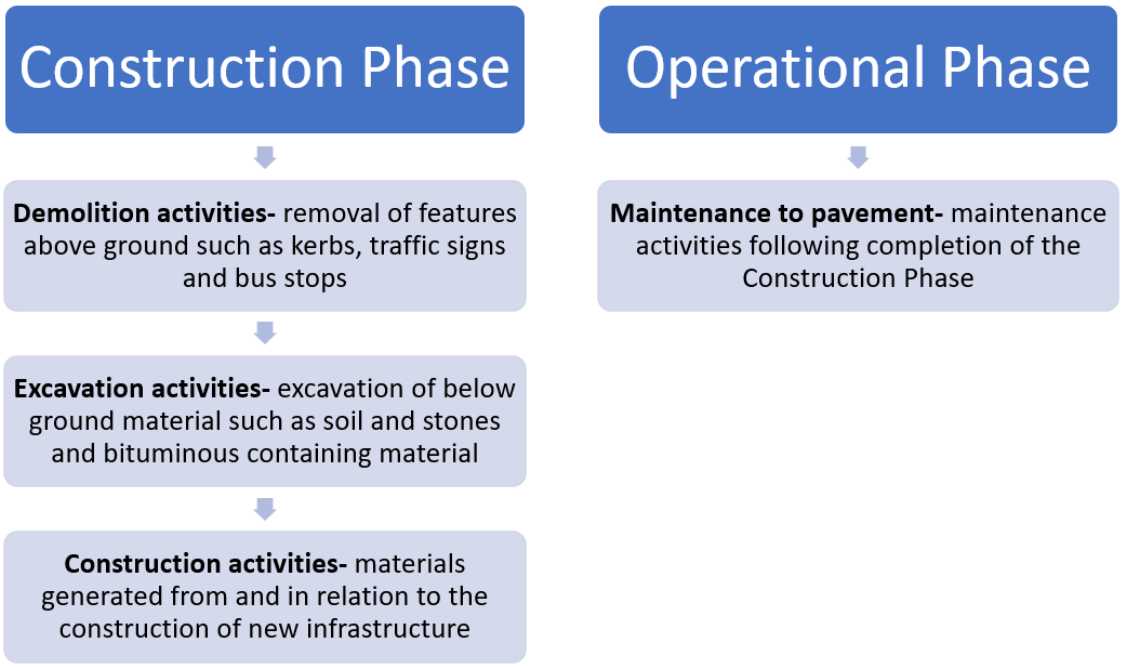

Diagram 17.3: Summary of surplus materials source considered in this assessment for each phase of Proposed Scheme

Construction Phase

Information including the following was gathered to inform the impact assessment related to C&D waste for the Proposed Scheme:

- a description of proposed demolition, excavation material quantities and properties;
- consideration of options for reuse within the Proposed Scheme of materials generated during construction; and
- consideration of the on-site and off-site treatment, reuse, recovery or disposal of materials.

Operational Phase

During the Operational Phase, the predominant surplus materials generation will result from maintenance activities.

The assessment quantified surplus materials being generated only in the areas being widened and narrowed as a result of the Proposed Scheme, as the existing road network would continue to require maintenance in any event. It is assumed that additional maintenance would be required, above the baseline, in areas that will be widened. It is assumed that less maintenance will be required, compared to the baseline, in areas that will be narrowed as part of the Proposed Scheme. In the Operational Phase the infrastructure will be maintained by the local authority, in accordance with their own standards and requirements.

17.2.4 Appraisal Method for the Assessment of Impacts

The potential environmental impacts of solid waste and resource generation and management associated with the Proposed Scheme was assessed with respect to both the Construction and Operational Phases. These impacts may be neutral, positive or adverse and are dependent on the measures employed to prevent and / or manage the waste generated.

17.2.4.1 Assessment Methodology

The likely impacts are assessed by describing waste and by-products generation and management from the Proposed Scheme and comparing this to the current waste and by-product management baseline in Ireland.

The impact assessment and waste management options of this EIAR (as set out in Section 17.4 and Section 17.5) have been considered in line with the waste hierarchy and the Waste Framework Directive - see Diagram 17.2.

The following factors are considered when determining the significance of the impacts of the Proposed Scheme on the various aspects of the baseline environment:

- Desk study of current practices for waste and by-product management in Ireland;
- Data gathered on the types and quantities of waste and by-product generation and management from the Proposed Scheme. This is compared with the established baseline set out in Section 17.3;
- An assessment of the likely environmental impacts that may arise from the quantity of waste requiring disposal to landfill, in line with the significance criteria set out in Chapter 1 (Introduction) of this EIAR.
- The surplus materials arising and waste infrastructure capacity in Connacht-Ulster Waste Region in which the Proposed Scheme is located; and
- A review of the Proposed Scheme in the context of the waste hierarchy and circular economy principles to determine the mitigation measures required.

17.2.4.2 Legislation, Policy and Guidance

The assessment considers relevant waste management legislation, policies and guidance applicable to all infrastructure components along the Proposed Scheme. This includes, but is not limited to the legislation, policy and guidance set out within Section 17.2.2.

Significance Criteria

The criteria used to categorise waste and resources impacts is based on the EPA Guidelines (EPA 2022) as set out in Chapter 1 (Introduction) of this EIAR.

The Institute for Environmental Management and Assessment (IEMA) released guidance in 2020 setting out a standard approach to undertaking waste assessments for EIA (IEMA, 2020). The EPA guidelines are complemented by the more detailed approach set out in the IEMA guidelines.

The IEMA guidance sets out that the receptor for waste relates to availability of regional (and where appropriate, national) landfill void capacity in the absence of proposed development. Landfill capacity is recognised as an unsustainable and increasingly scarce option for managing waste. However, the IEMA guidance states that in some specific cases baseline data collected on the availability and capacity of non-landfill waste management infrastructure (in conjunction with any identified trends) may be used to provide a more comprehensive context for assessing the magnitude of impacts, see Table 17.1.

Table 17.1: Significance Criteria based on EPA Guidelines and IEMA Guidance for Magnitude of Impact for Inert and Non-Hazardous Waste

No change	Negligible	Minor	Moderate	Major
Zero waste generation and disposal from the development	Waste generated by the development will reduce regional authorised waste management infrastructure intake capacity by <1%	Waste generated by the development will reduce regional authorised waste management infrastructure intake capacity by 1-5%	Waste generated by the development will reduce regional authorised waste management infrastructure intake capacity by 6-10%	Waste generated by the development will reduce regional authorised waste management infrastructure intake capacity by >10%

As set out in the baseline (Section 17.3), Irelands construction and demolition waste is predominately managed through backfilling (82.4%). 10.4% is managed through disposal routes (EPA 2021c). Therefore, in conjunction with identified trends nationally and in the region it is considered appropriate to use regional authorised waste management infrastructure intake capacity, as set out in Table 17.4, Section 17.3.2.

The approach of the EPA was supplemented by the IEMA guidance in order establish the waste management significance criteria for this assessment of non-hazardous waste. The EPA significance ratings are used to describe the impacts arising from the construction and operation of the Proposed Scheme.

17.2.4.3 Waste Management Principles

In the construction of the Proposed Scheme the appointed contractor will have regard to the following principles of the waste hierarchy, in line with the Waste Framework Directive (see Diagram 17.2).

Prevention and Reuse

Waste prevention and minimisation is the most environmentally sustainable means of managing surplus material from demolition, excavation and construction materials. The principles of prevention and minimisation of waste are inherent in the design of the Proposed Scheme.

Where naturally occurring material will be used for the purpose of construction in its natural state within the Proposed Scheme, this material will not be deemed to be a waste in accordance with Section 3 of the Waste Management Act 1996. Naturally occurring material, including topsoil, will be reused for the purpose of

construction throughout the Proposed Scheme, where feasible. The material will also be subject to testing to ensure it is suitable for its proposed end use.

Where non-naturally occurring surplus excavation material occurs within the Proposed Scheme it will be beneficially reused within the Proposed Scheme, where feasible. The use of excavation material on other projects, for example in engineering works or landscaping may take place where feasible and where it cannot be reused on site. Where construction by-products are proposed to be further used on-site or off site, this will take place in compliance with Article 27 of the Waste Directive Regulations (S.I. 323 of 2020). The appointed contractor will be responsible for ensuring compliance with these regulations, where appropriate.

Recycling, Recovery and Disposal

Where surplus materials are generated which cannot be reused, these will be waste and will be delivered to authorised recycling or recovery facilities where feasible and in accordance with the Waste Management Act, 1996, as amended. These must hold the appropriate Certificate of Registration, Waste Facility Permit or EPA licence.

All wastes removed from site will be transported by the holder of the appropriate waste collection Permit, granted in accordance with the S.I. No. 820/2007 - Waste Management (Collection Permit) Regulations 2007, as amended.

The option of disposal is the least desirable outcome for surplus material generated by the Proposed Scheme and will only be considered where it is not possible to deliver wastes for recycling or recovery to appropriately licensed / permitted facilities for reuse / recycling purposes. In addition, reuse and recycling is preferable to energy recovery.

In addition, where waste facility capacity does not exist within Ireland for management of specific waste streams, such as hazardous soils, these will be exported for treatment, recovery or disposal in accordance with the provisions of S.I. No. 419/2007 - Waste Management (Shipments of Waste) Regulations 2007 and in accordance with current practice in Ireland.

The appointed contractor may seek to crush and re-use certain materials, primarily concrete and excavated rock, during the Construction Phase of the Proposed Scheme. In such scenario a mobile crusher may be located in the main Construction Compounds, see Chapter 5 (Construction) of this EIAR. The appointed contractor will obtain all necessary authorisations, under the Waste Management Act 1996, as amended, to undertake crushing, processing, and storage.

It will be the responsibility of the appointed contractor, under the Waste Management Act 1996, as amended, to ensure that all material delivered to authorised waste facilities is correctly classified and will meet the waste acceptance criteria of the receiving site.

It will be the responsibility of the appointed contractor to secure agreements for reuse, recycling or disposal of surplus materials from the Proposed Scheme in

construction projects or authorised facilities where appropriate, in accordance with the Waste Management Act, 1996 as amended and associated regulations.

Best Practice Waste Management Measures

Table 17.2 sets out a list of best practice waste management measures which will be implemented by the appointed contractor, where practicable during the scheme construction in accordance with the waste hierarchy.

Table 17.2: List of Waste Management Best Practice Actions (Construction Phase)

Stage in Hierarchy	Action
Recycling	Where possible, metal, timber, glass and other recyclable material will be segregated and removed off site to a permitted / licensed facility for recycling. Waste stream colour coding and photographs will be used to facilitate segregation.
Recycling	On-site office and food waste arising will be source separated at least into dry mixed recyclables, biodegradable and residual wastes.
Recycling	Waste bins, containers, skip containers and storage areas will be clearly labelled with waste types which they should contain, including photographs as appropriate.
Prevention	The site will be maintained to prevent litter and regular litter picking will take place throughout the site.
Prevention	'Just-in-time' delivery will be used as where practicable to minimise material wastage (Building Research Establishment (BRE) 2012; EPA 2015b)
General	The appointed contractor will record the quantity in tonnes and types of waste and materials leaving the site during the demolition works. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show material which is recovered and disposed of.
Prevention	Paints, sealants and hazardous chemicals will be stored in secure, bunded locations.
Prevention	All hazardous waste will be separately stored in appropriate lockable containers prior to removal from site by an appropriate waste collection holder.
General	Waste generated on-site will be removed as soon as practicable following generation for delivery to an authorised waste facility.
General	The appointed contractor will ensure that any off site interim storage facilities for excavated material have the appropriate waste licences or waste facility permits in place.
Prevention	All staff on-site will be trained on how to minimise waste (i.e. training, induction, inspections and meetings).
Prevention	Materials on-site will be correctly and securely stored (BRE 2012).
Prevention / Recycling	Segregated skips will be used on-site if space permits (particularly for hazardous, gypsum, metal, timber, inert waste and general waste) (BRE 2012).

17.3 Baseline Environment

17.3.1 Overview

The baseline environment for waste and by products management in Ireland is described in the following sections. Construction waste, including demolition and excavation waste, will be generated at the Construction Phase of the Proposed Scheme. Construction waste, due to maintenance activities, will also be generated during the Operational Phase of the Proposed Scheme. Construction waste, including demolition and excavation waste, will be the main type of waste generated as a result of the Proposed Scheme.

There will be small quantities of municipal-type waste generated during construction and operation. Therefore, the waste management baseline of construction and municipal waste was established for both the Construction and Operational Phases.

Article 27 of the Waste Directive Regulations (S.I. 323 of 2020) allows a material producer to determine, under certain circumstances, that a material is a by-product and not a waste. Substances or objects, such as soil and stones, produced during construction projects may be determined as a by-product if they satisfy all of the following criteria:

[1] Further use of the material is certain;

[2] The material can be used directly without any further processing other than normal industrial practice;

[3] The material is produced as an integral part of the production process;

[4] Further use is lawful, in that the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

They will be a by-product if they meet each of the conditions detailed in Article 27. The baseline area for reuse of by-products in accordance with Article 27 comprises the whole country, as no regional distinction is made in the Article 27 register.

Where it is proposed to use an Article 27 EPA notification in relation to excavation material from the Proposed Scheme, the Contractor will be responsible for ensuring compliance with Regulation 27 of the Waste Directive Regulations (S.I. 323 of 2020) including notification of the EPA, seeking a determination from the E.P.A. on the matter and compliance with all relevant Agency guidance on the matter.

Where it is proposed to use soil from off-site which is a by-product and subject to Regulation 27 of the Waste Directive Regulations (S.I. 323 of 2020), the Contractor is responsible for carrying out any necessary due diligence regarding the material and ensuring that all EPA guidelines relating to that Article 27 notification have been complied with before the soil is imported into the site.

Where feasible, appropriate and available construction by-products arising from other sites will be used in the Proposed Scheme in place of virgin materials.

The government noted in the Waste Action Plan for a Circular Economy 2020 that selected waste streams would be the subject of sector or industry wide Article 28 End-of-Waste determinations. Should a determination be made which applies to wastes arising from the proposed development, and the contractor wishes to apply the declaration, it will be the responsibility of the contractor to ensure that all of the conditions of the declaration and of Article 28 of the European Union (Waste Directive) Regulations, 2011 to 2020 are complied with.

17.3.2 Construction Waste

List of Waste (LoW) codes for typical C&D wastes are included in Appendix 17.2 List of Waste Codes Construction in Volume 4 of this EIAR. In 2019, the latest year for which there are published statistics available, 8.8 million tonnes of C&D waste was generated, an increase of 2.6 million tonnes from 2018 (EPA 2021c). Of this waste, 7.5 million tonnes comprised soil and stones, making up 85% of the material waste stream. A breakdown of the composition of C&D waste in Ireland in 2019 is set out in Table 17.3. These figures should be considered as a guide only as C&D waste can vary significantly from one project to another, depending on the nature of the development and the waste management practices employed on-site.

Table 17.3: Quantity of C&D Waste Collected by Authorised Waste Collectors in 2019 (EPA 2021c)

Waste Materials from C&D Sources	Quantity (tonnes)	Proportion of Material Stream (%)
Soil and stone	7,488,357	84.8
Mixed C&D waste	393,247	4.5
Concrete, bricks, tiles and similar	608,746	6.9
Metals	190,904	2.2
Bituminous mixtures	113,454	1.3
Segregated wood, glass and plastic	30,423	0.3
Total	8,825,130	

The EPA reports that a total of 580,977 tonnes of hazardous waste was managed and treated in Ireland in 2019, 65% of which was exported for treatment. Hazardous waste types include contaminated soils, motor oil, asbestos and chemical waste.

The EPA reports that Ireland achieved 82.4% material recovery of C&D waste in 2019 (EPA 2021c). Under the Waste Framework Directive, EU Member States must achieve 70% of material recovery of non-hazardous and non-soil-and-stone C&D waste by 2020.

A summary of the permitted waste facilities for the CUWR, active at the time of preparation of this assessment, is provided in Table 17.4. Many permit holders are authorised to accept more than one waste type.

Table 17.4 sets out the minimum number and capacity for each waste type. The minimum figure sets out the waste facilities accepting the specified waste type only. Figure 17.1 and Figure 17.2 in Volume 3 of this EIAR show the locations of permitted construction waste facilities in Galway and the CUWR, respectively. Facilities located in Donegal and Monaghan County have been excluded from the baseline due to the travel distance to these facilities.

Table 17.4: Summary of CUWR Waste Facility Permit Data (Regional Waste Management Office 2021)

Waste Type (Some Facilities Treat More Than One Waste Type)	Total Number of Waste Facility Permit Sites in the CUWR	Capacity of Waste Facility Permit Sites in the CUWR (tonnes)
Soil and Stones	11	152,880
Wood	1	2,000
Concrete	0	-
Other Construction Wastes	35	530,436
Asphalt	0	-
Total	47	685,316

Article 27 of the Waste Directive Regulations (S.I. 323 of 2020) allows a material producer to determine, under prescribed circumstances, that a material is a by-product and not a waste and so can be reused onsite or offsite within the industry.

On receipt of "Article 27" notifications by the EPA, materials can be determined as a waste or a by-product. In some cases, no determination is issued by the EPA; this means that the material has not been determined as a waste. In 2019, the EPA received by-product notifications for 5.98 million tonnes of soil and stones material. The EPA determined that 2.77 tonnes of the soil and stone notified were a by-product, as notified and 49,000 tonnes were waste. Notifications for 1.05 million tonnes were withdrawn.

The estimated quantity of C&D material notified in 2018 as a by-product for which no determination was made to date was 2.11 million tonnes. The EPA notes in its 2020 guidance, 'Guidance to Planners, Planning Authorities and An Bord Pleanála on the Management of Excess Soil and Stone from Developments', that it will endeavour to issue determinations as waste or by-products for all notifications from 2020 (EPA 2020) and determinations have started to be issued.

A summary of Article 27 notifications for three key road construction materials for the years 2017 to 2020 is presented in Table 17.5. A significant increase in the number of notifications occurred for soil and stones and asphalt from 2017 to 2020, with asphalt notifications increasing from 10 to 186 and soil and stones notifications increasing from 92 to 172, with a peak in 2019 of 214.

Table 17.5: Number of Article 27 Notifications (2017 to 2020)

Waste Type / Year	2017	2018	2019	2020
Soil and stones	92	153	214	172
Asphalt / road plannings	10	109	175	186
Concrete / demolition concrete	9	24	8	5

Article 27 notification data obtained from the EPA, shows that there was 20,500 tonnes of notified in the CUWR in 2020, which was established as the baseline for the Proposed Scheme.

There is only one licenced facility within the region. The Lennon Quarries Limited facility is a soil recovery facility with a capacity of 90,000 tonnes per annum (EPA 2022). Figure 17.3 in Volume 3 of this EIAR shows the location of the Lennon Quarries facility. The regional waste management offices have published a Construction and Demolition- Update Report 2020 which states that (Regional Waste Management Offices 2020):

*'*In comparison to [the East Midlands and Southern] regions, the CUR had just 10% of the remaining national capacity at the end of 2018.*'*

Table 17.6 sets out the baseline for construction waste, permitted and licensed, capacity and Article 27 notifications for 2020. This data has been used to establish a baseline of available waste capacity for 2020. The available C&D waste capacity in CUWR, and so the construction waste baseline, is approximately 795,800 million tonnes based on the following assumptions:

- Using the minimum available capacity for permitted facilities within the CUWR (only including facilities that accept a single waste type in order to avoid double counting capacity and excluding Donegal and Monaghan);
- including only licensed facilities accepting soil and stones; and
- including all Article 27 notifications for 2020 in the CUWR.

Table 17.6: C&D waste management baseline for CUWR, 2020 (permitted, licensed and Article 27 notifications)

C&D Waste Management Baseline for 2020	Capacity/ annual intake (Tonnes)
Minimum Permitted capacity (Regional Waste Management Office (Offaly County Council, 2021)	685,316
Licenced annual intake (soil and stone facilities) (EPA 2022)	90,000
Article 27 (by-product) notifications (EPA 2021c)	20,500
Total	795,796

17.3.3 Municipal Waste

Municipal waste will be generated in small quantities during the Construction and Operational Phases (i.e. associated with maintenance activities) of the Proposed Scheme. Municipal waste in Ireland is made up of household waste as well as commercial and other waste that, because of its nature or composition, is similar to household waste. According to the EPA, Ireland generated 3.1 million tonnes of municipal waste and recycled 37% of this in 2019 (EPA 2021d).

Of the 3.1 million tonnes of municipal waste generated in Ireland in 2019, 37% was recycled, 46% was used in energy recovery, 15% was landfilled and 2% waste estimated to be unmanaged. Of the 3.1 million tonnes of municipal waste, 48% is estimated to be non-household municipal waste. Since 2001, significant changes have occurred in the management of municipal waste in Ireland, notably the dramatic decline in landfilling over this period accompanied by increased levels of recycling in the early 2000s and subsequently an increase in the share of municipal waste sent for energy recovery since 2011.

In September 2020, the DCCAE published a new national waste strategy, the National Waste Action Plan (DCCAE 2020). The following targets were noted in the National Waste Action Plan for municipal waste in Ireland which will be implemented using waste collection permit conditions:

- Municipal solid waste (MSW) recycling rate of 55%, 60%, and 65% by 2025, 2030 and 2035 respectively; and
- Limit the amount of MSW to landfill to 10% by 2035.

To achieve these targets from the 37% recycling rate in 2019 improvements are required in waste reduction, segregation and contamination rates. The EPA estimates that (Government of Ireland 2019):

'*…that Ireland's municipal recycling (including organic waste for composting and anaerobic digestion through the organic bin) rate could increase from 41% to 62% if all recyclable (including organic) material was removed from the general waste bins and placed into the correct mixed dry recycling and organic waste bins.*'

Biodegradable municipal waste (BMW) comprises those elements of the municipal waste stream that will degrade biologically, for example food waste, garden and parks waste, waste paper and cardboard.

Under the Landfill Directive, Ireland is committed to meeting targets for the diversion of BMW from disposal to landfill including a target of less than 427,000 tonnes to landfill in 2020. This has already been achieved and the quantity of BMW disposed to landfill in 2020 was 104,255 tonnes.

17.4 Potential Impacts

This section presents potential impacts that may occur due to the Proposed Scheme, in the absence of mitigation. This informs the need for mitigation or monitoring to be proposed (refer to Section 17.5). Predicted residual impacts taking into account any proposed mitigation is then presented in Section 17.6.

17.4.1 Characteristics of the Proposed Scheme

Surplus materials are likely to be generated during the following activities and are addressed in this Section:

- Demolition – including waste generated from the removal of features above ground such as kerbs, traffic signs and bus stops;
- Excavation – including waste generated from the excavation of below ground material such as soil and stones and bituminous mixtures etc.; and
- Operation – including waste generated from maintenance activities following completion of the Construction Phase.

Surplus organic materials, including vegetation from shrub, tree or garden clearance or deposits removed from within redundant drainage channels, may generate waste material for treatment at organic waste facilities. There is adequate capacity for the management of such wastes, please see Section 17.3. Segregation facilities may be provided, where necessary, on the construction site to ensure that recovery and recycling of such wastes is maximised.

Small volumes of general municipal wastes will be generated by construction workers during the Construction Phase (e.g. from offices and welfare facilities at the construction compounds). Segregation facilities will be provided on the construction site, if necessary, to ensure that recovery and recycling of such wastes is maximised.

17.4.2 Do Nothing Scenario

In the Do Nothing scenario, the Proposed Scheme would not be implemented and the materials described in Section 17.4 would not be generated.

However, ongoing maintenance of the existing road infrastructure would continue to result in waste generation. The resource and waste impact will be Neutral.

17.4.3 Construction Phase

C&D waste is defined as waste which arises from construction and demolition activities. Typical C&D wastes which are likely to arise during the Construction Phase of the Proposed Scheme are set out in Appendix 17.2 List of Waste Codes for Construction and Demolition Wastes in Volume 4 of this EIAR, including EPA LoW codes.

The most environmentally sustainable means of managing C&D and excavated material is its prevention and minimisation. Refer to Section 17.1.1 and Table 17.2 for the principles of waste management. The contactor will be responsible for implementation of these for the Proposed Scheme. In recent years there has been a shift in focus on best practice waste management and waste minimisation in construction and an increase in the reuse of construction by-products in projects.

17.4.3.1 Demolition

All material generated from the Proposed Scheme will be considered for reuse for construction within the Proposed Scheme or in other construction projects in accordance with Article 27 of the Waste Directive Regulations. It will be the responsibility of the appointed contractor to review the feasibility of reuse of materials and ensure that the necessary testing is undertaken to demonstrate compliance with Article 27, as appropriate.

Materials will require on-site segregation by waste classification and if not suitable for reuse, will be delivered to an authorised recycling, recovery or disposal facility.

Where practicable and appropriate, and if in reusable condition, street and roadside infrastructure such as bus stops, lighting poles, traffic signals, manhole access covers and signs will be reused within the Proposed Scheme. If not reused, they will be delivered to appropriately authorised recycling or recovery facilities.

Where metal railings and gates are removed, they may have inherent value due to their metal content. These will be delivered for metal recycling to an authorised waste facility where not reused.

Some example facilities which are currently authorised to accept metal and electronic waste include:

- Irish Lamp Recycling Co. Ltd, Woodstock Industrial Estate, Kilkenny Road, Athy, County Kildare; and
- Hammond Lane Metal Company, Pigeon House Road, Dublin 4, Dublin.

The least preferable option is disposal to an authorised facility and will be considered by the contractor when reasonable opportunities for reuse, recycling and recovery are unavailable.

Table 17.7 shows the estimated quantity and type of waste that will be generated by demolition activities in connection with the Proposed Scheme.

Table 17.7: Estimated Demolition Waste Types and Quantities

Waste Type	Approximate Waste and Material Quantity (Tonnes)
Concrete, bricks, tiles and similar	590
Metals	90
Segregated wood, glass and plastic	20
Total	700

The estimated 700 tonnes of demolition waste which will be generated as a result of the Proposed Scheme is equivalent to 0.09% of the C&D waste management baseline in the CUWR set out in Table 17.7.

The potential impact of Demolition Waste during the Construction Phase, prior to mitigation, is adverse, not significant and short-term.

17.4.3.2 Excavation

Excavation waste will arise from such activities as:

- Excavation of existing carriageways (e.g. road narrowing, removal of islands);
- Excavation of existing footpaths and cycle tracks and pedestrianised areas (e.g. widening, urban real improvement; and
- Excavation for utility diversions and / or protections.

In line with current practice in Ireland, surplus demolition materials and wastes from the Proposed Scheme will be managed as follows:

- Where practicable, naturally occurring excavated material will be reused within construction in the Proposed Scheme in accordance with Article 2 of the Waste Directive Regulations, Waste Framework Directive and Section 3 of the Waste Management Act 1996, as amended;
- Excavation material will be used as engineering and landscaping material within the Proposed Scheme and on other projects requiring the types of materials generated, where practicable, through Article 27. Reuse of topsoil and excavated material within the Proposed Scheme is proposed, where practicable. The material will also be subject to testing to ensure it is suitable for its proposed end use;
- Should material meet the acceptance criteria set out in Article 28 of the Waste Directive Regulations (EPA 2020), this material will be delivered to recovery or disposal facilities which are authorised to collect this material under the Waste Management Act 1996 (i.e. which hold a Certificate of Registration, Waste Facility Permit or EPA Licence), should such recovery or disposal facilities become available by the time of commencement of construction of the Proposed Scheme;
- In accordance with the law all excavation wastes requiring removal from site for recycling or recovery will be delivered to facilities which are authorised under the Waste Management Act 1996 (i.e. which hold a Certificate of Registration, Waste Facility Permit or EPA Licence). Examples of recycling / recovery activities for excavation material include:
  - Processing of stone to produce construction aggregate;
  - Backfilling of quarries; and
  - Raising land for site improvement or development.
- Crushing and screening of material may be undertaken for the Proposed Scheme, which will be a decision for the appointed contractor;
- Any hazardous waste arising will be managed by the appointed contractor in accordance with the applicable legislation; and
- In accordance with the law all wastes removed from site will be transported by the holder of the appropriate waste collection permit, granted in accordance with S.I. No. 820/2007 - Waste Management (Collection Permit) Regulations 2007.

It will be the responsibility of the appointed contractor to secure agreements for removal of excavation material offsite to:

- An authorised and regulated facilities, in accordance with the Waste Management Act, 1996 as amended or

- For use as a by product in connection with an Article 27 determination.

Where carriageway is removed it will be reused where possible within the Proposed Scheme through implementation of the measures set out below.

Due to the nature of the works in an urban environment there are limited opportunities to achieve a cut / fill balance of materials. This could be more readily accommodated on a greenfield project where earthworks embankments / bunds are more common. Material from the existing pavement layers will be temporarily stockpiled at the proposed construction compound and sent to a suitable recovery facility for recycling or reuse as recycled aggregate material in the industry as further described in Section 17.5.1 and Table 17.12

Material resulting from excavation will require appropriate testing by the contractor for quality and contamination. This could potentially be reused as general fill or general landscape fill material in construction under the provisions of an Article 27. Material which meets the necessary acceptance criteria will be delivered to an authorised soil recovery facility.

Material which requires recycling will be sent to an authorised waste facility and may be used in accordance with Article 28 of the European Communities (Waste Directive) Regulations 2011 - S.I. 126 of 2011 as amended. Article 28 sets the criteria which must be complied with and the EPA must use to determine a waste reaches “end of waste” status and becomes a material.

Demolished pavement materials such as capping, subbase, bituminous and concrete materials may be reused where they meet the requirements of the relevant Transport Infrastructure Ireland specification. Alternatively, they may require recycling to meet the required specification.

Opportunities include the following:

- Capping, subbase, bituminous and concrete materials could be reused or recycled in fill and capping materials (e.g. 6A, 6B, 6C, 6F, 6G, 6H ,6I, 6M, 6N) providing they comply with the Specification for Road Works Series 600 – Earthworks (CC-SPW-00600) (TII2013a);
- Subbase, bituminous and concrete materials could be reused or recycled in subbase or base materials (e.g. Granular Material Type A to Clause 803) providing they comply with the Specification for Road Works Series 800 – Unbound and Cement Bound Mixtures (CC-SPW-00800) (TII 2013b); and
- Subbase and bituminous materials could be recycled in base or binder materials (e.g. Asphalt Concrete base and binder products to Clause 3 or Low Energy Bound Mixtures to Clause 8.1) providing they comply with Road Pavements – Bituminous Materials (CC-SPW-00900) (TII 2015).

Estimated quantities of potential pavement material reuse is provided in Table 17.12.

These pavement materials will either be removed directly from the Proposed Scheme or temporarily stored and removed at a later date as part of a spoil / waste management strategy having consideration of the intermittent nature of the street

works construction activities. The waste types likely to be generated during the Construction Phase are set out in Table 17.8.

Table 17.8: Summary of Excavation Material Type and Quantities

Materials from C&D Sources	Approximate Waste and Material Quantity (Tonnes)
Soil and stone	36,500
Concrete, bricks, tiles and similar	12,300
Bituminous mixtures	19,300
Total	68,100

The total forecast of surplus excavation material from the Proposed Scheme will be 68,100 tonnes and is equivalent to 8.56% of the C&D waste management baseline for the CUWR set out in Table 17.6.

In addition to the above an existing petrol station, located at CC will be decommissioned as part of the proposed scheme. Please refer to Appendix 14.5 in Volume 4 of this EIAR for a land contamination remediation strategy report. The report notes the presence of cadmium within the soil on site. It notes that 200m2 of soil will be excavated which may contain cadmium. This may be categorised as hazardous. Testing is required during excavation to determine the properties of excavated soil from the petrol station. Existing fuel tanks will be removed as part of site redevelopment. Hazardous soils and other wastes will be removed and delivered to an appropriately EPA licenced waste facility.

The potential impact of excavation waste during the Construction Phase, prior to mitigation, is adverse, moderate and short-term.

17.4.3.3 Construction

Construction works, site offices and temporary works facilities are also likely to generate waste. General construction waste can vary significantly from site to site but typically will include the following non-hazardous fractions:

- Soil and stone;
- Concrete, brick, tiles and ceramics;
- Bituminous mixtures;
- Metals;
- Wood;
- Municipal type wastes generated by construction employees; and
- Other.

The hazardous waste streams which could arise from construction activities include the following:

- Waste electrical and electronic equipment (WEEE) components;
- Batteries;
- Asbestos;
- Wood preservatives;

- Liquid fuels; and
- Contaminated soil.

Also included within this definition are surplus and damaged products and materials arising in the course of construction work or used temporarily during the course of on-site activities.

The Construction Phase will require the importation of a number of key construction materials for the Proposed Scheme works. This material will include items such as concrete, granular fill / aggregate, bituminous mixtures and structural steel. Table 17.9 provides an estimate of the quantities of the major materials required to complete the Construction Phase of the Proposed Scheme, for impacts on material assets see Chapter 18 (Material Assets) of this EIAR.

Table 17.9: Estimated Quantities of Major Construction Materials Required by the Proposed Scheme

Material	Estimated Quantity (tonnes)
Asphalt	21,300
Granular Material	45,670
Concrete	34,000

In the case of the Proposed Scheme, the most likely type and quantity of general construction waste will be surplus concrete and unusable or damaged pipe segments which may arise on-site. Quantities of these materials are estimated to be small; assumed to be approximately between 5% to 15% of construction material delivered to site (WRAP 2014). There is adequate capacity for the management of such wastes, please see Section 17.3. Segregation facilities will be provided to ensure that recovery and recycling of such wastes are maximised.

The potential impact of construction waste during the Construction Phase, prior to mitigation, is adverse, imperceptible and short-term.

17.4.3.4 Municipal Waste

It is anticipated that there will be approximately 70 to 80, possibly up to 100 at peak, construction staff employed over the Construction Phase of the Proposed Scheme. Small volumes of general municipal wastes will be generated by construction staff during the Construction Phase (e.g. from offices and welfare facilities). Segregation facilities will be provided on the construction site to ensure that recovery and recycling of such wastes is maximised.

The potential impact of Municipal Waste during the Construction Phase, prior to mitigation, is adverse, imperceptible and short-term.

17.4.4 Summary of the Potential Construction Phase Impacts

A summary of the potential impacts for the C&D phase is set out in Table 17.10.

Table 17.10: Summary of Potential C&D Phase Impacts

Assessment Topic	Potential Impact
Demolition waste	Adverse, Not Significant and Short-Term
Excavation waste	Adverse, Moderate and Short-Term
Construction waste	Adverse, Imperceptible and Short-Term
Municipal waste	Adverse, Imperceptible and Short-Term

The Construction Phase of the Proposed Scheme is not predicted to give rise to significant impacts and all the impacts will be short-term in duration.

17.4.5 Operational Phase

17.4.5.1 Construction and Demolition Waste

Operational waste may arise as a result of carriageway maintenance which will be undertaken at regular intervals, or as necessary. This will primarily consist of bituminous mixtures due to maintenance of carriageway pavement. Only waste generated from the areas where road widening and narrowing, undertaken as part of the Proposed Scheme, have taken place will be considered in this assessment, as routine maintenance, and associated waste generated, would be carried out on the existing road irrespective of the Proposed Scheme. It is important to note that maintenance operations will be undertaken under the jurisdiction of the relevant Local Authority.

It is envisaged that bitumen-containing material will be reused within new carriageway construction as far as practicable and in accordance with all applicable legislation.

Bitumen-containing materials which are not incorporated into the Proposed Scheme may be salvaged by the Local Authority for reuse elsewhere in accordance with Article 27, of the Waste Framework Directive. Bitumen-containing materials may be recycled in accordance with the provisions of an Article 28 (End of Waste) decision by the EPA (EPA 2020).

The quantity of bitumen-containing material generated over the assumed lifetime of the Proposed Scheme (60 years), will decrease, compared to the Do Nothing scenario due to an overall reduction of the carriageway area. Therefore, there will be a decrease in maintenance needs during operation of the Proposed Scheme, in comparison to required maintenance of the existing carriageway under the Do Nothing scenario. Therefore, the potential impact of operational construction and demolition waste will be beneficial and long-term.

17.4.5.2 Municipal Waste

It is anticipated that maintenance activities during the Operational Phase would result in no greater levels of waste generation than during the Construction Phase.

Therefore, the potential impact of municipal waste, generated during maintenance activities during the Operational Phase, prior to mitigation, is neutral and long-term.

17.4.6 Summary of Potential Operational Phase Impacts

A summary of the potential impacts for the Operational Phase is set out in Table 17.11.

Table 17.11: Summary of Potential Operational Phase Impacts

Assessment Topic	Potential Impact
C&D waste	Beneficial and Long-term
Municipal waste	Neutral and Long-term

The Operational Phase of the Proposed Scheme is not predicted to give rise to significant adverse impacts.

17.5 Mitigation and Monitoring Measures

17.5.1 Construction Phase

The Construction Phase is not predicted to give rise to significant adverse impacts and therefore no specific mitigation or monitoring measures are required. However, a suite of management measures are outlined which the appointed contractor will implement and, in any event, the appointed contractor will ensure that waste arisings will be managed in accordance with the waste hierarchy and in compliance with the provisions of the Waste Management Acts, 1996, as amended.

A Construction and Demolition Resource and Waste Management Plan (CDRWMP) has been prepared and this will be implemented (and updated as necessary) by the appointed contractor in line with the Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (EPA 2021a).

The CDRWMP outlines how waste arising during the Construction and Demolition Phase of the Proposed Scheme will be managed in a way that ensures compliance with the provisions of the Waste Management Acts, 1996, as amended – refer to the CDRWMP within Appendix 5.1 Construction Environmental Management Plan (CEMP) in Volume 4 of this EIAR. The appointed contractor will update the CDRWMP in advance of construction commencing.

The following measures will be implemented during construction, where practicable by the appointed contractor, to ensure the maximum quantity of material is reused on the Proposed Scheme and to contribute to achieving the objectives set out in the National Waste Action Plan as follows:

- Stockpiling of existing sub-base, capping layer and topsoil material generated on-site for direct reuse in the Proposed Scheme where practicable in the proposed construction compound (subject to material quality testing to ensure it is suitable for its proposed end use); and
- Recycled aggregates and reclaimed bituminous mixtures will be specified in the Proposed Scheme where practicable. For example, suitable recycled aggregates and appropriate site won material may be specified in the proposed road base / binder layers, sub-base layers under footpaths / cycle tracks, and capping layer material within the road, footpath and cycle track pavement, subject to testing to ensure material is suitable for its proposed use.

Table 17.12: Quantities of Proposed Material for Reuse and Recycling

Reuse or Recycle	Material for Reuse	Approximate Quantity (tonnes)	Reuse Specification for Example TII Series or Other Reuse Specification	Reuse Class (note: Class to be Provided in all Cases where TII Specification is used)
Recycle on Proposed Scheme	Bituminous Materials	2,300	TII Series 800 and 900 (TII 2013b and TII 2015)	Bituminous plannings for recycle in subbase material, base and binder layers
Reuse on Proposed Scheme	Sub-base material	2,600	TII Series 800 (TII 2013b)	Sub-base material
Reuse on Proposed Scheme	Capping material	12,500	TII Series 600 (TII 2013a)	Capping material
Reuse on Proposed Scheme	Concrete	2,400	TII Series 800 (TII 2013b)	CBGM Base to paved footway

It is estimated that potentially up to approximately 19,800 tonnes of recycled / reused aggregates could be incorporated into the Proposed Scheme (refer to Table 17.12). The quantities outlined in Table 17.12 will not result in a change in significance assessment for the impact assessment of excavation waste. Therefore, the impact of excavation waste will remain Adverse, Moderate and Short-Term.

The following management measures will be implemented in so far as reasonably practicable:

- Where waste generation cannot be avoided, waste disposal will be minimised;
- Opportunities for reuse of materials, by-products and wastes will be sought throughout the Construction Phase of the Proposed Scheme;
- Possibilities for reuse of clean non-hazardous excavation material as fill on the site or in landscaping works will be considered following appropriate testing to ensure material is suitable for its proposed end use;

- Where excavated material cannot be reused within the Proposed Scheme works, material will be sent for recovery or recycling;
- Source segregation: Metal, timber, glass and other recyclable material will be segregated (and waste stream colour coding will be used) during construction works and removed off site to a permitted / licensed facility for recycling;
- Material management: 'Just-in-time' delivery, where practicable, will be used to minimise material wastage;
- General construction waste and by-products will be reused within the Proposed Scheme, where practicable, or appropriately reused (in accordance with Article 27 of the Waste Directive Regulations), recovered, recycled or disposed of off-site, as arranged by the appointed contractor ;
- Any hazardous waste arising will be managed by the appointed contractor in accordance with the applicable legislation;
- Waste auditing: The quantity and types of waste and materials leaving site during the Construction Phase will be recorded by the appointed contractor. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity to each facility. Records will show material, which is recovered, which is recycled and which is disposed of;
- Where Article 27 notifications are required in relation to the Proposed Scheme, the appointed contractor will complete and submit these Article 27 notifications to the EPA for by-product reuse;
- Any off-site interim storage or waste management facilities for excavated material will have the appropriate EPA licence, Waste facility permit or Certificate of Registration, as appropriate, in place;
- The relevant appropriate waste authorisation will be in place for all facilities that wastes are delivered to (i.e. EPA Licence, Waste Facility Permit or Certificate of Registration).

17.5.2 Operational Phase

Maintenance operation will be undertaken under by GCC in accordance with its waste management plans. No additional mitigation or monitoring measures are considered necessary.

17.6 Residual Impacts

17.6.1 Construction Phase

A summary of the predicted residual impacts during the Construction Phase, following implementation of the appropriate management measures is shown in Table 17.13; which align with the objectives set out in Chapter 1 (Introduction) of this EIAR.

Table 17.13: Summary of Predicted Construction Phase Impacts Following the Implementation of Mitigation and Monitoring Measures

Aspect of the Proposed Scheme	Potential Impact (Pre-Mitigation and Monitoring	Residual Impact (Post Mitigation)

Demolition waste	Adverse, Not Significant and Short-Term	Adverse, Not Significant and Short-Term
Excavation waste	Adverse, Moderate and Short-Term	Adverse, Moderate and Short-Term
Construction waste	Adverse, Imperceptible and Short-Term	Adverse, Imperceptible and Short-Term
Municipal waste	Adverse, Imperceptible and Short-Term	Adverse, Imperceptible and Short-Term

17.6.2 Operational Phase

Maintenance operations will be undertaken under the jurisdiction of the local authority and in accordance with their waste management plans. No additional mitigation or monitoring measures are considered necessary. A summary of the predicted residual impacts during the Operational Phase following implementation of mitigation measures is outlined in Table 17.14.

Table 17.14: Summary of Predicted Operational Phase Impacts Following the Implementation of Mitigation and Monitoring Measures

Aspect of the Proposed Scheme	Potential Impact (Pre-Mitigation and Monitoring)	Residual Impact (Post Mitigation)
C&D waste	Beneficial and Long-Term	Beneficial and Long-Term
Municipal waste	Neutral and Long-Term	Neutral and Long-Term

No significant negative residual impacts have been identified during the operation of the Proposed Scheme, whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

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Chapter 18
Material Assets

Contents

18 Material Assets

18.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the impacts on material assets associated with the Construction and Operational Phases of the Proposed Scheme.

During the Construction Phase, the potential material assets impacts associated with the development of the Proposed Scheme have been assessed. This has included both impacts on utilities and impacts arising from the importation of construction materials, which result from construction activities such as utility diversions, road resurfacing and road realignments.

During the Operational Phase, the potential material assets impacts associated with changes in utility demand from new infrastructure associated with the Proposed Scheme have been assessed. The assessment has been carried out according to best practice and guidelines relating to material asset assessment, and in the context of similar large-scale infrastructural projects.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure in Galway City, which will enable and deliver efficient, safe, and integrated sustainable transport movement. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction) of this EIAR. The Proposed Scheme which is described in Chapter 4 (Proposed Scheme Description)of this EIAR has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through the application of a comprehensive design iteration process with particular emphasis on minimising the potential for environmental impacts where practicable whilst ensuring the objectives of the Proposed Scheme are maintained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development programme have been incorporated where appropriate.

18.2 Methodology

This Section presents the study area and appraisal method for the assessment of impacts on Material Assets.

Material assets are resources of both natural and human origin that have intrinsic value. The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impacts Assessment Reports (hereafter referred to as the EPA EIAR Guidelines) (EPA 2022) discuss material assets as follows:

'In Directive 2011/92/EU this factor included architectural and archaeological heritage. Directive 2014/52/EU includes those heritage aspects as components of cultural heritage.

Material assets can now be taken to mean built services and infrastructure. Traffic is included because in effect traffic consumes transport infrastructure. Sealing of agricultural land and effects on mining or quarrying potential come under the factors of land and soils.'

The EPA Guidelines specifically list built services, roads and traffic, and waste management as topics which fall into the category of material assets. This EIAR includes separate chapters for a number of those material assets as follows:

- Roads and traffic - Chapter 6 (Traffic & Transport); and
- Waste management - Chapter 17 (Waste & Resources).

Other items which may also be considered as material assets are included in their own respective chapters as follows:

- Employment and land-use assets - Chapter 10 (Population);
- Ecological assets - Chapter 12 (Biodiversity);
- Waterways, rivers and streams - Chapter 13 (Water);
- Soils, lands, and mining or quarrying potential - Chapter 14 (Land, Soils, Geology & Hydrogeology);
- Cultural heritage assets - Chapter 15 (Archaeological Cultural Heritage and Architectural Heritage; and
- Visual amenity assets - Chapter 16 (Landscape (Townscape) & Visual).

The focus of this Chapter is on built services, specifically:

- Major infrastructure and utilities; and
- Imported material, excluding the materials which will be covered in Chapter 17 (Waste & Resources).

Major infrastructure includes items such as canals, railway lines and Luas lines interacting with the Proposed Scheme. Existing utility information has been collated from the utility service providers and utility (ground penetrating radar (GPR)) surveys have been carried out, as required. In addition, as part of the design development, the diversions and changes required to existing utilities infrastructure have been considered.

Indicative estimates have been prepared of the quantities of materials that may be needed for construction in order to inform the impact assessment of the Proposed Scheme. For the purpose of this Chapter, imported materials includes materials which are sourced from outside the Proposed Scheme, namely the major construction materials (concrete granular fill / aggregate, asphalt and structural steel).

18.2.1 Study Area

The study area with regard to major infrastructure and utilities comprises all areas within the Proposed Scheme, including both permanent and temporary land take boundaries. All major infrastructure with which the Proposed Scheme interfaces have been identified.

The utility infrastructure, both above and below ground, have been identified within the study area of the Proposed Scheme through consultation with utility companies and service providers, complemented by utility surveys undertaken within the study area.

The volumes of major imported materials used in the construction of the Proposed Scheme will be considered in this assessment. The transportation of the material to the site has been considered within the assessment of construction traffic in Chapter 6 (Traffic and Transport) of this EIAR.

18.2.2 Relevant Guidelines, Policy and Legislation

This Chapter has been prepared in accordance with the following guidance:

- EPA Guidelines (EPA 2022);
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017);
- National Roads Authority (NRA) Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA 2008); and
- Institute of Environmental Management and Assessment (IEMA) Guide to: Materials and Waste in Environmental Impact Assessment - Guidance for a Proportionate Approach (IEMA 2020).

18.2.3 Data Collection and Collation

Baseline data has been collected through carrying out a desk study, availing of the most up-to-date available data, at the time of writing. This comprises, the following sources:

- All major infrastructure and utilities which may be impacted by the Proposed Scheme including:
    - Electricity;
    - Water / Wastewater;
    - Surface Water Drainage;
    - Gas; and
    - Telecommunications.
- Existing utility information requested from utility companies and service providers:
    - Galway City Council;
    - Electricity Supply Board (ESB) Networks / EirGrid;
    - Gas Networks Ireland (GNI);

- Irish Water; and
- Telecommunications providers.

- The estimated type and quantity of the major materials which will need to be imported for the construction of the Proposed Scheme.

18.2.4 Appraisal Method for the Assessment of Impacts

The assessment of the potential impact of the Proposed Scheme on material assets has been undertaken having regard to the EPA Guidelines (EPA 2022). The following issues have been considered as part of the assessment of impacts:

- The potential for impacts on major infrastructure and public utilities and the need to adequately protect them during the Construction Phase;
- The requirement for connections to public utilities by the Proposed Scheme during both the Construction and Operational Phases; and
- The use of imported materials required for the construction of the Proposed Scheme.

Each impact has been categorised based on:

- The quality of the impact;
- The significance of the impact; and
- The duration of the impact.

The definition of these impact characteristics as per the EPA Guidelines is provided in Table 1.4 in Chapter 1 (Introduction) of this EIAR. These characteristics have been used to assess the quality and duration of all impacts.

Table 18.1 provides the significance criteria used to identify the significance of impacts on major infrastructure and utilities. For the purposes of assessing the impacts on major infrastructure and utilities, an impact is deemed to be not significant from a rating of Imperceptible to Moderate, and significant from Significant to Profound.

Table 18.1: Significance Criteria for Major Infrastructure and Utilities

Significance Level	Criteria
Profound	Where there is a continuous utility disruption* of more than a week; Where additional demand on a utility would consume all remaining capacity; or Where there is a permanent disruption* of a major piece of infrastructure.
Very Significant	Where there is a continuous utility disruption* of more than 48 hours; Where additional demand on a utility would significantly reduce the available capacity of that utility; or Where there is long-term disruption* of a major piece of infrastructure.
Significant	Where there is a continuous utility disruption* of more than 24 hours; Where there is significant additional demand on a utility; or Where there is a medium-term disruption* of a major piece of infrastructure.

Significance Level	Criteria
Moderate	Where there are discrete utility disruptions* of up to a number of hours for more than seven consecutive days; Where the additional demand on a utility is relatively large; or Where there is a short-term disruption* of a major piece of infrastructure.
Slight	Where there are discrete utility disruptions* of up to a number of hours for more than one day; Where additional demand on a utility is relatively small; or Where there is a temporary disruption* of a major piece of infrastructure.
Not Significant	Where there is a utility disruption* of up to a number of hours on a single day; Where additional demand on a utility is quantifiable but is too small to have any impact on capacity; or Where there is a brief disruption* of a major piece of infrastructure.
Imperceptible	Where there is no utility disruption* during diversion works; Where additional demand on a utility has no material change; or Where there are minor changes on a major piece of infrastructure which has no material impact on its usability.
*Disruption with respect to utilities refers to the shut-off of the service. Disruption with respect to major infrastructure refers to the closure or significant reduction in usability of the infrastructure.	

For the significance of the impacts associated with imported materials, the IEMA Guide to: Materials and Waste in Environmental Impact Assessment (IEMA 2020) (hereafter referred to as the IEMA Guidance) has been used. For materials, the sensitivity of the receptor (Table 18.2) and the magnitude of the impact (Table 18.3) are assigned and used to determine the significance of the impact (Table 18.4).

Table 18.2: Sensitivity Criteria for Materials (IEMA 2020)

Value	Description
	On balance, the key materials required for construction of a development …
Very high	Are known to be insufficient in terms of production, supply and/or stock; and/or Comprise no sustainable features and benefits compared to industry-standard materials*.
High	Are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock; and/or Comprise little or no sustainable features and benefits compared to industry-standard materials*.
Medium	Are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock; and/or Are available comprising some sustainable features and benefits compared to industry-standard materials*.
Low	Are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock; and/or Are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials*.

Value	Description
Negligible	Are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock; and/or Are available comprising a very high proportion of sustainable features and benefits compared to industry-standard materials.*
*Subject to supporting evidence, sustainable features and benefits could include, for example, materials or products that: comprise reused, secondary or recycled content (including excavated and other arisings); support the drive to a circular economy; or in some other way reduce lifetime environmental impacts.	

Table 18.3: Assessing Magnitude for Materials (IEMA 2020)

Value	Description
	The assessment is made by determining whether through a development, the consumption of …….
Major	...one or more materials is >10% by volume of the regional* baseline availability;
Moderate	...one or more materials is between 6-10% by volume of the regional* baseline availability;
Minor	...one or more materials is between 1-5% by volume of the regional* baseline availability
Negligible	...no individual material type is equal to or greater than 1% by volume of the regional* baseline availability.
No change	….....no materials is required.
* or where justified, national.	

Table 18.4: Determining Significance for Materials (IEMA 2020)

Sensitivity (or Value) of Receptor	Magnitude of impact					
		No change	Negligible	Minor	Moderate	Major
	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

In accordance with the IEMA Guidance an impact is deemed to be significant if it has a significance level of Moderate, Large or Very Large, while Neutral or Slight are deemed to be not significant.

18.3 Baseline Environment

18.3.1 Overview

There are a number of utilities in place along and crossing the Proposed Scheme, the majority of which are buried within and along the roadways. These utilities include:

- ESB electricity lines (high, medium and low voltage) and associated infrastructure;
- Gas Networks Ireland gas mains (high, medium and low pressure) and associated infrastructure;
- Irish Water potable water mains and associated infrastructure;
- Irish Water sewer lines (foul and combined sewers) and associated infrastructure;
- Local Authority surface water drainage network and associated infrastructure;
- Eir, ENET, BT and Virgin Media (VM) telecommunications lines and associated infrastructure;
- Local Authority traffic signal ducting.

The following outlines the baseline environment with respect to material assets.

18.3.2 Major Infrastructure and Existing Utilities

Table 18.5 lists the types of major infrastructure and utilities within the study area of the Proposed Scheme, along or crossing the Proposed Scheme. The majority of utilities are buried beneath the roads or footpaths, with a mixture of main trunk routes as well as branches off these main routes existing along the entire length of the Proposed Scheme. Aside from the listed utilities, there are no other major infrastructure items such as railway lines or canals within the Proposed Scheme.

Table 18.5: Utilities Within the Proposed Scheme Study Area

Utility Provider	Service Type
ESB	High voltage electricity (Underground and Overground)
	Medium voltage electricity (Underground and Overground)
	Low voltage electricity (Underground and Overground)
Gas Networks Ireland	High pressure gas
	Medium pressure gas
	Low pressure gas
Irish Water	Potable water and associated infrastructure
	Foul sewer lines

Utility Provider	Service Type
	Combined sewer lines and associated infrastructure
	Storm water drainage and associated infrastructure
Telecommunications	Virgin Media
	Eir
	Enet
	BT
	Other Telecom and Fibre services

18.3.3 Imported Material

The quantities of material which are currently imported to the area covered by the Proposed Scheme under baseline conditions are low. Currently material is only imported as part of maintenance activities which are undertaken on the existing roadways, cycle lanes, footpaths, utilities and verges. These activities would largely involve repair of road, cycle lane and footpath surfaces, repainting of road markings, drainage maintenance and repair, utility works, landscaping and winter maintenance.

A report entitled Essential Aggregates: Providing for Ireland's Needs to 2040 (Irish Concrete Federation 2019) was published in 2019 which details and quantifies Ireland's natural aggregate reserves. At the time of publication of that report, Ireland had approximately 500 active large commercial quarries, approximately 220 ready mixed concrete plants, 20 large scale precast concrete plants and 40 plants producing bitumen bound road surfacing materials.

The Irish Concrete Federation quantifies the annual production of these materials in Ireland on their website, with the 2019 figures (the most recent available) being as follows:

- Five million cubic metres of ready-mixed concrete;
- 135 million concrete blocks;
- 38 million tonnes of aggregates;
- Two million tonnes of bituminous road surfacing materials; and
- Two million square metres of paving products.

18.4 Potential Impacts

18.4.1 Major Infrastructure and Utilities

Construction of the Proposed Scheme has the potential to have an impact on existing infrastructure and utilities in order to accommodate changes to junction layouts or changes to carriageway widths. Where protection of utilities in place is not an option, this will involve realignment, upgrade or replacement of this infrastructure as part of works within those areas. Each proposed modification to the existing infrastructure or utilities is outlined in this Chapter.

Where utility diversions are proposed, the approximate length of the diversions is provided in Table 18.6 to Table 18.9. The potential impacts would occur predominantly during the Construction Phase.

During the Operational Phase, some utilities will be required for the Proposed Scheme. This will include electricity connections for such elements as new street lighting, junction signalling and real time passengers information (RTPI) displays at bus stops. There will also be some amendments to existing surface water drainage to control and/or attenuate surface water runoff from any additional paved surfaces.

18.4.2 Imported Material

Material will be required to construct the Proposed Scheme. These materials will be comprised of standard construction materials, paving materials, landscaping materials, street furniture, paints, lighting, junction infrastructure materials and fill materials, as required. This Chapter covers the major materials needing to be imported to the site for the purposes of construction of the Proposed Scheme (i.e. concrete, granular fill / aggregate, asphalt and structural steel). Any materials arising from within the site which are to be reused within the Proposed Scheme (e.g. excavated soils) are assessed in Chapter 17 (Waste & Resources) of this EIAR.

18.4.3 'Do Nothing' Scenario

In the 'Do Nothing' scenario, the Proposed Scheme would not be implemented and there would be no changes to existing infrastructure or utilities as a result of the Proposed Scheme. Therefore, there would be a Neutral impact on infrastructure and utilities under the 'Do Nothing' scenario.

Similarly with respect to imported material, the 'Do Nothing' scenario means that there is no requirement to import material for the construction of the Proposed Scheme. Therefore, this material is not consumed by the Proposed Scheme, and the impact under the 'Do Nothing' scenario is Neutral.

18.4.4 Construction Phase

18.4.4.1 Utilities

The main Construction Phase impacts will arise from the requirement to divert utilities. The proposed utility diversions are listed in Table 18.6 to Table 18.99 To the best of the engineering experience and judgement available, and based on the available records and preliminary reasonable site investigations, it is expected that the utility diversion will be to the stated length. It is likely however that modifications to these proposed measures may be required at the detailed design / construction stage, and any such modifications (if required) will not give rise to any impacts which are any more significant than those already identified and assessed in this chapter and will not alter the summary of potential Construction Phase impacts presented in Table 18.13.

18.4.4.2 Electricity

The Construction Compounds will require electricity to power temporary office and welfare facilities during the Construction Phase. Power for the Construction Compounds will be supplied through a connection into the electricity network, or where this is unavailable, via generators. Temporary electricity provision for works areas along the Proposed Scheme to power items such as temporary lighting, temporary traffic signals and other construction equipment will be provided through generators, as required.

The electricity demand during the Construction Phase is considered to be a Negative, Not Significant and Short-Term impact.

A number of interfaces between the existing electricity infrastructure and the Proposed Scheme have been identified, some of which will require diversion of the infrastructure as outlined in Table 18.6 and shown in drawing series BCG-CCL__UTL-UL-00 to 13 in Volume 3 of this EIAR. As a result of these diversions there may be temporary local interruptions to the electricity provision during works on that infrastructure.

Table 18.6: Potential Major Electricity Infrastructure Diversions

Reference No.	Asset/ Apparatus Impacted	Description of Works
G-UE-001	ESB pole on Saint Francis Street.	Potential relocation of electric pole.
G-UE-002	ESB box and a pole at the junction of Wood Quay and Walsh Terrace.	Potential relocation of the box and the pole.
G–UE-003	Medium voltage underground duct on Dyke Road running north from Walsh's Terrace.	Potential diversion length of 62m for ESB utility
G–UE-004	Low voltage overhead cable on intersection of St Brenda's Avenue & Bóthar Na mBan.	Potential diversion length of overhead cable to underground line of 38m.
G–UE-005	Low voltage underground ducts on intersection of St Brenda's Avenue & Bóthar Na mBan.	Potential diversion length of 51m for ESB utility.
G–UE-006	Electric pole and attached low voltage overhead line running north on Collage Road adjacent to Lough Atalia Road	Potential diversion length of 14m for ESB utility.
G–UE-007	Electric pole on Collage Road	Potential diversion of electric pole and low voltage line.
G–UE-008	Low voltage overhead line on Collage Road.	Potential diversion of electric pole.
G–UE-009	Low voltage overhead line on College Road.	Potential diversion length of 20m for ESB utility
G–UE-010	Low voltage underground cable on College Road.	Potential diversion length of 149m for ESB utility

Reference No.	Asset/ Apparatus Impacted	Description of Works
G–UE-011	Medium voltage underground cable on College Road.	Potential diversion length of 192m for ESB utility
G–UE-012	Medium voltage underground duct running east on Dublin Road	Potential diversion length of 202m for ESB utility
G–UE-013	Medium voltage underground duct running east on Dublin Road	Potential diversion length of 134m for ESB utility

While electricity interruptions, if required, will generally only occur for a set number of hours per day (no more than eight hours where reasonably practicable), the exact number of interruption days for particular customers for each diversion cannot be ascertained at this stage so a worst-case scenario of up to a week has been assessed. Using the criteria as outlined in Section 18.2.4 and Table 18.1, where diversion of an electricity line is required which will result in the planned interruption of electricity provision, the worst-case potential impact will be Negative, Moderate and Temporary.

18.4.4.3 Water

The Construction Compounds and construction areas will require a water supply for welfare facilities within the Construction Compounds, as well as for dust suppression at certain construction areas where the conditions require it. The Construction Compounds will be connected into the local mains water supply where possible. Where a connection is not possible, water tankers will be used.

The potable water demand during the Construction Phase is considered to be a Negative, Not Significant and Short-Term impact.

A number of interfaces between the existing water infrastructure and the Proposed Scheme have been identified, some of which will require diversion of the infrastructure as outlined in Table 18.7 and shown in drawing series BCG-CCL__UTL-UL-00 to 13 in Volume 3 of this EIAR. As a result of these diversions there may be temporary local interruptions to water provision during works on that infrastructure.

Table 18.7: Potential Major Water Infrastructure Diversions

Reference No.	Asset/ Apparatus Impacted	Description of Works
G-UW-001	250mm diameter Asbestos Cement watermain on west side of Dyke Road.	Proposed diversion length of 57 m for watermain utility.
G-UW-002	Watermain on Walsh's Terrence.	Propose protection measures for watermain utility.
G-UW-004	Watermain on Merchants Road.	Proposed diversion length of 14m for watermain utility.
G-UW-005	76.2mm diameter Cast Iron and 152.4mm diameter Asbestos Concrete watermains on Dublin Road.	Proposed diversion length of 24m for both watermain utilities.

While water interruptions, if required, will generally only occur for a set number of hours per day (no more than eight hours where reasonably practicable), the total number of interruption days for particular customers for each diversion cannot be ascertained at this stage, so a worst-case scenario of up to a week has been assessed. Using the criteria as outlined in Section 18.2.4 and Table 18.1, where diversion of a watermain is required which will result in the planned interruption of water provision, the worst-case potential impact will be Negative, Moderate and Temporary.

18.4.4.4 Wastewater and Surface Water Runoff

There will be wastewater and surface water runoff created by the Construction Compounds and construction areas. Wastewater will be created by welfare facilities within the Construction Compounds and construction areas, and surface water runoff will emanate from any areas of the Construction Compounds and construction areas which are paved. The Construction Compounds will be connected into the local foul / combined sewers where possible, or where not possible, will have on-site tanks for the collection of foul water which will be emptied by means of a suction tanker and the wastewater will be disposed of to a licensed wastewater treatment plant. Where required, temporary welfare facilities (for example portable toilets) will be used, which will be collected as required for offsite disposal of the wastewater to a suitably licensed facility.

The potential impact as a result of demand on the wastewater network during the Construction Phase is considered to be a Negative, Not Significant and Short-Term impact.

A number of interfaces between the existing wastewater infrastructure and the Proposed Scheme have been identified, one of which will require diversion of the infrastructure as outlined in Table 18.8 and shown in drawing series BCG-CCL__UTL-UL-00 to 13 in Volume 3 of this EIAR. As a result of these diversions there may be temporary local interruptions to provision of wastewater services during works on that infrastructure.

Table 18.8: Potential Major Wastewater Infrastructure Diversions

Reference No.	Asset/Apparatus Impacted	Description of Works
G–UF-001	Manhole on University Road	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-002	Manhole on Gaol Road	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-003	Manhole on Corrib Terrace.	Proposed manhole cover adjustment to avoid clash with new kerb line.

Reference No.	Asset/Apparatus Impacted	Description of Works
G-UF-004	Manhole on Wood Quay.	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-005	Manhole on Walsh's Terrace	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-006	Manhole on Bóthar na mBan	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-007	Manhole on Bóthar na mBan	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-008	Manhole on Bóthar na mBan	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-009	Manhole on Wood Quay.	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-010	Manhole on Eglington Street	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-011	Manhole on Rosemary Avenue.	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-012	Manhole on Eyre Street	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-013	Manhole on College Road	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-014	Manhole on College Road	Proposed manhole cover adjustment to avoid clash with new kerb line.
G-UF-015	Manhole on College Road	Proposed manhole cover adjustment to avoid clash with new kerb line.

Wastewater utility diversions generally do not cause major interruption to customers using the infrastructure. Using the criteria as outlined in Section 18.2.4 and Table 18.1, where diversion of a sewer line is required which may result in some brief planned interruptions to the flow of wastewater, the potential impact will be Negative, Not Significant and Temporary.

There will be limited upgrade works required to the surface water drainage network in order to facilitate the changes to the road alignment and the impermeable surface area. The majority of this work will involve the construction of new road gullies to align with the new kerb line. There will also be a number of Sustainable Drainage System (SuDS) measures installed, namely rain gardens, bioretention areas, filter drains, swales, tree pits and permeable paving to control the flow of surface water. All surface water will continue to drain into existing networks and outfalls, apart from the proposed new outfall at Lough Atalia. Refer to Chapter 13 (Water) of this EIAR for further information on surface water drainage during the Construction Phase of the Proposed Scheme.

18.4.4.5 Gas

There will be no requirement for a connection to existing gas infrastructure during the Construction Phase of the Proposed Scheme and no impacts to gas mains have been identified. Therefore, it is predicted that there will be no significant impact associated with gas demand or supply during the Construction Phase.

18.4.4.6 Telecommunications

Telecommunications access will be required by the Construction Compounds.

The potential impact as a result of the demand on the telecommunications network during the Construction Phase is considered to be a Negative, Not Significant and Short-Term impact.

A number of interfaces between the existing telecommunications infrastructure and the Proposed Scheme have been identified, some of which will require diversion of the infrastructure as outlined in Table 18.99 and shown in drawing series BCG-CCL__UTL-UL-00 to 13 in Volume 3 of this EIAR. As a result of these diversions there may be temporary local interruptions to the telecommunications provision during works on that infrastructure.

Table 18.9: Potential Major Telecommunications Infrastructure Diversions

Reference No.	Utility Provider	Asset/Apparatus Impacted	Description of Works
G–UT-001	EIR	EIR telecom Chamber on University Road.	Proposed relocation of EIR utility.
G–UT-003	EIR	EIR duct on corner of Bóthar Na mBan and St Brendan's Avenue	Proposed diversion length of 21m for EIR utility
G–UT-004	EIR	EIR telecom chamber on Eglinton Street.	Proposed relocation of EIR utility.
G–UT-005	ENET	ENET telecom chambers on Rosemary Avenue.	Proposed relocation for ENET utility.
G–UT-006	EIR	EIR telecom chamber and duct on corner of Prospect Hill and Bohemore Road.	Proposed diversion length of 16m and chamber relocation for EIR utility

Reference No.	Utility Provider	Asset/Apparatus Impacted	Description of Works
G–UT-007	EIR	EIR chamber on Bohemore Road.	Proposed relocation of EIR utility.
G–UT-008	ENET	ENET telecom chambers on Fairgreen road	Proposed relocation of ENET utility
G–UT-009	EIR	EIR telecom cambers on Collage Road next to Galway City Hall.	Proposed relocation of EIR utility.
G–UT-010	EIR	EIR telecom cambers on Collage Road.	Proposed relocation of EIR utility.
G–UT-011	BT	BT telecom chamber on College Road.	Proposed relocation of BT utility.
G–UT-012	VM	Virgin Media duct on Collage Road.	Proposed diversion of 63m for VM utility.
G–UT-013	EIR	EIR ducts on Collage Road.	Proposed diversion length of 63m for EIR utility.
G–UT-014	BT	BT ducts on Collage Road.	Proposed diversion length of 63m for BT utility.
G–UT-015	EIR	EIR ducts on Collage Road.	Proposed diversion length of 190m for EIR utility.
G–UT-016	VM	VM ducts on Collage Road.	Proposed diversion length of 214m for VM utility.
G–UT-017	BT	BT ducts on Collage Road.	Proposed diversion length of 211m for BT utility.
G–UT-017	EIR	EIR duct on north side of Dublin Road.	Proposed diversion of 30m Potential relocation of EIR utility

While telecommunications interruptions, if required, will generally only occur for a set number of hours per day (no more than eight hours where reasonably practicable), the total number of interruption days for particular customers for each diversion cannot be ascertained at this stage so a worst-case scenario of up to a week has been assessed. Using the criteria as outlined in Section 18.2.4 and Table 18.1, where diversion of a telecommunications main is required which will result in the planned interruption of telecommunications provision, the worst-case potential impact will be Negative, Moderate and Temporary.

18.4.4.7 Imported Material

The Construction Phase will require the importation of a number of key construction materials for the Proposed Scheme works. This material will include items such as concrete, granular fill / aggregate, asphalt and structural steel. For a full description of the Construction Phase, refer to Chapter 5 (Construction) of this EIAR. An assessment of the climate impact from the carbon associated with these materials is included in Chapter 8 (Climate) of this EIAR. Table 18.10

provides a conservative estimate of the quantities of the major materials required to complete the Construction Phase of the Proposed Scheme.

Table 18.10: Conservative Quantity Estimates of Major Construction Materials Required by the Proposed Scheme

Material	Estimated Quantity (tonnes)
Asphalt	21,300
Granular Material	45,670
Concrete	34,000

The quantities of material listed in Table 18.10 represents a very small proportion of the Irish quantities manufactured per year as outlined in Section 18.2.4. The estimated quantity of concrete required represents less than one percent of the total quantity produced in Ireland per annum. Similarly, assuming the aggregate composition of asphalt is 90-95% and concrete is 60-80%, the estimated total aggregate quantity required by the Proposed Scheme represents less than one percent of the total aggregate quantity produced in Ireland per annum.

Importation of material to the Proposed Scheme site will be carried out throughout the Construction Phase, with different materials being required at different times. The main direct impacts associated with the importation of construction materials arises from the gathering / manufacture of the materials, as well as the fact that once the materials are used within the Proposed Scheme, they are no longer available for other uses. There will also be impacts associated with the importation of materials through the requirement of heavy goods vehicles (HGVs) for the delivery of the material and the use of materials.

Impacts are covered in more detail in Chapter 6 (Traffic & Transport), Chapter 7 (Air Quality), Chapter 8 (Climate), and Chapter 9 (Noise &Vibration) of this EIAR where relevant.

As the materials required for the Construction Phase of the Proposed Scheme are generally readily available, the sensitivity of the material will be Low. As the quantities of the materials required constitute less than one percent of the quantities produced per annum in Ireland, the magnitude of the impact will be Negligible. Therefore, the potential impact associated with the imported materials will be Negative, Slight and Long-Term.

18.4.4.8 Construction Phase Impact Summary

Table 18.11 provides a summary of the potential impacts on material assets associated with the Construction Phase of the Proposed Scheme.

Table 18.11: Summary of Potential Construction Phase Impacts

Assessment Topic	Potential Impact
Major Infrastructure and Utilities	
Major Infrastructure	No significant impact

Assessment Topic	Potential Impact
Electricity Demand	Negative, Not Significant, Short-Term
Electricity Interruption	Negative, Moderate, Temporary
Water Demand	Negative, Not Significant, Short-Term
Water Interruption	Negative, Moderate, Temporary
Wastewater Demand	Negative, Not Significant, Short-Term
Wastewater Interruption	Negative, Not Significant, Temporary
Gas Demand	No significant impact
Gas Interruption	No impact
Telecommunications Demand	Negative, Not Significant, Short-Term
Telecommunications Interruption	Negative, Moderate, Temporary
Imported Material	
Use of Imported Material	Negative, Slight, Long-Term

18.5 Operational Phase

The main impacts on major infrastructure and utilities will be associated with the Construction Phase. However, there will be some demand on utilities by the Proposed Scheme once operational. These impacts are outlined in the following sections.

18.5.1 Electricity

Once the Proposed Scheme is operational, electricity will be required to power such elements as street lighting, junction signalling and RTPI displays. Power for these types of equipment will be supplied via power cables which connect the equipment to an electricity supply cabinet.

The potential impact on electricity demand during the Operational Phase will be Negative, Not Significant and Long-Term.

18.5.2 Water Usage

The Proposed Scheme will not require any water to operate. Therefore, there is no significant Operational Phase impact anticipated on water infrastructure as a result of the Proposed Scheme.

18.5.3 Surface Water Runoff

Once the Proposed Scheme is constructed, the hardstanding surface area will be larger in some places than before construction due to the construction of wider carriageways, cycle infrastructure and footpaths. This larger surface area will result in additional surface water runoff. Drainage upgrades and SuDS measures have been included as part of the design of the Proposed Scheme to attenuate any additional run-off.

There will therefore be no significant Operational Phase impacts anticipated on surface water drainage infrastructure. Impacts on water courses and water quality as a result of any potential increases in surface water run-off through existing outfalls is assessed in Chapter 13 (Water) of this EIAR.

18.5.4 Gas

The Proposed Scheme will not require any gas connection to operate. Therefore, there is no significant Operational Phase impact anticipated on gas infrastructure as a result of the Proposed Scheme.

18.5.5 Telecommunications

Once the Proposed Scheme is operational, telecommunications links will be required for such equipment as traffic signal controllers, and for RPTI displays at bus stops and on bus information apps. Generally, this equipment will be connected to the local fibre optic cable network via ducting connected to fibre cabinets. In the case of the real time bus information, cellular communications (3G / 4G / 5G) will be provided. This type of infrastructure is already in operation along the Proposed Scheme route. Therefore, any additional telecommunications requirements by any new infrastructure will be minimal.

Therefore, the anticipated impact on telecommunications demand during the Operational Phase will be Negative, Imperceptible and Long-Term.

18.5.6 Imported Material

Materials will be required during the Operational Phase for maintenance of the infrastructure. This will include repair of roadway, cycleway, and footway surfaces, as well as repair of street furniture (including bus shelters and poles), and landscaping. However, as the Proposed Scheme largely involves the upgrade and alteration of existing roadways, most of the material required for maintenance of the Proposed Scheme would have already been required for the maintenance of the existing roadways in the absence of the Proposed Scheme.

As the materials required for the Operational Phase of the Proposed Scheme are generally readily available, the sensitivity of the material will be Low. As the quantities of the material required for maintenance will be lower than the quantities required for the Construction Phase and therefore constitute less than one percent of the quantities produced per annum in Ireland, the magnitude of the impact will be Negligible. Therefore, the potential impact associated with the imported materials will be Neutral and Long-Term.

Operational Phase Impact Summary

Table 18.12 provides a summary of the potential impacts on material assets associated with the Operational Phase of the Proposed Scheme.

Table 18.12: Summary of Potential Operational Phase Impacts

Assessment Topic	Potential Impact
Major Infrastructure and Utilities	
Major Infrastructure	No significant impact
Electricity	Negative, Not Significant, Long-Term
Water Usage	Negative, Not Significant, Long-Term
Wastewater	Negative, Not Significant, Long-Term
Surface Water Runoff	No significant impact
Gas	No significant impact
Telecommunications	Negative, Imperceptible, Long-Term
Imported Material	
Use of Imported Material	Neutral, Long-Term

18.6 Mitigation and Monitoring Measures

The following outlines the measures which will be adhered to in order to ensure that there are no significant impacts on material assets as a result of the construction and operation of the Proposed Scheme. No monitoring measures are considered to be required for material assets.

18.6.1 Construction Phase

The Proposed Scheme has been designed to minimise the impact on utility infrastructure as far as practicable.

Where there are interfaces with existing utility infrastructure, protection in place or diversion as necessary is proposed to prevent long-term interruption to the provision of the affected services.

All possible precautions will be taken by the appointed contractor to avoid unplanned interruptions to any services during the Construction Phase of the Proposed Scheme. This will include appropriate investigation by the appointed contractor to identify the precise location of all utility infrastructure within the working areas prior to the commencement of excavation works.

Where works are required in and around known utility infrastructure, precautions will be implemented by the appointed contractor to protect the infrastructure from damage, in accordance with best practice methodologies and the requirements of the utility companies, where practicable. Protection measures during construction will include warning signs and markings indicating the location of utility infrastructure, safe digging techniques in the vicinity of known utilities, and in certain circumstances where possible, isolation of the section of infrastructure during works in the immediate vicinity.

Consultation has been undertaken with the major utility companies regarding the design, potential interfaces and measures required to protect or divert the infrastructure which is interfacing with the Proposed Scheme design. All utility companies for which diversions are proposed will continue to be consulted when designing any diversions to ensure that proposed diversions conform to the utility provider's requirements, where practicable, and to ensure that service interruptions are kept to a minimum.

Where diversions, or modifications, are required to utility infrastructure (as listed in Section 18.4.4), service interruptions and disturbance to the surrounding residential, commercial and/or community property may be unavoidable. Where this is the case, it will be planned by the appointed contractor in consultation with each utility provider, as relevant. Required service interruptions will generally only occur for a set period of time per day (a set number of hours not exceeding eight hours where reasonably practicable) and will generally not be continuous for full days at a time. Prior notification will be given to all impacted properties. This notification will include information on when interruptions and works are scheduled to occur and the duration of such interruption. Any required works will be carefully planned by the appointed contractor to ensure that the duration of interruption is minimised in so far as is practicable.

18.6.2 Imported Materials

The Proposed Scheme has been designed to minimise the amount and extent of major construction works required, and therefore minimise the quantities of construction materials required. The majority of the Proposed Scheme will require minimal intervention, being comprised of lane reconfigurations, road marking layout changes, resurfacing works and construction of segregated cycle tracks.

Consideration will be given to the sustainability of material being sourced for the construction of the Proposed Scheme by the appointed contractor.

In so far as is reasonably practicable, materials required for the construction of the Proposed Scheme will be sourced locally to reduce the amount of travelling required to get the material to the site. Key issues to be considered when sourcing materials for the Construction Phase will include the source, the material specification, production and transport costs, and the availability of the material. Only quarries which are included in Local Authority quarry registers will be used by the appointed contractor to source any quarried material.

Construction materials will be managed on site by the appointed contractor in such a way as to prevent over-ordering and waste.

Materials will be stored in appropriate storage areas or receptacles to reduce the potential for damage requiring replacement. 'Just-In-Time' ordering principles will be implemented by the appointed contractor where practicable to reduce the potential for over-ordering.

18.6.3 Operational Phase

Due to the measures which are included within the design and the fact that impacts are anticipated to be minimal, there are no specific mitigation measures necessary during the Operational Phase. The predicted post mitigation impact is therefore unchanged as summarised in Table 18.14.

18.7 Residual Impacts

18.7.1 Construction Phase

Due to the fact that impacts are anticipated to be minimal and mitigation measures are largely inherent in the design of the Proposed Scheme, the predicted post mitigation impacts are unchanged as summarised in Table 18.13.

Table 18.13: Summary of Predicted Construction Phase Impacts Following the Implementation of Mitigation Measures

Assessment Topic	Potential Impact (Pre-Mitigation)	Predicted Impact (Post Mitigation)
Major Infrastructure and Utilities		
Major Infrastructure	No significant impact	No significant impact
Electricity Demand	Negative, Not Significant, Short-Term	Negative, Not Significant, Short-Term
Electricity Interruption	Negative, Moderate, Temporary	Negative, Moderate, Temporary
Water Demand	Negative, Not Significant, Short-Term	Negative, Not Significant, Short-Term
Water Interruption	Negative, Moderate, Temporary	Negative, Moderate, Temporary
Wastewater Demand	Negative, Not significant, Short-Term	Negative, Not significant, Short-Term
Wastewater Interruption	Negative, Not significant, Temporary	Negative, Not significant, Temporary
Gas Demand	No significant impact	No significant impact
Gas Interruption	No impact	No impact
Telecommunications Demand	Negative, Not Significant, Short-Term	Negative, Not Significant, Short-Term
Telecommunications Interruption	Negative, Moderate, Temporary	Negative, Moderate, Temporary
Imported Material		
Use of Imported Material	Negative, Slight, Long-Term	Negative, Slight, Long-Term

There will be no significant residual impacts on major infrastructure and utilities or as a result of imported material during the Construction Phase.

18.7.2 Operational Phase

Due to the measures which are included within the design and the fact that impacts are anticipated to be minimal, there are no specific mitigation measures necessary during the Operational Phase. The predicted post mitigation impact is therefore unchanged as summarised in Table 18.14.

Table 18.14: Summary of Predicted Operational Phase Impacts Following the Implementation of Mitigation Measures

Assessment Topic	Potential Impact
Major Infrastructure and Utilities	
Major Infrastructure	No significant impact
Electricity	Negative, Not Significant, Long-Term
Water Usage	Negative, Not Significant, Long-Term
Wastewater	Negative, Not Significant, Long-Term
Surface Water Runoff	No significant impact
Gas	No significant impact
Telecommunications	Negative, Imperceptible, Long-Term
Imported Material	
Use of Imported Material	Neutral, Long-Term

There will be no significant residual impacts on major infrastructure and utilities or as a result of imported material during the Operational Phase.

No significant residual impacts have been identified either in the Construction or Operational Phases of the Proposed Scheme, whilst meeting the scheme objectives set out in Chapter 1 of this EIAR.

18.8 References

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

National Roads Authority (NRA) Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA 2008)

European Commission (EC) (2017). Environmental Impact Assessment of Projects - Guidance on the Preparation of the Environmental Impact Assessment Report

Institute of Environmental Management and Assessment (IEMA) (2020). IEMA Guide to: Materials and Waste in Environmental Impact Assessment - Guidance for a Proportionate Approach

Irish Concrete Federation (2019). Essential Aggregates Providing for Ireland's Needs to 2040

Directives and Legislation

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment

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

Chapter 19
Risk of Major Accidents and / or Disasters

Contents

19 Risk of Major Accidents and / or Disasters

19.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) assesses the potential significant impacts of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) (hereafter referred to as the Proposed Scheme) on the environment, deriving from its vulnerability to risks of major accidents and / or disasters during the Construction Phase and Operational Phase.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Galway region, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction) of this EIAR. The Proposed Scheme which is described in Chapter 4 (Proposed Scheme Description)of this EIAR has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts where practicable whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process have been incorporated, where appropriate.

19.2 Risk of Major Accidents and / or Disasters

Article 3 of Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as the Environmental Impact Assessment (EIA) Directive) requires for the assessment of expected effects of major accidents and / or disasters within environmental impact assessment (EIA). Article 3(2) of the Directive states that the:

'effects referred to in paragraph 1 on the factors set out therein shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and / or disasters that are relevant to the project concerned.'

In addition, Annex IV of the EIA Directive states that the EIAR shall contain:

'A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and / or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council (1) or Council Directive 2009/71/Euratom (2) or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met.

Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies'.

The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Statements (EPA 2022) refer to 'Accident', recommending that:

'The potential for a project to cause risks to human health, cultural heritage or the environment due to its vulnerability to external accidents or disaster is considered where such risks are significant'.

The Guidelines elaborate on risk assessment further under Section 3.7.3:

'*To address unforeseen or unplanned effects the Directive further requires that the EIAR takes account of the vulnerability of the project to risk of major accidents and / or disasters relevant to the project concerned and that the EIAR therefore explicitly addresses this issue. The extent to which the effects of major accidents and / or disasters are examined in the EIAR should be guided by an assessment of the likelihood of their occurrence (risk)*'.

Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EU (hereafter referred to as the Seveso III Directive) is also relevant to this assessment. S.I. No. 209/2015 – Chemical Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (hereafter referred to as the COMAH Regulations) transposed the Seveso III Directive into Irish law. The Seveso III Directive and the COMAH Regulations outline the legal obligations for operators of industrial establishments where dangerous substances are stored. These establishments are referred to as Seveso sites and are classified as Upper Tier or Lower Tier establishments. As per Regulation 25 of the COMAH Regulations, Upper Tier establishments are required to submit information regarding their operations to the Health and Safety Authority (HSA). Each Seveso site has a consultation zone which is the '*area liable to be affected by a major accident*' at the site (Department of the Environment, Community and Local Government (DECLG 2015)). Therefore, if a development falls within the specified consultation zone of a Seveso site, the HSA must be consulted. Only one Seveso site is located in proximity to the Proposed Scheme, the Circle K Galway Terminal at Galway Harbour Enterprise Park (see Section 19.4.3).

This Chapter of the EIAR identifies how risks of accidents and / or disasters relevant to the Proposed Scheme have been identified and how those risks have been managed. This Chapter considers:

- Major accidents and / or disasters that the Proposed Scheme may be vulnerable to;
- Whether a major accident and / or disaster occurring could result in likely significant adverse environmental impacts, and if so, what these would be; and
- Existing and proposed mitigation measures to prevent or mitigate the likely significant adverse impacts of such events on the environment.

19.2.1 Definitions

At the time of undertaking this assessment, no clear definition of the term 'major accident and / or disaster' has been outlined in the context of the EIA Directive. For the purpose of this assessment, the following definitions from the Institute of Environmental Management and Assessment (IEMA) Major Accidents and Disasters in EIA: A Primer (hereafter referred to as the IEMA Primer) (IEMA 2020) have been adopted:

- Accident – something that happens by chance or without expectation;
- Disaster – a natural hazard (e.g. earthquake) or a man-made / external hazard (e.g. act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident;
- Major Accident – events that threaten immediate or delayed serious environmental effects to human health, welfare and / or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g. train derailment) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events;
- Risk –the likelihood of an impact occurring, combined with the effect or consequence(s) of the impact on a receptor if it does occur;
- Risk event – an identified, unplanned event, which is considered relevant to the Proposed Scheme and has the potential to result in a major accident and / or disaster, subject to assessment of its potential to result in a significant adverse effect on an environmental receptor;
- Vulnerability – describes the potential for harm as a result of an event, for example due to sensitivity or value of receptors. In the context of the EIA Directive, the term refers to 'exposure and resilience' of the Proposed Scheme to the risk of a major accident and / or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact; and
- Significant environmental effect (in relation to a major accident and / or disaster assessment) – includes the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration.

In addition, a 'Significant' impact resulting from major accidents and / or disasters are deemed to be adverse impacts if they meet the criteria for 'Significant', 'Very Significant' or 'Profound' under the EPA Guidelines (EPA 2022).

19.3 Methodology

19.3.1 Scope and Context

The identification, control and management of risk is an integral part of the design and assessment process throughout all stages of a project lifecycle.

For example, a Flood Risk Assessment was carried out to assess the vulnerability of the Proposed Scheme to flooding in order to mitigate, where required. The elements of the Proposed Scheme that incorporate measures that are designed to eliminate, reduce, isolate, control or exploit the occurrence of accidents have been described throughout this EIAR where required. Measures to control risks associated with Construction Phase activities are incorporated into the Construction Environmental Management Plan (CEMP) in Appendix 5.1 in Volume 4 of this EIAR.

The methodology for this risk assessment is as follows:

- Identify major accidents and / or disasters (i.e. unplanned incidents) that the Proposed Scheme may be vulnerable to; and
- Assess the consequence of impacts and significance of such incidents in relation to the environmental, social and economic receptors that may be affected.

Such risks may be present at the Construction Phase and / or Operational Phase of the Proposed Scheme.

19.3.2 Legislation, Guidelines and Reference Material

The development of the risk assessment methodology has been informed by the following guidelines:

- S.I. No. 291 of 2013 - Safety, Health and Welfare at Work (Construction) Regulations 2013 (hereafter referred to as the Safety, Health and Welfare (Construction) Regulations);
- Number 10 of 2005 - Safety, Health and Welfare at Work Act 2005 (hereafter referred to as the Safety, Health and Welfare at Work Act);
- S.I. No. 138/2012 - Building Regulations (Part A Amendment) Regulations 2012;
- S.I. No. 299/2007 - Safety, Health and Welfare at Work (General Application) Regulations 2007 (hereafter referred to as the Safety, Health and Welfare at Work (General Application) Regulations);
- Guidelines on the Information to be Contained in Environmental Impact Statements (EPA 2022);
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017);
- IEMA Primer (IEMA 2020);
- A National Risk Assessment for Ireland 2020 (Government of Ireland 2020);
- Strategic Emergency Management National Structures and Framework (Department of Defence 2017);
- Guidance on Assessing and Costing Environmental Liabilities (EPA 2014);

- A Framework for Major Emergency Management. Guidance Document 10 (DECLG 2015);
- The Department of Environment, Heritage and Local Government (DEHLG) A Framework for Major Emergency Management. A Guide to Risk Assessment in Major Emergency Management (Department of Environment, Heritage and Local Government (DEHLG 2010); and
- The Galway County Council Major Emergency Plan Revised 2021 (January 2021) has also informed the assessment (GCC 2021).

19.3.3 Appraisal Method for the Assessment of Impacts

This Section sets out how each assessment topic has been undertaken and highlights where input from other environmental disciplines has been included within the risk of major accidents and disasters assessment.

The risk assessment is set out in three stages:

- Identification and Screening;
- Risk Classification; and
- Risk Evaluation.

19.3.3.1 Identification and Screening

The first stage of the assessment is to identify potential unplanned risks that the Proposed Scheme may be vulnerable to. An initial list of relevant hazards which may make the Proposed Scheme vulnerable to major accidents and / or disasters were sourced through consultation with relevant environmental specialists and the design engineers and by consulting the guidelines and reference documentation and grouped into ‘risk events’.

The list of potential risk events that could lead to major accidents and / or disasters was subjected to an initial screening assessment to identify those that meet the scoping criteria. Where appropriate, risk events were screened out of the assessment according to the following scoping criteria:

- Major accidents and / or disasters associated with Construction Phase and Operational Phase activities that fall within the scope of health and safety legislation and associated obligations;
- Major accidents and / or disasters as a result of Seveso Sites, for which the Proposed Scheme does not fall within the specified consultation distance for that Seveso site and for which the Proposed Scheme has no interaction with access to the designated hospital(s) and fire stations identified on a Seveso site’s emergency plans;
- Risk events where no ‘source-pathway-receptor’ linkage exists to result in a major accident and / or disaster (e.g. an oil spill occurring at an oil depot that is not located near to a watercourse and for which there is no pathway from source to receptor);

- Major accidents and / or disasters where risk events are not applicable to that particular geographic location (e.g. volcanic activity, earthquakes and risk of nuclear accidents in Ireland);
- Risk events in relation to users of the Proposed Scheme infrastructure (bus users, cyclists, pedestrians) during the Operational Phase, as the scope of this assessment for the Operational Phase relates to the provision of infrastructure only and not to the use of that infrastructure;
- Risk events that possess low likelihood / low consequence, as they do not meet the criteria to be brought forward for further consideration (i.e. they do not meet the definition of a major accident and / or disaster), for example the risk of traffic accidents on the wider road network causing delays to Construction or Operational Phase vehicles;
- Risk events that possess high likelihood / high consequence, as these would be considered high risk and unacceptable for the development of the Proposed Scheme; and
- Risk events in relation to existing emergency access arrangements and response plans for facilities along the route of the Proposed Scheme. Emergency accesses along the route of the Proposed Scheme will be retained insofar as is possible throughout the Construction Phase. Where construction works for the Proposed Scheme will interface with emergency access arrangements, the appointed contractor will consult with the affected landowners / site operators and the emergency services to agree, where required, alternative emergency access arrangements and changes to response plans for the duration of the works.

19.3.3.2 Risk Classification

Following the initial identification and screening process, the remaining major accidents and / or disasters risk events were evaluated with regard to the likelihood of occurrence and the potential impact. The rating criteria adopted for the assessment follows that used in A Guide to Risk Assessment in Major Emergency Management (DEHLG 2010). The EPA Guidelines (EPA 2022) state that the risk assessment must be based on a 'worst-case' approach. Therefore, the consequent rating assumes that all proposed mitigation measures and safety procedures have failed to prevent the occurrence of a major accident and / or disaster.

The classification and rating of likelihood and consequence, as taken from A Guide to Risk Assessment in Major Emergency Management are provided in Table 19.1 and Table 19.2.

Table 19.1: Classification of Likelihood

Rating	Classification	Impact Description
1	Extremely Unlikely	May occur only in exceptional circumstances; once every 500 or more years
2	Very Unlikely	Is not expected to occur; no recorded incidents or anecdotal

Rating	Classification	Impact Description
		evidence; and / or very few incidents in associated organisations, facilities or communicates; and / or little opportunity, reason or means to occur. May occur once every 100 to 500 years.
3	Unlikely	May occur at some time; and / or few, infrequent, random recorded incidents or little anecdotal evidence; some incidents in associated or comparable organisations worldwide; some opportunity, reason or means to occur. May occur once every 10 to 100 years.
4	Likely	Likely to or may occur; regular recorded incidents and strong anecdotal evidence. Will probably occur once every one year to 10 years
5	Very Likely	Very likely to occur; high level of recorded incidents and / or strong anecdotal evidence. Will probably occur more than once a year.

Table 19.2: Classification of Consequence

Rating	Classification	Impact	Description
1	Minor	Life, Health, Welfare, Environment, Infrastructure, Social	Small number of people affected; no fatalities and small number of minor injuries with first aid treatment No contamination, localised effects <0.5 million euro Minor localised disruption to community services or infrastructure (<6 hours)
2	Limited	Life, Health, Welfare, Environment, Infrastructure, Social	Single fatality; limited number of people affected; a few serious injuries with hospitalisation and medical treatment required. Localised displacement of a small number of people for 6 to 24 hours. Personal support satisfied through local arrangements Simple contamination, localised effects of short duration 0.5 million to 3 million euro Normal community functioning with some inconvenience
3	Serious	Life, Health, Welfare, Environment, Infrastructure, Social	Significant number of people in affected area impacted with multiple fatalities (<5), multiple serious or extensive injuries (20), significant hospitalisation. Large number of people displaced for 6 to 24 hours or possibly beyond; up to 500 evacuated. External resources required for personal support. Simple contamination, widespread effects or extended duration 3 million to 10million euro Community only partially functioning, some services available
4	Very Serious	Life, Health,	5 to 50 fatalities, up to 100 serious injuries, up to

Rating	Classification	Impact	Description
		Welfare, Environment, Infrastructure, Social	2,000 evacuated Heavy contamination, localised effects or extended duration 10 million to 25 million euro Community functioning poorly, minimal services available
5	Catastrophic	Life, Health. Welfare, Environment, Infrastructure, Social	Large numbers of people impacted with a significant number of fatalities (>50), injuries in the hundreds, more than 2000 evacuated. Very heavy contamination, widespread effects of extended duration. >25 million euro Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support

19.3.4 Risk Evaluation

In accordance with A Guide to Risk Assessment in Major Emergency Management (DEHLG 2010), the evaluated major accidents and / or disasters risk events were compared to a risk matrix to determine the level of significance of each risk event. These have been grouped according to three categories:

- **High Risk** – events that have an evaluation score of 15 to 25, as indicated by the Red Zones in Table 19.3;
- **Medium Risk** – events that have an evaluation score of 8 to 12, as indicated by the Amber Zone in Table 19.3; and
- **Low Risk** – events that have an evaluation score of 1 to 6, as indicated by the Green Zone in Table 19.3.

Table 19.3: Levels of Significance

Likelihood	5 – Very Likely					
	4 – Likely					
	3 – Unlikely					
	2 – Very Unlikely					
	1 – Extremely Unlikely					
		1 – Minor	2 – Limited	3 – Serious	4 – Very Serious	5 – Catastrophic
	Consequence of Impact					

Significant impacts resulting from major accidents and / or disasters are adverse impacts that are described as 'Significant', 'Very Significant' or 'Profound' under the EPA Guidelines (EPA 2022). Consequently, major accidents and / or disasters risk events that fall within the Amber or Red Zones ('Medium' or 'High' risk events) are considered to present risk of significant impacts and are brought forward for further consideration and assessment for mitigation.

19.4 Potential Impacts

19.4.1 Do Nothing Scenario

With respect to risk of major accidents and / or disasters, the 'Do Nothing' scenario means that there are no changes to existing infrastructure or utilities as a result of the Proposed Scheme. Therefore, there would be a Neutral impact on risk of major accidents and / or disasters under the 'Do Nothing' scenario.

19.4.2 Risk Evaluation

As mentioned in Section 19.3, the p impacts in this Section assume a worst-case scenario, which does not consider the implementation of mitigation measures or emergency plans which would be put in place to reduce the likelihood and potential impact of any major accidents and / or disasters.

A Risk Register has been developed which contains all the plausible scenarios identified during the Construction Phase and Operational Phase of the Proposed Scheme and has been evaluated using the criteria Section 19.3. This is provided in Table 19.4.

Table 19.4: Rating of Major Accidents and Disasters in the Absence of Mitigation

Risk ID	Event	Proposed Scheme Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
Construction Phase							
A	Utilities – Risk of gas explosion due to the strike of a gas mains during excavation works	Throughout	Unlikely	3	Serious Potential fatalities and injuries. Hazards associated with the explosion to neighbouring residents, businesses and activities. Potential to discharge deleterious material to adjacent watercourses	3	Medium
B	Utilities – Risk of release of trapped gas under pavements that accumulates due to local gas leaks	Throughout	Unlikely	3	Minor Potential minor risk of poisoning. Simple contamination, localised effects of short duration	1	Low
C	Utilities – Risk of exposure to and release of untreated wastewater due to the strike of mains sewers and combined sewers during excavation	Throughout	Very unlikely (Sewer depth greater than excavation depths required for the Proposed Scheme)	2	Limited Potential injury Hazards associated with exposure to untreated wastewater (diseases etc.) Potential untreated wastewater to discharge to adjacent watercourses	2	Low
D	Utilities – Risk of striking watermains supply	Throughout	Unlikely	3	Minor Potential minor injury for nearby personnel and potential displacement of local residences and business in the event of flooding. Clean mains water supply so no potential	1	Low

Risk ID	Event	Proposed Scheme Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
					for contamination		
E	Utilities – Risk of striking and damaging low voltage overhead lines (such as telecoms, fibre optics etc.) that cross the Proposed Scheme	Throughout	Unlikely	3	Limited Localised disruption / inconvenience to community	2	Low
F	Utilities – Risk of striking and damaging high voltage underground cables during excavation	Throughout	Very Unlikely (Easiest cables to detect remotely and have warning marker tapes above them)	2	Serious Potential fatalities and injuries Potential to lead to fire and associated effects Potential to disrupt electricity / telecoms supply	3	Low
G	Utilities – Risk of striking and damaging low voltage underground cables (telecoms, fibre optic etc.) during excavation	Throughout	Unlikely	3	Limited Localised disruption / inconvenience to community	2	Low
H	Tree Stability - Risk of trees with unstable roots falling during surface and excavation works / potential for contact with overhead lines, residents, properties, pedestrians and road users	Throughout	Unlikely	3	Limited Potential fatality and injuries Localised effects and short duration. Potential for some minor damage to local infrastructure	2	Low
I	Deep excavation during roadworks adjacent to live traffic – risk of falling from a height	Throughout	Very Unlikely	2	Minor Shallow excavations only required.	2	Low
J	Ground Collapse - Risk of excavation works leading to subsidence of land / encountering unstable ground during construction	Throughout	Unlikely	3	Minor Shallow excavations only required.	1	Low
K	Transport Accident - Major road traffic accidents resulting from Construction Phase traffic and	Throughout	Unlikely	3	Limited Potential fatality and injuries	2	Low

Risk ID	Event	Proposed Scheme Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
	works taking place adjacent to live traffic				Disruption to local road network infrastructure		
L	Contamination Event - Risk of encountering unknown contaminated ground and mobilisation during construction / hazardous pipe materials (i.e. asbestos pipes) and potential damage to brittle pipes during construction works	Throughout	Unlikely	3	Limited Potential injury from exposure to hazardous substances Potential for a limited number of people to be affected and for short duration localised effects	2	Low
M	Contamination Event – Pollution event leading to environmental damage to watercourses or groundwater, particularly associated with the potential release of silt to the aquatic environment	Various locations adjacent to watercourses	Unlikely	3	Serious Potential to cause environmental damage to the aquatic environment and associated species and to ecologically designated areas	3	Medium
N	Biosecurity - Risk of spread of invasive species during construction works, particularly during site clearance works	Throughout	Unlikely	3	Serious Contamination with extended duration and potential to lead to more widespread effects	3	Medium
O	Extreme Weather Event – Risk of extreme weather events such as prolonged flooding resulting in sediment load runoff during construction, storm damage, snowstorm, wildfire.	Throughout	Unlikely	3	Limited Localised displacement of a small number of people and short duration and localised effects	2	Low
P	Industrial Incident – Explosion / fire occurring at adjacent facility containing flammable / hazardous substances (i.e. petrol station)	Throughout	Very Unlikely	2	Limited Potential for injury working near live traffic taking evasive action to avoid fire services Localised disruption to road network	2	Low
Q	Industrial Incident - Incident within nearby Seveso sites as cited in Section 19.2 for which emergency services need to access	Throughout	Unlikely	3	Limited Potential for fatalities at site if emergency	2	Low

Risk ID	Event	Proposed Scheme Element	Likelihood	Rating	Consequence	Rating	Resulting Risk Category
					access response time was delayed Potential for injury working near live traffic taking evasive action to avoid fire services Localised disruption to road network		
Operational Phase							
R	Extreme Weather Event – Risk of extreme weather events such as prolonged flooding resulting in sediment load runoff, storm damage, snowstorm, wildfire.	Throughout	Unlikely	3	Limited Potential for localised damage to infrastructure	2	Low
S	Industrial Incident – Explosion / fire occurring at adjacent facility containing flammable / hazardous substances (i.e. petrol station)	Throughout	Very Unlikely	2	Limited Potential for localised damage to infrastructure	2	Low

The evaluation of risk and the associated significance of risk is determined by risk likelihood x risk consequence (Table 19.5) with the score used to determine the resulting risk category (Table 19.4) and level of significance.

Table 19.5: Evaluation of Levels of Significance in the Absence of Mitigation

Likelihood	**5 – Very Likely**					
	4 – Likely					
	3 – Unlikely	[B] [D] [J]	[E] [G] [H] [K] [L] [O] [Q] [R]	[A] [M] [N]		
	2 – Very Unlikely		[I] [C] [S]	[F] [J]		
	1 – Extremely Unlikely	[R]				
		1 – Minor	**2 – Limited**	**3 – Serious**	**4 – Very Serious**	**5 – Catastrophic**
	Consequence of Impact					

From examining the plausible risks presented in Table 19.4, Risk IDs B, C, D, E, F, G, H, I, J, K, L, O, P, Q, R and S are considered as being below the threshold of significance set for the purposes of this assessment (Green Zone or 'Low' risk event).

No risks have been assessed to fall within the Red Zone ('High' risk scenario) and Risk IDs A, M and N fall within the Amber Zone ('Medium' risk event) and are therefore brought forward for further consideration and assessment of mitigation measures. These three Risk IDs fall within the Construction Phase. No Operational Phase risks fell within the Amber Zone, and are therefore not considered further.

The scenario with the highest risk score relates to A, M, and N associated with the Proposed Scheme.

19.4.3 Seveso Sites

A review of Upper Tier and Lower Tier Seveso sites and their respective distances from the Proposed Scheme was undertaken. The nearest Seveso sites are set out in Table 19.6. The proposed location of the temporary construction compound and parts of the access route to the compound are within the consultation distance (400m) for Circle K Energy Ireland terminal at New Docks. The terminal subject to the COMAH Regulations due to the storage of fuel on site.

On this basis, the Health and Safety Authority will be consulted as a statutory consultee during the planning process.

Table 19.6: Seveso sites

Name	Location	Approximate Distance from the Proposed Scheme	Nearest Hospital	Nearest Fire Station	Consultation Distance (m)
Upper Tier Seveso Sites					
Circle K Galway Terminal	Terminal at Galway Harbour Enterprise Park.	Adjacent to the Proposed Scheme at New Docks.	University Hospital Galway (2km)	Galway City Fire Station (1km)	400

19.5 Mitigation and Monitoring Measures

19.5.1 Inherent Design

The design of the Proposed Scheme has been developed to best international practice and standards and complies with the relevant design standards which include provisions to reduce the likelihood of risk events occurring (e.g. bridge structures have been designed to avoid the risk of collapse, drainage systems have been designed to cater for increased rainfall events etc.). The design of the Proposed Scheme will continue to be developed by the appointed contractor(s) to best international practice and standards.

Regulation 15 of the Safety, Health and Welfare at Work (Construction) Regulations places a duty on designers carrying out work related to the design of a project to take account of the 'General Principles of Prevention' as listed in Schedule 3 of the Safety, Health and Welfare at Work Act. In addition to the duties imposed by Regulation 15 of the Safety, Health and Welfare at Work (Construction) Regulations, designers must comply with Section 17(2) of the Safety, Health and Welfare at Work Act which requires persons who design a project for construction work to ensure, so far as is reasonably practicable, that the project is designed and is capable of being constructed to be safe and without risk to health, can be maintained safely and without risk to health during use, and complies in all respects, as appropriate, with other relevant legislation. This includes S.I. No. 138/2012 - Building Regulations (Part A Amendment) Regulations 2012 and, if the works being designed are intended for use as a workplace, the relevant parts of the Safety, Health and Welfare at Work (General Application) Regulations. In accordance with these requirements, the Proposed Scheme engineering design team established a consistent and appropriate means of assessing the risks that may arise from design decisions and of applying the General Principles of Prevention, mitigation measures that are to be embedded into the design of the Proposed Scheme.

19.5.2 Plans and Procedures

The plans outlined in this Section have been developed to effectively manage and minimise risk by ensuring that every reasonable effort will be made to ensure that environmental impacts during construction will be mitigated or reduced, where possible. Specific mitigation measures are also included in the relevant Chapters of this EIAR.

19.5.2.1 Construction Environmental Management Plan (CEMP)

A CEMP has been prepared to demonstrate how the proposed construction works can be undertaken in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature. The CEMP will be developed by the appointed Contractor to set how environmental protection will be achieved during the Construction Phase of the Proposed Scheme.

The CEMP summarises the overall environmental management strategy that could be adopted and implemented during the Construction Phase of the Proposed Scheme and must be read in conjunction with the construction details outlined in Chapter 5 (Construction) in this EIAR.

The CEMP is provided in Appendix 5.1 CEMP in Volume 4 of this EIAR.

19.5.2.2 Construction and Demolition Resource and Waste Management

Construction and Demolition Resource and Waste Management is addressed in the CEMP to demonstrate how waste arising during the Construction Phase (including) demolition works of the Proposed Scheme will be managed and disposed of in a way that ensures compliance with the provisions of Number 10 of 1996 – Waste Management Act, 1996, as amended. The RWMP will be developed by the appointed contractor.

19.5.2.3 Construction Traffic Management

Construction Traffic Management is addressed in the CEMP to demonstrate how the interface between public and construction related traffic could be managed, where practicable, and to control vehicular movements associated with the construction of the Proposed Scheme. The Construction Traffic Management Plan will be developed by the appointed contractor so that construction traffic will be managed and monitored safely and efficiently throughout the duration of the Construction Phase.

19.5.2.4 Non-Native Invasive Species Management

Non-Native Invasive Species Management is addressed in the CEMP to provide the strategy that will be adopted during the construction of the Proposed Scheme in order to manage and prevent the spread of non-native invasive plant species.

The Non-Native Invasive Species Management Plan will be developed by the appointed contractor using a suitably qualified ecologist as necessary.

Non-native invasive plant species have been identified and documented within the Proposed Scheme boundary, as well as in close proximity to the Proposed Scheme boundary. The survey results have been provided in the CEMP, in addition to potential management options for the treatment of non-native species.

19.5.2.5 Surface Water Management

Surface Water Management is addressed in the CEMP, summarising the procedures and technical practices for implementing effective sediment, erosion and pollution control that will be adopted during the Construction Phase of the Proposed Scheme. The Surface Water Management Plan will be developed by the appointed contractor.

19.5.2.6 Environmental Incident Response

Environmental Incident Response is addressed in the CEMP, demonstrating how in the unlikely event of an incident, response efforts take place promptly, efficiently, and suitably for the particular circumstances. developed by the appointed contractor. The management of the risk of major accidents and / or disasters occurring will continue throughout the planning, design and Construction Phase of the Proposed Scheme. The CEMP details procedures that could be undertaken in the event of a significant release of sediment into a watercourse, or a significant spillage of chemical, fuel or other hazardous substances (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.

This assessment has considered the reasonable worst consequences, and as such, risks are unlikely to be greater than those that have been assessed within this EIAR. However, activities on-site will be monitored and controlled to ensure that risk does not increase over time.

19.5.3 Galway Port Emergency Plan

A Galway Port Emergency Plan has been developed by Circle K Ireland Energy Limited and includes the area where the construction compound is proposed. In the event of an emergency at the port, the Galway Port Emergency Plan will be activated, and sirens sounded.

Table 19.7: Major Accidents and / or Disasters – Assessment of Mitigation Measures

Risk ID	Event	Pre-Mitigation Risk Score	Mitigation Measures [Including Confirmatory Studies]	Post-Mitigation Likelihood	Post-Mitigation Consequence of Impact	Post Mitigation Risk Score
Construction Phase						
A	Utilities – Risk of gas explosion due to the strike of a gas mains during excavation works	Medium	Refer to Chapter 5 Construction of this EIAR and to Appendix 5.1 CEMP in Volume 4 of this EIAR for details on pre-construction surveys that may be conducted and mitigation measures that may be put in place.	2 Very Unlikely	3 Serious	Low
N	Contamination Event – Pollution event leading to environmental damage to watercourses or groundwater, particularly associated with the potential release of silt to the aquatic environment	Medium	Refer to Chapter 13 (Water), Chapter 14 (Land, Soils, Geology & Hydrogeology) of this EIAR, Appendix 5.1 CEMP in Volume 4 of this EIAR for details on design and mitigation measures that may be place.	2 Very Unlikely	2 Serious	Low
M	Biosecurity - Risk of spread of invasive species during construction works, particularly during site clearance works	Medium	Refer to Chapter 12 (Biodiversity) of this EIAR, Appendix 5.1 CEMP in Volume 4 of this EIAR for details on mitigation measures that may be put in place.	2 Very Unlikely	3 Serious	Low
Operational Phase						
N/A						

Table 19.8: Evaluation of Levels of Significance - Post-Mitigation

Likelihood	5 – Very Likely					
	4 – Likely					
	3 – Unlikely					
	2 – Very Unlikely			[A] [N] [M]		
	1 – Extremely Unlikely					
		1 – Minor	2 – Limited	3 – Serious	4 – Very Serious	5 – Catastrophic
	Consequence of Impact					

19.6 Residual Impacts

There are no identified incidents and / or major accidents and / or disasters risk events that present a sufficient combination of risk and consequence that would lead to significant residual environmental impacts.

No significant residual impacts have been identified either in the Construction or Operational Phases of the Proposed Scheme, whilst meeting the scheme objectives set out in Chapter 1 (Introduction) of this EIAR.

19.7 References

DECLG (2015). A Framework for Major Emergency Management. Guidance Document 10.

DEHLG (2010). A Framework for Major Emergency Management. A Guide to Risk Assessment in Major Emergency Management.

Department of Defence (2017). Strategic Emergency Management National Structures and Framework.

EPA (2014). Guidance on Assessing and Costing Environmental Liabilities.

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

European Commission (2017). Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report

GCC (2017) – Galway County Council Major Emergency Plan Revised 2021 (January 2021).

Government of Ireland (2020). A National Risk Assessment for Ireland 2020.

IEMA (2020). Major Accidents and Disasters in EIA: A Primer.

Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EU.

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

Number 10 of 1996 – Waste Management Act, 1996.

Number 10 of 2005 - Safety, Health and Welfare at Work Act 2005.

S.I. No. 138/2012 - Building Regulations (Part A Amendment) Regulations 2012.

S.I. No. 209/2015 – Chemical Act (Control of Major Accident Hazards Involving Dangerous Substances) (COMAH) Regulations 2015.

S.I. No. 291 of 2013 - Safety, Health and Welfare at Work (Construction) Regulations 2013.

S.I. No. 299/2007 - Safety, Health and Welfare at Work (General Application) Regulations 2007.

Chapter 20
Cumulative Impacts & Environmental Interactions

Contents

20 Cumulative Impacts and Environmental Interactions

20.1 Introduction

This chapter reports the assessment of potential cumulative impacts of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) Scheme (hereafter referred to the Proposed Scheme) in combination with other existing and or approved projects.

In addition, the chapter addresses the potential for interactions between impacts on different environmental factors of the Proposed Scheme itself on the receiving environment.

20.1.1 Cumulative Impacts

Annex IV of the EIA Directive (2011/92/EU as amended by 2014/52/EU) requires that an EIAR provides a 'description of the likely significant effects of the project on the environment resulting from…the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.'

The EPA EIAR Guidelines (EPA 2022) define cumulative effects as:

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

Note that the EPA guidelines use the terms impacts and effects interchangeably. A relatively minor effect on a particular receptor caused by the Proposed Scheme could result in a significant effect if it is added to by impacts from other nearby projects. This chapter identifies and provides an assessment of likely significant cumulative effects caused by the Proposed Scheme in combination with other planned projects. Section 20.2 sets out the process for deciding which other planned projects were included in the assessment.

20.1.2 Environmental Interactions

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

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

a. Population and human health;

b. Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;

c. Land, soil, water, air and climate;

d. Material assets, cultural heritage and the landscape;

e. The interaction between the factors referred to in points (a) to (d).'

Some of the topic assessments within this EIAR already address environmental interactions. For example, Chapter 10 (Population) provides an assessment of effects on community amenity, which relates to the interaction of impacts on air quality; visual amenity; traffic and transport; and noise and vibration. Furthermore, Chapter 11 (Human Health) describes and assesses how a combination of impacts on health determinants (air quality; noise and vibration; community amenity; traffic and transport) can interact and influence health outcomes. Section 20.4 of this chapter sets out the main environmental interactions identified from the Proposed Scheme, sign-posting chapters which already address environmental interactions and providing a description and assessment of environmental interactions which are not addressed elsewhere in this EIAR.

20.1.3 Guidance

This assessment has been completed with reference to the following guidance documents:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022);
- Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017); and
- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Union 2017).

20.2 Methodology for Cumulative Impacts Assessment

20.2.1 Source for the Identification of other Projects

Potentially relevant other projects include those from various sectors, such as residential and commercial projects, utilities, and other transport projects. The identification of other projects considered the following source:

- National Planning Application Database (https://data.gov.ie/dataset/national-planning-applications) – for downloadable list of planning applications sent from Local Authorities.

All planning application data provided by each local authority is fed into the national Data.Gov.ie database (https://data.gov.ie/dataset/national-planning-

applications). This dataset was used to identify planning applications within a search area of the Proposed Scheme.

For this exercise, the database was consulted to identify all applications permitted or pending a decision over the period of 2012 - present. This included analysis of applications along the Proposed Scheme and within 200m of the Proposed Scheme, where they are likely to be significantly impacted by the Proposed Scheme. An element of professional judgement was used to identify applications within 200m of the Proposed Scheme that may be significantly impacted by the Proposed Scheme.

The EIA Portal was consulted to determine if an application included an EIAR. The planning files of each identified permission or application were analysed to determine if an NIS was included. Compliance details on the planning files were also analysed to determine if the permission was commenced, uncommenced or completed. This was cross-referenced with Google Maps imagery.

In relation to the traffic impact assessment, the traffic model in the Opening year (2023) assessment is based on the same network as the base year plus other committed schemes. The Design year (2038) assessment is based in the context of the full implementation of the Galway Transport Strategy (GTS) network re-design (including the Galway City Ring Road) in both the Do Minimum and Do Something scenarios, with the Proposed Scheme servicing the new GTS services. In addition, the model includes for forecasted increased travel demand from general development to capture projected traffic growth from reasonably foreseeable development across the city in both 2023 and 2038.

20.3 Assessment of Cumulative Impacts and Environmental Interactions

This section provides a topic-by-topic assessment of likely significant cumulative effects of the Proposed Scheme in combination with other projects, before moving on to a description of the main environmental interactions identified for the Proposed Scheme.

In total, 122 other projects, including the Proposed Scheme, were listed for further cumulative assessment. Appendix 20.1 of Volume 4 of this EIAR sets out a record of which projects were listed for assessment against the relevant topics. Reference should be made to Figure 20.1 in Volume 3 of the EIAR, for the locations of the listed projects.

20.3.1 Construction Impacts

20.3.1.1 Traffic & Transport

Appropriate construction planning of the Proposed Scheme and other nearby projects will mitigate potential cumulative impacts of general construction disruption on neighbouring communities.

Other major infrastructure projects could directly interface with the construction of the Proposed Scheme. Interface liaison will take place on a case-by-case basis through the GCC, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

20.3.1.2 Air Quality

The cumulative risk to sensitive receptors as a result of dust soiling, health impacts and ecology impacts due to the construction and operational phases of the Proposed Scheme and other projects listed in Appendix 20.1 of Volume 4 of this EIAR, has been considered. The assessment methodology is described in full in Section 7.2.5 of Chapter 7 (Air Quality) of this EIAR. The projects listed in Appendix 20.1 of Volume 4 of this EIAR with the potential for cumulative effects to air quality include the following:

- Hanover Limited development comprising demolitions works and the construction of a three-story boutique hotel;
- O'Malley Group (Homes and Developments Limited) comprising demolition works and the construction of additional floors and extension;
- Seagulpoint Limited large scale residential mixed use development and urban regeneration masterplan;
- Bonha, Dock Limited mixed use office development; and
- K. King Construction Clare Galway Limited development of 27 residential units.

Without mitigation, there is the potential for cumulative dust impacts near to these other projects should the construction durations overlap. However, to ensure that no dust nuisance impacts occur to human health or ecological receptors, a series of mitigation measures have been identified that will be implemented during construction of the Proposed Scheme, as set out in Section 7.5 of Chapter 7 (Air Quality). Mitigation measures to reduce construction dust are standard practice for moderate/major scale developments likely to generate dust. With the implementation of the dust minimisation measures detailed in Section 7.5 and the CEMP (Appendix 5.1 in Volume 4 of the EIAR), fugitive emissions of dust will be insignificant and pose no nuisance at nearby receptors. Therefore, it is predicted that no significant cumulative impacts will arise from the concurrent construction of the other projects identified in Appendix 20.1 of Volume 4 of this EIAR.

A number of other local projects could directly interface with the construction of the Proposed Scheme.

As outlined in Chapter 5 (Construction, Section 5.5), liaison with third-party developers will take place on a case-by-case basis, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

As outlined in Section 20.3.1, cumulative traffic volumes are included in the analysis through the use of travel demand forecasting using the NTA's Western Regional Model. Therefore, the operational noise assessment includes for the cumulative scenario, refer to Section 7.6.2 of Chapter 7 (Air Quality) for the residual impacts in relation to air quality.

20.3.1.3 Climate

The cumulative risk of climate impacts due to the construction and operational phase of the Proposed Scheme, and other projects listed in Appendix 20.1 of Volume 4 of this EIAR, has been considered. The assessment methodology is described in full in Section 8.3 of Chapter 8 (Climate).

Climate is affected by macro-scale carbon contribution rather than by local effects; therefore, projects need not be considered at a local level for the cumulative assessment, in line with IEMA guidance. As such, the zone of influence for the climate assessment is not limited to the study area and is considered on a national basis. The IEMA guidance suggests that should sectoral carbon budgets exist, the cumulative impacts can be assessed on that basis however, the sectoral carbon budgets have not been established at the time of writing this assessment.

The construction of a wide range of projects in Ireland over the construction period of the Proposed Scheme will result in the generation of embodied carbon. When considering projects at a national scale, there is potential for significant cumulative impacts to embodied carbon.

However, it should be noted that the embodied carbon contribution from the Proposed Scheme comprises a fractional proportion of Ireland's projected baseline (with additional measures) in 2024, with substantial savings in embodied carbon achieved through inherent mitigation measures. Therefore, the cumulative impacts due to embodied carbon from the Proposed Scheme in a national context is considered not significant.

20.3.1.4 Noise & Vibration

Construction phase noise and vibration from the Proposed Scheme has been assessed in conjunction with other developments that are planned for construction in the same time period as the Proposed Scheme refer to Appendix 20.1 in Volume 4 of this EIAR.

Construction phase noise impacts in the Study Area are predicted to be negative, significant, and short term for the Proposed Scheme.

Because of the nature of the construction works along the Proposed Scheme (i.e., transient, intermittent, and short term at any one sensitive receptor) any cumulative construction noise impacts at sensitive receptors will also be intermittent, transient, and short term.

Cumulative vibration impacts are not predicted to have a significant impact on sensitive receptors.

All good practice guidelines for construction noise and vibration mitigation measures will be followed to minimise impacts at sensitive receptors during construction periods.

As outlined in Section 20.3.1, cumulative traffic volumes are included in the analysis through the use of travel demand forecasting using the NTA's Western Regional Model. Therefore, the operational noise assessment includes for the cumulative scenario, refer to Section 9.6.2 of Chapter 9 (Noise &Vibration) of this EIAR for the residual impacts in relation to noise.

20.3.1.5 Population

Cumulative construction effects on Population due to the Proposed Scheme when considered together with effects arising from other plans and projects are dealt with in relation to the factors under which Population effects might occur, particularly Traffic & Transportation, Noise & Vibration and Landscape (Townscape) & Visual. Following a review of the completed, commenced and uncommenced projects and the planning files for Galway City Council (refer to Appendix 20.1 in Volume 4 of this EIAR), it can be concluded that there is no likelihood of other significant cumulative effects arising in relation to Population and no need for a separate cumulative assessment of effects under this heading.

20.3.1.6 Human Health

Cumulative construction effects on Human Health due to the Proposed Scheme when considered together with effects arising from other plans and projects are dealt with in relation to the factors under which human health effects might occur, particularly Traffic and Transportation, Noise and Vibration and Landscape. There is no likelihood of other significant adverse cumulative effects arising in relation to Human Health and no need for a separate cumulative assessment of effects under this heading.

20.3.1.7 Biodiversity

In-combination or cumulative construction effects are changes in the environment that result from numerous human-induced, small-scale alterations. Cumulative impacts can be thought of as occurring through two main pathways: first, through persistent additions or losses of the same materials or resource, and second, through the compounding effects as a result of the coming together of two or more effects.

As part of the assessment, in addition to the Proposed Scheme, other relevant plans and projects in the area must also be considered at this stage.

This step aims to identify at this early stage any possible significant in-combination effects of the Proposed Scheme with other such plans and projects.

While there may be a number of proposed plans or projects at any one time in the vicinity of the Proposed Scheme, this report only reviewed those approved by the planning authority.

This section of the EIAR was prepared with consideration of the policies and objectives of the Galway City Development Plan (2017-2023) in relation to Biodiversity.

The Galway City Development Plan in complying with the requirements of the Habitats Directive, Wildlife Acts and Planning & Development Acts requires that all Projects and Plans that could affect biodiversity in the same potential Zone of Influence of the Proposed Scheme site would be assessed on a case by case basis that appropriate employable mitigation measures would be put in place to avoid, reduce or ameliorate negative effects. In this way any, in-combination impacts with Plans or Projects for the Proposed Scheme areas in which the Proposed Scheme site is located, would be avoided.

Projects considered for assessment are presented in Appendix 20.1 in Volume 4 of this EIAR.

The listed developments have been granted permission in most cases with conditions relating to sustainable development by the consenting authority in compliance with the relevant Local Authority Development Plan and in compliance with the Local Authority requirement for regard to the Habitats Directive. The development cannot have received planning permission without having met the consenting authority requirement in this regard.

Given, the inclusion of best practice construction management measures to be employed as per a site-specific CEMP, there is no potential for in-combination effects to occur.

There are no predicted cumulative construction effects given that it is predicted that the Proposed Scheme will have no significant effects on biodiversity. In this way, in-combination impacts with Plans or Projects for the development area and surrounding area in which the development site is located, would be avoided.

20.3.1.8 Water

The Proposed Scheme was assessed for cumulative impacts with other Proposed Developments in proximity to the Study Area refer to Appendix 20.1 in Volume 4 of this EIAR.

Development proposals outlined in City and County Development plans and Local Area plans include standard surface water management strategies in the form of SUDs to mitigate against impacts on the receiving waters. Therefore, the in-combination impacts on hydrology of the proposed development and various others included in developments plans are considered imperceptible.

Other major development proposals currently underway or in planning include:

- N6 Galway City Ring Road, and
- The Galway Harbour Port Extension

The N6 Galway City Ring Road has one major crossing of the River Corrib. The EIAR for that Scheme proposed strict control measure during construction to reduce the pollution risk. It specifically proposes that there will be no in-stream works to protect the downstream water works at Terryland.

The Galway Harbour Port extension is located south of the proposed Scheme. Residual impacts identified in the EIAR of the Harbour Project relate to impacts caused by changes in salinity, sediment input, accidental spills, release of oils and fuel from construction site, dredging, etc. to which the proposed Scheme will have little or no contribution to these effects as mitigation measures will be in place to control discharges to the receiving water.

Therefore, it is concluded the effect of the Scheme in-combination with the N6 Galway City Ring Road and the Galway Harbour Port extension is imperceptible.

20.3.1.9 Land, Soils, Geology and Hydrogeology

From a Land, Soils, Geology and Hydrogeology perspective the construction phase of some of the proposed projects (refer to Appendix 20.1 in Volume 4 of this EIAR) will result in a loss of soil. In combination with the Proposed Scheme this could comprise a permanent adverse effect of the loss of a moderate to large quantity of soil across the study area. As the soil is predominately made ground with a low importance the overall cumulative impact is considered to be slight/moderate. Hence there are no likely significant direct or indirect cumulative impacts on land, soils, geology and hydrogeology during the construction phase.

20.3.1.10 Archaeological Cultural Heritage and Architectural Heritage

All permitted and proposed projects as detailed in Appendix 20.1 of Volume 4 of this EIAR were reviewed as part of the potential cumulative impact assessment. From an archaeological and cultural heritage perspective no significant negative cumulative impacts are predicted at construction. This is due to the fact that other developments already have archaeological mitigation for development in place (where applicable, at construction stage), which will allow for the preservation either by record or in-situ of any archaeological remains that may be identified. Given that the same mitigation measures are proposed for the Proposed Scheme at construction, no cumulative impacts will occur.

All permitted and proposed projects as detailed in Appendix 20.1 of Volume 4 of this EIAR were reviewed as part of the potential cumulative impact assessment. No cumulative impacts were identified upon the architectural heritage at construction stage.

20.3.1.11 Landscape (Townscape) and Visual

The proposed N6 Galway City Ring Road, permitted An Bord Pleanála (HA07.302848), is likely to give rise to significant, very significant and profound landscape and visual effects along its route. However, as it is separated from the Proposed Scheme by an intervening distance of over 2km, with no intervisibility, potential townscape and visual cumulative effects are considered to be imperceptible during construction. No other potential significant cumulative impacts are envisaged from the construction of the projects included in Appendix 20.1 in Volume 4 of this EIAR.

20.3.1.12 Waste and Resources

A qualitative assessment has been undertaken using publicly available information to establish the cumulative effects associated with the off-site treatment of solid waste that will be generated by the construction and operational phase of the Proposed Scheme and other developments (refer to Appendix 20.1 in Volume 4 of this EIAR) that will have simultaneous requirements for landfill and treatment capacity of any C&D waste generated during the construction timeframe.

20.3.1.12.1 Baseline trends

The waste management baseline for the CUWR, established for the assessment using publicly available data from the Regional Waste Management Offices and the EPA, has been used as the baseline for the cumulative assessment in Section 17.3 of Chapter 17 (Waste and Resources) of this EIAR, set out permitted and licensed capacity and Article 27 notifications for 2020. This data has been used to establish a baseline for 2020. The available C&D waste and by-product capacity in CUWR for 2020 is approximately 796,000 tonnes based on the following assumptions, see Table 20.1:

- Using the available capacity for permitted facilities for construction and demolition wastes;
- Including only licensed facilities accepting soil and stones; and
- Including all Article 27 notifications dated 2020 in the CUWR.

Table 20.1: C&D Waste Management Baseline for CUWR, 2020 (Permitted, Licensed and Article 27 Notifications)

C&D Waste Management Baseline for 2020	Capacity / Annual Intake (Tonnes)
Minimum Permitted capacity (Regional Waste Management Office (Offaly County Council, 2021)	685,316
Licenced annual intake (soil and stone facilities) (EPA 2022)	90,000
Article 27 (by-product) notifications (EPA 2021c)	20,500
Total	795,796

Therefore, the authorised C&D waste and by product tonnage in CUWR in 2020, and so the construction and operation waste baseline, is an estimated 796,000 tonnes per annum.

The Regional waste authorities state in the publication *Construction and Demolition Waste Management Plans 2015-2021: Update Report 2020*, which sets out the national capacity of primarily soil and stone treatment facilities:

'In comparison to [the East Midlands and Southern] regions, the CUR had just 10% of the remaining national capacity at the end of 2018.'

The Update Report sets out that there were four inert landfill facilities active nationally in 2018, all located in the EMR.

20.3.1.12.2 Key developments

A list of developments that have been taken into account in the cumulative effects assessment is provided in Appendix 20.1 in Volume 4 of this EIAR. Due to the nature of waste management in Ireland cumulative effects for waste have been considered on a regional basis. A short-list of proposed developments planned within the region, was also developed, including having regard to those projects set out in Project 2040 (Department of Public Expenditure and Reform 2018; Investment Projects and Programmes Office 2019). These projects were reviewed and screened base on the following criteria:

- Construction phases likely to overlap with the Proposed Scheme - where unknown, overlap is considered as worst case;
- Similar project waste profile is expected to be generated i.e. tunnelling excavation material, soil and stones and bitumen containing material.

A list of regional developments that have been taken into account in the cumulative effects assessment is provided in Table 20.2:

Table 20.2: Regional Developments Included in Cumulative Assessment

Project Name	Project Type	Anticipated Construction completion (year) where known	Waste type likely to be generated
Galway City Ring Road	The proposed road development comprises 11.8km of motorway between the existing N6 at Coolagh (northeast of the city) to the existing Ballymoneen Road (northwest of the city) and then continues as a single carriageway road for a further 5.6km as far as the R336 Coast Road, west of Bearna.	2025	• Soil and stones • Bitumen containing material • General C&D waste
N5 Ballaghaderreen	The project comprises a proposed road development of 33.4km which consists of a single carriageway road. There are	2024	• Soil and stones • Bitumen containing

Project Name	Project Type	Anticipated Construction completion (year) where known	Waste type likely to be generated
to Scramoge	an additional 13km of side road improvements, 17 at-grade T-junctions and 5 roundabouts to be provided as part of the scheme.		material • General C&D waste
N59 Moycullen Bypass	This scheme consists of 4.3km of single carriageway bypassing the village of Moycullen to the northeast. The project extends from the townland of Drimcong, approximately 1.5km north-west of Moycullen village to the townland of Clydagh, approximately 2km southeast of the village.	2023	• Soil and stones • Bitumen containing material • General C&D waste
No. 26 & No. 34 Nun's Island Street, Galway	Permission for development which will consist of a) demolition of existing derelict buildings including a habitable house on site (327 sqm) b) three storey over part-basement boutique hotel of 1239 sqm containing 34 bedrooms and ancillary spaces and a balcony.	TBC	• General C&D waste
Lands to the rear of Ceannt Train Station, Galway	10 year permission - construction of mixed use regeneration project including 376 no. apartments, retail units, cafe/restaurant/bar units, Hotel, office use, childcare facility, car parking and other services and associated site works.	2026	• General C&D waste
Woodlands Centre Renmore Galway	Development which will consist of the construction of a new 3,640 sq. m. single storey special school including staff and visitor car parking, bus drop-off areas, new perimeter boundary walls and fences, removal of selected trees	TBC	• Soil and stones • Bitumen containing material • General C&D waste

The developments identified comprise a mixture of major infrastructure transport projects, commercial and residential developments. Each development would generate solid waste from construction and from operation for management within the regional areas. Waste will generally be generated over the period of construction for each development. Additionally, waste generation will vary over time as the nature of the projects are multi-year and are undertaken with a phase approach i.e., demolition, excavation and construction.

20.3.1.12.3 Cumulative Construction Effects

Construction of developments within the region will produce Construction and Demolition (C&D) waste, a proportion of which will be sent for recycling, further treatment or disposal to landfill. In line with relevant policy, also applicable to the Proposed Scheme, it is anticipated that all these developments will seek to minimise disposal to landfill and manage waste in accordance with the waste hierarchy.

The Proposed Scheme, together with the developments listed in Appendix 20.1 in Volume 4 of this EIAR will add to the need for off-site capacity for recovery, recycling, treatment and disposal of waste to landfill. Many of the listed projects are in very early stages so documentation hasn't been published or associated planning documents submitted which would include waste generation estimates however is anticipated that the proposed developments will give rise to rise to similar types of wastes to the Proposed Scheme and that the quantities will vary depending on the type of project

Opportunities are likely to continue to arise during the construction phase of other developments to provide C&D waste and surplus excavated material for use in other local construction projects thereby increasing diversion of such materials from landfill.

It was acknowledged the volumes of waste being generated would support the provision of further licensed capacity:

> *"The CUR has 3% of the national capacity. New licensed facilities are also due to come on stream."*

The construction phase impact of the Proposed Scheme has been assessed as resulting in a not significant short-term and adverse.

Considering therefore the likely potential for waste generation from other developments, the opportunities to divert waste from off-site treatment and the amount of inert, non-hazardous and hazardous waste treatment capacity likely to be available on in the region in the coming years over the time period for the delivery of the Proposed Scheme, it is considered that there will be no likely significant effects as a result of the construction of the Proposed Scheme in combination with the construction of other developments.

20.3.1.13 Material Assets

Material quantities required for the construction of the Proposed Scheme are considered insignificant and therefore no likely significant cumulative effects on material assets are predicted as a result of the Proposed Scheme in combination with other proposed development in Galway.

20.3.2 Operational Impacts

20.3.2.1 Traffic & Transport

As detailed in Section 6.3 of Chapter 6 (Traffic & Transport) of this EIAR all core modelling scenarios (Do Minimum and Do Something) have taken into account committed transport schemes for Galway City and its environs, as part of the Galway Transport Strategy (GTS) and those likely to be completed for the various years assessed. This comprises the following schemes in the 2023 and 2038 modelling scenarios as outline in Table 20.3.

Table 20.3: Schemes included in the 2023 to 2038 Do Minimum Scenario

Scheme (Modelling Year)	Description	Committed Scheme	GTS Scheme
Martin Junction (2023 and 2038)	Upgrade from a roundabout to a signalised junction	**X**	
GTS Bus Services (2023 and 2038)	Brown, red, blue, green and yellow bus routes to replace existing local bus services 401-412 and 414.		**X**
Galway City Ring Road (2038)	N6 to R336 Barna Road	**X**	
Skerlett Roundabout Signalisation (2038)	Upgrade from a roundabout to a signalised junction.		**X**
N59 Dangan Upgrade (2038)	Speed limit increase		**X**
W4 BC2 - Tuam Road Bus Corridor (2038)	It is proposed to install an outbound shared bus/cycle lane from the junction with Wellpark Road/Connolly Avenue, north to the junction with the Tuam Rd and east to the junction with Bóthar na dTreabh		**X**
W6 BC4 - Father Griffin Road Corridor (2038)	It is proposed to reduce vehicle speeds to advertise the presence of pedestrians and cyclists.		**X**
W7 BC5 - Monivea Road Scheme (2038)	Add an on-road bus priority to allow buses to travel to the Briarhill Junction.		**X**
W9 BC7 - Western Distributor Road Corridor (2038)	It is proposed to transform Blake and Athy roundabouts into signalised junctions and add bus lanes in both direction along the road.		**X**

Scheme (Modelling Year)	Description	Committed Scheme	GTS Scheme
W11 BC9 - Rahoon Road Bus Lane	Adding an inbound bus lane from Rahoon Cemetery to the junction with Seamus Quirke Road.		**X**
W13 BC11 - Galway Bus Connects (2038)	It is proposed to install bus corridors all along Dublin Rd from Martin Roundabout to Moneenageisha Junction (about 4km long) in both directions.		**X**
New Link from Liosban to N6 (2038)			**X**
Browne Roundabout (2038)	Upgrade from a roundabout to a signalised junction		**X**
Blake Roundabout (Ballymoneen Road) (2038)	Upgrade from a roundabout to a signalised junction		**X**
Athy Roundabout (Clybaun Road) (2038)	Upgrade from a roundabout to a signalised junction		**X**
Bothar Stiofan Roundabout (2038)	Upgrade from a roundabout to a signalised junction		**X**
Gort na Bro Roundabout (2038)	Upgrade from a roundabout to a signalised junction		**X**
Deane Roundabout (2038)	Upgrade from a roundabout to a signalised junction		**X**
D'arcy (Salthill) Roundabout (2038)	Upgrade from a roundabout to a signalised junction		**X**
Joyce Roundabout (Cemetry Cross) (2038)	Upgrade from a roundabout to a signalised junction		**X**
Bus lanes (2038)	Bus lanes on Salthill Road, Doughiska Road, Parkmore Road and Tuam Road		**X**
Park and Ride	P&R Sites at Cappagh Road, Galway		**X**

Scheme (Modelling Year)	Description	Committed Scheme	GTS Scheme
(2038)	Clinic and Tuam Road.		

Cumulative traffic volumes are included in the analysis through the use of travel demand forecasting using the NTA's Western Regional Model.

20.3.2.2 Air Quality

The cumulative risk to sensitive receptors as a result of the operational phase of the Proposed Scheme and other projects listed in Appendix 20.1 of Volume 4 of this EIAR, have been considered.

As outlined in Section 20.3.1, cumulative traffic volumes are included in the analysis through the use of travel demand forecasting using the NTA's Western Regional Model. Therefore, the operational noise assessment includes for the cumulative scenario, refer to Section 7.6.2 of Chapter 7 (Air Quality) of this EIAR for the residual impacts in relation to air quality.

20.3.2.3 Climate

The cumulative risk of climate impacts due to the construction and operational phase of the Proposed Scheme, and other projects listed in Appendix 20.1 of Volume 4 of this EIAR, has been considered. The assessment methodology is described in full in Section 8.3 of Chapter 8 (Climate) of this EIAR.

Climate is affected by macro-scale carbon contribution rather than by local effects; therefore, projects need not be considered at a local level for the cumulative assessment, in line with IEMA guidance. As such, the zone of influence for the climate assessment is not limited to the study area and is considered on a national basis. The IEMA guidance suggests that should sectoral carbon budgets exist, the cumulative impacts can be assessed on that basis however, the sectoral carbon budgets have not been established at the time of writing this assessment.

The Climate Action and Low Carbon Development Act, 2021, as amended, commits to a reduction in greenhouse gas emissions such that the total amount of annual greenhouse gas emissions in the year ending on 31 December 2030 is 51 per cent less than the annual greenhouse gas emissions reported for the year ending on 31 December 2018. Policy changes will include the acceleration of the electrification of the transport system, including electric bikes, electric vehicles and electric public transport, alongside a ban on new registrations of petrol and diesel cars from 2030. In addition, there is a policy to ensure an unprecedented modal shift in all areas by a reorientation of investment to walking, cycling and public transport.

The 2038 Do Minimum and Do Something scenarios assumes a number of transport schemes to be in the traffic model including the roll out of the Galway Transport Strategy (GTS) as well as general traffic growth.

As noted above the cumulative impacts to climate are considered at a national level due to the macro-scale impacts of GHG emissions, therefore, there is potential for significant cumulative impacts to operational carbon. However, it should be noted that the contribution of operational carbon from the Proposed Scheme to the projected baseline for the transport sector for the Opening and Design Years is marginal, with the introduction of infrastructure that will enable the shift to sustainable transport modes. In addition, the vastly changing policy landscape that will see significant improvements in fleet emissions across the transport sector and the subsequent projects. Therefore, the cumulative impacts due to operational carbon from the Proposed Scheme in a national context is considered not significant.

The Proposed Scheme is not expected to result in a significant cumulative impact to climate change vulnerability in combination with other projects due to the not significant impacts predicted for the operational phase of the Proposed Scheme.

Overall, it is considered that the cumulative residual effects as a result of the Proposed Scheme's operation is not significant.

20.3.2.4 Noise & Vibration

Predicted traffic noise levels from the Proposed Scheme have been assessed in conjunction with other developments in the Study Area that have received planning permission or have applied for planning permission to determine the cumulative noise impacts on the surrounding noise sensitive community. Developments that are already operational will have been included in the noise measurements and assessed as part of the baseline environment.

Only one planning applications has been found to be relevant from a noise point of view. The details for this application are:

- Planning registration number 20/47 (ABP: PL61.310568) for a large scale development near the Galway Railway Station

Noise levels from the development have been assessed as part of the EIAR prepared for the development. Levels were predicted to be neutral, imperceptible, and long term.

In the vicinity of the proposed development, changes in noise levels due to the Proposed Scheme are not predicted to be significant and therefore no significant cumulative noise effects are predicted from the Proposed Scheme.

Vibration levels from the Proposed Scheme are not predicted to be perceptible, and therefore no cumulative impact is predicted.

As outlined in Section 20.3.1, cumulative traffic volumes are included in the analysis through the use of travel demand forecasting using the NTA's Western Regional Model. Therefore, the operational noise assessment includes for the cumulative scenario, refer to Section 9.6.2 of Chapter 9 (Noise and Vibration) of this EIAR for the residual impacts in relation to noise.

20.3.2.5 Population

The Population assessment considered potential cumulative effects on land-take, amenity and accessibility during operation. No potential likely significant cumulative impacts on the receptors assessed in Chapter 10 (Population) of this EIAR were identified during operation.

20.3.2.6 Human Health

Cumulative effects on Human Health due to the operation of the Proposed Scheme when considered together with effects arising from other plans and projects are dealt with in relation to the factors under which human health effects might occur, particularly Traffic and Transportation, Noise and Vibration and Landscape. There is no likelihood of other significant cumulative effects arising in relation to Human Health and no need for a separate cumulative assessment of effects under this heading.

20.3.2.7 Biodiversity

No significant cumulative operational impacts on biodiversity are envisaged.

20.3.2.8 Water

This conclusion applies to the operational phase of the Scheme as no significant cumulative effects (direct and indirect) are anticipated from the projects discussed above (refer to section 20.3.1.8) and hence no additional mitigation measures are necessary or required.

20.3.2.9 Land, Soils, Geology and Hydrogeology

The operational phase of some of the proposed projects (refer to Appendix 20.1 in volume 4 of this EIAR) will increase the area of impermeable hard standing in the area which could cumulatively reduce the recharge rate. In the centre and east of the Proposed Scheme the area is underlain by a Regionally Important Aquifer. The west is underlain by a Poor Aquifer.

The areas underlying the Proposed Scheme are generally described as having a relatively low recharge and largely comprise roads which already impede recharge. Hence the impact of the Proposed Scheme is considered to be negligible on both aquifers.

As the area of the Proposed Scheme is larger than the other developments and has a negligible effect the combined effect of each proposed development with the effects of the Proposed Scheme are not likely to be any greater than negligible. Consequently, the combined effect of the Proposed Scheme in combination with each individual development is considered to be negligible. Hence the significance will be imperceptible and there are no likely significant direct or indirect cumulative impacts on land, soils, geology and hydrogeology during the operational phase.

20.3.2.10 Archaeological Cultural Heritage & Architectural Heritage

Archaeology and Cultural Heritage

All permitted and proposed projects as detailed in Appendix 20.1 of Volume 4 of this EIAR were reviewed as part of the potential cumulative impact assessment. From an archaeological and cultural heritage perspective no significant negative cumulative impacts are predicted at the Operational Phase.

Architectural Heritage

All permitted and proposed projects as detailed in Appendix 20.1 of Volume 4 of this EIAR were reviewed as part of the potential cumulative impact assessment. Four of the projects, as listed below, were identified that may result in negative cumulative impacts upon the architectural heritage resource at operation stage:

- ABP Planning Ref.: JP61.308783. Salmon Weir Pedestrian and Cycle Bridge. Construction of new pedestrian bridge to the south of the Salmon Weir Bridge and associated footpaths and plaza.
- Galway CC Planning Ref.: 19/157. Permission to demolish existing Guesthouse at No 3 Newtownsmith along with existing outbuildings. Permission to construct a new 3 Storey Mixed use building at 3 Newtownsmith.
- Galway CC Planning Ref.: 17/59. Permission for a change of use of existing shop to use as a restaurant with ancillary take away.
- Galway CC Planning Ref.: 14/18. Permission for development at Ceannt Station (a protected structure). Northern Elevation: The construction of a new 95 square metres single storey fully accessible glazed entrance building, the extension of the existing North Eastern bay platform, new 2m high boundary treatment to enclose this platform extension.

However, there would be no significant potential impacts from the Proposed Scheme in the locations where each of these projects are located. The new pedestrian bridge at Salmon Weir will facilitate the use of the vehicular bridge for the Proposed Scheme. Newtownsmith will be pedestrianised and no additional historic fabric relating to the streetscapes and the river will be lost due to both projects being carried out. In relation to Project 19/157, the historic structure located within this plot will be left in-situ and as such architectural heritage resource will not be affected. With regards to project 14/18 the proposed change to the elevation of the structure (considered in relation to the Eyre Square ACA) is very minimal and would not affect the overall character of the square when considered in tandem with the Proposed Scheme. With regards to project 14/18, the project is considered well set back from Eyre Square and the ACA and as such, would not result in an overall negative cumulative impact.

20.3.2.11 Landscape (Townscape) and Visual

Following a review of the projects included Appendix 20.1 in Volume 4 of this EIAR and as would be expected in a city centre urban environment, there are a large number of planned or permitted projects in close proximity to the proposed development, consisting of alternations to and new construction of commercial, retail, residential, institutional and infrastructural projects. All combined, these are considered to be consistent with the normal pattern of change and improvement to the city's landscape and visual environment. From a landscape and visual perspective, there are a number of infrastructure projects within the city related to the Galway Transport Strategy considered for assessment including:

- Salmon Weir Pedestrian and Cycle Bridge (JP61.308783) is to be constructed to the south of the Salmon Weir bridge. Once operational the proposed bridge will have a significant positive and permanent effects on pedestrian and cycle movement in this sensitive urban townscape setting of Galway City. Combined with the Proposed Development's pedestrianisation of Gaol Road and Newtownsmith, and public realm improvements in the area, the potential townscape and visual effects are considered to be significant, positive and permanent (see Figures 16.1.3.2, 16.1.4.2 and 16.1.5.2 in Volume 3 of this EIAR).
- The proposed N6 Galway City Ring Road, permitted An Bord Pleanála (HA07.302848), is likely to give rise to significant, very significant and profound landscape and visual effects along its route. However, as it is separated from the proposed development by an intervening distance of over 2km, with no intervisibility, potential townscape and visual cumulative effects are considered to be imperceptible during operation.

20.3.2.12 Waste & Resources

The predominant source of operational phase waste from the Proposed Scheme may arise as a result of carriageway maintenance which will be undertaken at regular intervals, or as necessary. This will primarily consist of bitumen containing material due to maintenance of carriageway pavement. The predicted impact of operational construction and demolition waste will be positive, not significant and long-term. It is therefore considered that the operational phase waste arising from the Proposed Scheme considered on combination with the types of waste arising from other developments will not give rise to likely significant cumulative effects.

20.3.2.13 Material Assets

No likely significant cumulative effects were identified for Material Assets for the Operational Phase.

20.4 Environmental Interactions

Table 20.4 sets out a matrix to indicate where interactions between different effects on different environmental factors have been addressed.

This is in line with the approach set out in the EIAR Guidelines (EPA 2022). These interactions are described briefly in Table 20.4.

Table 20.4: Environmental Interactions Matrix

Typical Inter-Relationship Matrix – Environmental Elements	Population		Human Health		Biodiversity		Land, Soils, Geology & Hydrogeology		Water		Air Quality		Climate		Noise & Vibration		Waste		Landscape(Townscape) & Visual		Cultural Heritage		Architectural Heritage		Material Assets		Traffic & Transport		Major Accidents and / or Disasters	
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Population																														
Human Health																														
Biodiversity																														
Land, Soils, Geology & Hydrogeology																														
Water																														
Air Quality																														
Climate																														
Noise & Vibration																														

Typical Inter-Relationship Matrix – Environmental Elements	Population		Human Health		Biodiversity		Land, Soils, Geology & Hydrogeology		Water		Air Quality		Climate		Noise & Vibration		Waste		Landscape(Townscape) & Visual		Cultural Heritage		Architectural Heritage		Material Assets		Traffic & Transport		Major Accidents and / or Disasters	
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Waste																														
Landscape(Townscape) &Visual																														
Cultural Heritage																														
Architectural Heritage																														
Material Assets																														
Traffic & Transport																														
Major Accidents and / or																														

Notes: This matrix should be read down, starting with each topic identified across the top. □□= significant interaction between. Blank cells indicate no or weak interaction. Con. = Construction phase. Op. = Operational phase.

20.4.1.1 Interactions between Population and Air Quality, Noise and Vibration and Landscape (Townscape) and Visual

Chapter 10 (Population) of this EIAR assesses impacts on amenity, which involves an assessment of the interactions between Landscape (Townscape) & Visual, Air Quality, Noise and Vibration. It therefore inherently addresses environmental interactions during both the Construction and Operational Phases. Reference should be made to Chapter 10 (Population) of this EIA for the assessments on commercial and community amenity. Visual impacts and landscape impacts on properties have been assessed in Chapter 16 (Landscape (Townscape) & Visual) of this EIAR.

20.4.1.2 Interactions between Human Health, Land, Soils, Geology & Hydrogeology, Water, and Air Quality and Noise &Vibration

The quality of the environment, including exposure to pollution and environmental hazards, is an important consideration in health protection. The Human Health assessment reported in Chapter 11 of this EIAR has considered the interaction of these environmental factors on human health.

Chapter 11 (Human Health) of this EIAR has assessed the interaction between Air Quality (Chapter 7) and Noise and Vibration (Chapter 8) and Human Health(Chapter 11) of this EIAR. Reference should be made to Chapter 11 (Human Health) for an assessment of potential health outcomes linked with these issues during the Construction and Operational Phases.

Chapter 13 (Water) of this EIAR assesses a variety of potential impacts on water including impacts on water quality and impacts on flood risk, both of which have an interaction with human health.

Chapter 14 (Land, Soils, Geology & Hydrogeology) of this EIAR assesses the potential for the excavation of contaminated ground, which can pose an environmental health hazard.

20.4.1.3 Interactions between Human Health and Landscape (Townscape) and Visual

The assessment of Human Health (Chapter 11) has an indirect interaction between Landscape (Townscape) and Visual (Chapter 16) via the assessment of amenity in Chapter 10 (Population) of this EIAR.

20.4.1.4 Interactions between Traffic & Transport and Material Assets

Material assets are resources of both natural and human origin that have intrinsic value. Chapter 18 (Material Assets) of this EIAR provides an assessment of impacts on major infrastructure and utilities and imported materials.

The chapter notes that other types of material assets are assessed in other chapters of the EIAR, for example, roads and traffic are assessed in Chapter 6 (Traffic & Transport).

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

There is significant interaction between these topics. The Traffic and Transport assessment has informed the assessments of Population, Human Health, Air Quality and Noise and Vibration. The Population assessment has considered effects on accessibility which directly interacts with Traffic and Transport. The Population assessment has also assessed effects on amenity which relate to traffic emissions of air pollution and noise, which indirectly interact with Traffic and Transport. The Human Health assessment has considered the evidence of associations with health outcomes from exposure to air pollution, traffic noise as well as changes to wider determinants of health such as traffic and transport, and access. It is considered that the key interactions for both Construction and Operational Phases, are inherently captured across Chapter 6 (Traffic & Transport), Chapter 7 (Air Quality), Chapter 9 (Noise & Vibration), Chapter 10 (Population) and Chapter 11 (Human Health) of this EIAR.

20.4.1.6 Interactions between Biodiversity, Traffic and Transport, Land, Soils, Geology and Hydrogeology; Water; and Air Quality; Noise and Vibration and, Landscape (Townscape) & Visual

The biodiversity assessment has considered the interactions between species, habitats and various other environmental issues. Specifically, there is an interaction between Traffic and Transport and mortality risk for species. There is an interaction between Water, Air Quality and Biodiversity as declines in surface water pollution and air pollution can contribute to habitat degradation. Non-native invasive plant species can be spread through soils, and also contribute to habitat degradation, meaning there is an interaction with Biodiversity. Some trees and areas of other planting will be removed during the Construction Phase as set out in in Chapter 16 (Landscape (Townscape) & Visual) of this EIAR. However, the Proposed Scheme also includes for replacement and new trees and other planting, with associated opportunities for enhancement of local biodiversity. While it will take time for new trees to establish and mature, no significant medium or long-term impact arises from the interrelationship between biodiversity and landscape and visual factors. Chapter 12 (Biodiversity) of this EIAR describes and assesses how different impacts of the Proposed Scheme on traffic, water, soils, air quality, noise and landscape may interact with biodiversity interests. Reference should be made to Chapter 12 (Biodiversity) of this EIAR to understand those interactions.

20.4.1.7 Interactions between Land, Soils, Geology and Hydrogeology and Water

There is an interaction between Chapter 14 (Land, Soils, Geology & Hydrogeology) and Chapter 13 (Water) of this EIAR. Chapter 14 (Land, Soils, Geology & Hydrogeology) assesses potential pollution of groundwater and watercourses from potential land contamination. There is therefore a potential interaction between land contamination and surface water. Surface water is interlinked with hydrogeology, so while impacts on these issues are assessed in separate chapters, there is an interrelationship. It is considered that these interactions are captured within Chapter 14 (Land, Soils, Geology & Hydrogeology) and Chapter 13 (Water) since they are intrinsic to the assessments.

20.4.1.8 Interactions between Land, Soils, Geology & Hydrogeology, Waste & Resources and Material Assets

The main interaction between these topics will be during the Construction Phase.

Chapter 18 (Material Assets) assesses the impact of imported materials, whereas Chapter 17 (Waste & Resources) assesses the use of site-won materials which can be re-used within the Proposed Scheme. There is an interaction between these issues as the amount of material to be imported will depend on the amount of material which can be recovered and re-used on-site. Chapter 14 (Land, Soils, Geology & Hydrogeology) provides an assessment of impacts on soils, including potentially contaminated land. There is an interaction between this issue and waste because the likelihood of excavated materials being suitable for use on site will depend on whether or not it is contaminated, and the type of contamination. One of the main reasons for undertaking any excavation of soils as part of the Proposed Scheme is to allow for utility diversions. The need to utility diversions is assessed in Chapter 18 (Material Assets), whereas the likelihood of encountering contaminated materials from this activity is assessed in Chapter 14 (Land, Soils, Geology & Hydrogeology).

20.4.1.9 Interactions between Water and Traffic & Transport

Chapter 13 (Water) identifies the potential impact from the interaction between traffic and transport and the water environment. It refers to traffic modelling described in Chapter 6 (Traffic & Transport) to inform the likelihood of a significant impact on pollutants and sediment from road surface run-off.

20.4.1.10 Interactions between Climate, Air Quality, Material Assets, Waste & Resources and Traffic & Transport

Chapter 8 (Climate) provides an assessment of the effects of the Proposed Scheme on greenhouse gas (GHG) emissions.

There is an interaction between Climate and Material Assets as the amount of material to be imported, and waste generated during construction of the Proposed Scheme, influences the embodied carbon footprint of the Proposed Scheme, which is assessed in Chapter 8 (Climate).

The redistribution of traffic associated with the traffic management during the operational phase (Chapter 6 (Traffic & Transport)), will also generate GHG emissions, which has informed the assessment in Chapter 8 (Climate).

20.4.1.11 Interactions between Climate and Water

The impact of climate change is considered in the flood risk assessment (Appendix 13.1 in Volume 4 of this EIAR), which is summarised in Chapter 13 (Water) and Chapter 8 (Climate). The interaction between climate change and flood risk is therefore captured in these assessments.

20.4.1.12 Interactions between Landscape (Townscape) & Visual

As an environmental factor landscape and visual considerations have natural relationships with all other environmental factors. Some are clearly direct relationships, e.g., population and visual impacts; biodiversity and landscape; land, soils and water and landscape; or the setting around features of cultural heritage etc. Others may be indirect, e.g. human health, air quality, material assets and landscape and visual aspects. Wherever possible these potential interactions have been incorporated into the landscape and visual impact assessment presented in Chapter 16 (Landscape (Townscape) & Visual.

20.4.1.13 Risk of Major Accidents and / or Disasters and other topics

Chapter 19 (Risk of Major Accidents and / or Disasters) inherently considers several potential interactions. For example, it assesses the risk of impacts on or from utilities (interacting with Chapter 18 (Material Assets)) such as a gas mains strike. It assesses the risk of tree instability, which has an interaction between Chapter 16 (Landscape (Townscape) & Visual) and it assesses the risk of spreading invasive species which is interrelated with Chapter 12 (Biodiversity) and Chapter 14 (Land, Soils, Geology & Hydrogeology). Also related to Chapter 14 (Land, Soils, Geology & Hydrogeology) is the risk of encountering contaminated ground or materials. Chapter 19 (Risk of Major Accidents and / or Disasters) assesses the risk of extreme weather events, which are linked to Chapter 8 (Climate) and flood risk Chapter 13 (Water) and Appendix 13.1 in Volume 4 of this EIAR). The risk of a major road traffic event due to construction traffic is also assessed in Chapter 19 (Risk of Major Accidents and/or Disasters) which is an issue interrelated with Chapter 6 (Traffic and Transport) as well as Chapter 11 (Human Health). Since all identified risks have the potential to harm human health, the assessment in Chapter 19 (Risk of Major Accidents and / or Disasters) is strongly interrelated to human health.

20.5 Mitigation

20.5.1 Construction Phase

Appropriate construction planning of the Proposed Scheme and other nearby projects will mitigate potential cumulative impacts of general construction disruption on neighbouring communities.

Other major infrastructure projects could directly interface with the construction of the Proposed Scheme. Interface liaison will take place on a case-by-case basis through the GCC, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

20.5.2 Operational Phase

No significant negative effects over and above those considered in the standalone assessments for the operational phase were predicted in the cumulative impact assessment. No additional mitigation measures are considered necessary.

20.6 Summary of Residual Cumulative Impacts and Environmental Interactions

This chapter has identified and assessed the likely significant cumulative effects caused by the Proposed Scheme in combination with other existing and planned projects. This section provides a summary of the main effects predicted.

Significant environmental interactions occur between the topics of population, human health, air quality, noise and vibration and traffic and transport. The assessments made for each of those topics consider those interactions both directly and indirectly. As an environmental factor, landscape and visual considerations have natural relationships with all other environmental factors. Some are direct relationships, e.g., population and visual impacts; biodiversity and landscape; land, soils and water and landscape; or the setting around features of cultural heritage etc. Others may be indirect, e.g. human health, air quality and landscape, material assets and landscape and visual aspects. Wherever possible these potential interactions have been incorporated into the relevant assessments.

In brief, the Proposed Scheme will provide for considerable journey time reliability for existing bus services coming into and running through the city centre while also cumulatively complementing the proposed new City bus network cross-city spine routes, proposed as part of the Galway Transport Strategy (GTS, 2016). The city bus network routes will be designed to coalesce along this high-quality corridor, providing high-frequency services with journey time reliability and opportunities for interchange.

The Proposed Scheme will ensure that public transport services can access key areas such as the retail and recreational centre of the city; public transport hubs at the rail and bus stations; City and County Halls; along with the city centre hotels and Bed & Breakfasts on College Road to the east of the city centre and key areas such as University Hospital Galway, NUI Galway, the Sportsgrounds and the Galway Cathedral.

The Proposed Scheme will include reconfiguration of traffic movements to facilitate improved pedestrian, cyclist and bus accessibility and movement, infrastructural works at certain roads and junctions, and improvements to the public realm at a number of locations within the city centre, including Eyre Square North, Woodquay and in the vicinity of Galway Cathedral.

20.7 References

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National Transport Authority project website https://www.nationaltransport.ie/planning-and-investment/transport-investment/projects/, provides detail

Project Ireland 2040 website gov.ie - https://www.gov.ie/en/campaigns/09022006-project-ireland-2040/

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Directives and Legislation

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Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment.

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU.

Chapter 21
Summary of Mitigation & Monitoring Measures

Contents

21 Summary of Mitigation & Monitoring Measures

21.1 Introduction

The purpose of this Chapter is to collate the mitigation and monitoring measures identified in the Environmental Impact Assessment Report (EIAR) that are considered necessary to protect the environment, prior to the commencement of, and throughout the duration of the Construction and / or Operational Phases of the BusConnects Galway: Cross-City Link (University Road to Dublin Road) (hereafter referred to as the Proposed Scheme).

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process have been incorporated, where appropriate.

As described throughout this EIAR, the design of the Proposed Scheme has been progressed taking account of environmental constraints and considerations that have been identified in assessments. This has enabled the avoidance of potential environmental impacts, wherever possible.

21.2 Mitigation and Monitoring Schedules

Mitigation and monitoring measures have been identified as environmental commitments and overarching requirements which shall avoid, reduce or offset potential impacts.

Mitigation and monitoring measures specified within the EIAR technical assessments are also provided in Chapter 6 to Chapter 20 of this EIAR.

The timing and implementation of the mitigation and monitoring measures are indicated within this Chapter as either the:

- Construction Phase: The undertaking of physical works to construct elements of the Proposed Scheme, as outlined in Chapter 4 (Proposed Scheme Description) of this EIAR; and
- Operational Phase: When the Proposed Scheme comes into operation, (including any mitigation associated with planned maintenance).

The following tables summarise the Construction and Operational phase mitigation outlined in the relevant EIAR technical assessments but should be read in conjunction with the mitigation outlined in the specific chapter and also with the Construction Environmental Management Plan (CEMP) in Volume 4 of this EIAR (note that the CEMP summarises the Construction Phase mitigation only).

Where appropriate the location to which the mitigation relates to is identified and where the mitigation measure is scheme wide the location is given as ‘throughout (as required)’. Note that in certain instances, a mitigation measure may be relevant to more than one environmental aspect (e.g., Mitigation Number WT2 is also a mitigation measure relevant to Biodiversity).

Where possible, environmental monitoring data will be made publicly available.

21.3 General Mitigation Requirements

Table 21.1: General Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
GEN1	Section 5.10	Throughout (as required)	The mitigation and monitoring measures appropriate to the construction contract summarised in this chapter have been included in the Construction Environmental Management Plan (CEMP) and its associated management plans (provided in Appendix 5.1 in Volume 4 of this EIAR).	**Construction**

21.4 Traffic & Transport

Table 21.2: Traffic and Transport Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
TT1	6.6	Throughout (as required)	A Construction Environmental Management Plan (CEMP) has been prepared (included as Appendix 5.1 in Volume 4 of this EIAR) and will be implemented (and developed further as required) by the appointed contractor. A detailed Construction Traffic Management Plan has been prepared and will subsequently be updated by the contractor prior to construction, including Temporary Traffic Management arrangement prepared in accordance with Department of Transport's 'Traffic Signs Manual, Chapter 8 Temporary Traffic Measures and Signs for Roadworks'. The plan will be agreed with GCC and will include measures to minimise the impacts associated with the Construction Phase upon the peak periods of the day.	**Construction**

21.5 Air Quality

Table 21.3: Air Quality Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
AQ1	7.5.1	Construction Compound and throughout (as required)	A series of mitigation measures will be implemented by the appointed contractor to reduce the dust nuisance impacts: • Fully enclose structures with screens during demolition to minimise dust dispersion; • Public roads outside the Proposed Scheme will be regularly inspected for cleanliness and cleaned as necessary; • Material handling systems and stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays (or similar dust suppression methods) will be used as required if particularly dusty activities associated with the construction contract are necessary during dry or windy periods; • During movement of dust generating materials both on and off-site, trucks will be covered with tarpaulin and before entrance onto public roads, trucks will be checked to ensure the tarpaulins are properly in place; • The appointed contractor will provide a site hoarding of 2.4m height along boundaries where works are taking place adjacent to ecological sensitive receptors(Lough Atalia and Lough Corrib) and at the Harbour Construction Compounds, which will assist in minimising the potential for dust impacts off-site. The appointed contractor will keep the effectiveness of the mitigation measures under review and revise them as necessary. In the event of dust nuisance occurring outside the works boundary associated with the Proposed Scheme occurring outside the works boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem.	**Construction**
AQ2	7.5.1.2	Throughout (as required)	The following monitoring measures, will be implemented for the construction phase of the proposed development:	

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			• The contractor will undertake on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to Galway City Council on request. The frequency of the inspections will be increased during site activities with a high potential to produce dust are being carried out. • Dust monitoring will be undertaken at the three nearest sensitive receptors (with agreement from the landowner) to the works during the construction phase. The TA Luft dust deposition limit values of 350 mg/m^2/day applied as a 30-day average. • The monitoring measures are included in the Construction Environmental Management Plan (CEMP) (Appendix 5.1 of Volume 4 of this EIAR).	

21.6 Climate

Table 21.4: Climate Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
CL1	8.6.1	Throughout (as required)	A series of mitigation measures have been incorporated into the Proposed Scheme with the goal of reducing the embodied carbon associated with the Construction Phase. These mitigation measures include: • The replacement, where feasible, of concrete containing Portland cement with concrete containing ground granulated blast furnace slag (GGBS); • The Proposed Scheme will minimise wastage of materials due to poor timing or over ordering on site thus helping to minimise the embodied carbon footprint of the Proposed Scheme;	**Construction**

			• Where practicable, opportunities for materials reuse will be incorporated within the extent of the Proposed Scheme including the use of reclaimed asphalt and recycled aggregate; and • Where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport.	

21.7 Noise & Vibration

Table 21.5: Noise and Vibration Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
NV1	9.5.1.1	Throughout (as required)	The appointed contractor will be required to take specific noise abatement measures to the extent required and comply with the recommendations of BS 5228–1 (BSI 2014a) and European Communities Noise Emissions by Equipment for Use Outdoors (Amendment) Regulations 2006 (S.I. No 241/2006). The mitigation measures outlined below for the Construction Phase have also been included in the Construction and Environmental Management Plan (Appendix 5.1 in Volume 4 of this EIAR). These measures will ensure that: • During the Construction Phase, the appointed contractor will be required to manage the works to comply with the limits detailed in Section 9.2.4.1 in Chapter 9 (Noise and Vibration) of this EIAR using methods outlined in BS 5228–1 (BSI 2014a); • The best means practicable, including proper maintenance of plant and equipment, will be employed to minimise the noise produced by on site operations.	**Construction**
NV2	9.5.1.1	Throughout (as required)	The appointed contractor will put in place the most appropriate noise control measures depending on the level of noise reduction required at individual working areas i.e., based on the construction threshold values for noise and vibration set out in Table 9.5 and Table 9.8 in Chapter 9 of this EIAR. Reference to Table 9.25 in Chapter 9 of this EIAR indicates that intrusive works occurring within 70 m of NSLs will need specific noise control measures to reduce impacts depending on time period over which they will occur, i.e. daytime or evening.	**Construction**
NV3	9.5.1.1	Throughout (as required)	The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item of plant will be selected wherever practicable. Should a particular item of plant already on the site be found to generate unexpectedly high noise levels, the first action will be to identify whether or not the item can be replaced with a quieter alternative. For static plant such as compressors and generators used at work	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			areas such as Construction Compounds etc., the units will be supplied with manufacturers' proprietary acoustic enclosures where practicable. The contractor will evaluate the choice of excavation, breaking or other working method taking into account various ground conditions and site constraints. Where possible, where alternative lower noise generating equipment are available that will provide structural / excavation / breaking results, these will be selected to minimise potential disturbance.	
NV4	9.5.1.1	Construction Compound and throughout (as required)	The following measures will be implemented by the appointed contractor to control noise levels at source in order to remain below the threshold values for noise set out in Table 9.5 in Chapter 9 (Noise and Vibration) of this EIAR, which relate to specific site considerations: • For mobile plant items such as dump trucks, planers, excavators and loaders, the installation of an acoustic exhaust, utilising an acoustic canopy to replace the normal engine cover and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB; • For percussive tools such as pneumatic concrete breakers and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensuring any leaks in the air lines are sealed; • Construction Compounds are located in close proximity to NSLs (refer to Table 9.24 in Chapter 9 (Noise and Vibration of this EIAR) and will therefore incorporate a strict noise control policy relating to materials handling. Noisy items of plant will be sited away from noise sensitive boundaries. • Where compressors, generators and pumps are located in proximity to NSLs and have potential to exceed the construction noise thresholds, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation; and • Resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds, while other noise nuisance can be controlled by fixing resilient materials in between the surfaces in contact.	**Construction**
NV5	9.5.1.1	Throughout (as required)	Erection of localised demountable enclosures or screens will be used around breakers or drill bits, as required, when in operation in proximity to NSLs boundaries with the potential to exceed the construction noise thresholds. Annex B of BS 5228–1 (BSI 2014a) (Figures B1, B2 and B3) provide typical details for temporary and mobile acoustic screens, sheds and enclosures that can be constructed on site from standard materials.	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
NV6	9.5.1.1	Construction Compound	The appointed contractor will provide a site hoarding of 2.4m height along noise sensitive boundaries, at a minimum, at the Construction Compounds.	**Construction**
NV7	9.5.1.1	Construction Compound	Careful planning of the Construction Compounds including the placement of site buildings such as offices and stores between the site and noise sensitive locations will also be considered by the appointed contractor.	**Construction**
NV8	9.5.1.1	Throughout (as required)	It is generally envisaged that construction working hours will be between 07:00hrs and 19:00hrs on weekdays. Night-time, Saturday and Sunday working will be required during certain periods in order to minimise the impact on road traffic movement during the daytime. The planning of such works will take consideration of sensitive receptors, in particular any nearby residential areas.	**Construction**
NV9	9.5.1.1	Throughout (as required)	Construction activities will be scheduled in a manner that reflects the location of the site and the nature of neighbouring properties. Construction activities / plant items will be considered with respect to their potential to exceed construction noise thresholds at NSLs and will be scheduled according to their noise level, proximity to sensitive locations and possible options for noise control. In situations where an activity with potential for exceedance of construction noise thresholds is scheduled (e.g. road widening and utility diversions or activities with similar noise levels identified in Table 9.25 in Chapter 9 (Noise & Vibration) of this EIAR) other construction activities will be scheduled to not result in significant cumulative noise levels.	**Construction**
NV10	9.5.1.1	Throughout (as required)	GCC will establish clear forms of communication that will involve the appointed contractor and NSLs in proximity to the works so that residents or building occupants are aware of the likely duration of activities likely to generate noise or vibration that are potentially significant as set out in Table 9.5 and Table 9.8 in Chapter 9 (Noise & Vibration) this of this EIAR.	**Construction**
NV11	9.5.1.1	Throughout (as required)	During the Construction Phase noise monitoring will be undertaken at representative NSLs to evaluate and inform the requirement and/ or implementation of noise management measures. Noise monitoring will be conducted in accordance with ISO 1996–1 (ISO 2016) and ISO 1996–2 (ISO 2017). The selection of monitoring locations will be based on the nearest representative NSLs to the working area which will progress along the length of the Proposed Scheme.	**Construction**
NV12	9.5.1.2	Throughout (as required)	In the case of vibration levels giving rise to human discomfort, to minimise such impacts the appointed contractor will implement the following mitigation measures during the Construction Phase: • A clear communication programme will be established by GCC to inform adjacent building occupants in advance of any potential intrusive works which may give rise to vibration levels likely to result in significant effects as per Table 9.9 in Chapter 9 (Noise & Vibration) EIAR;	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			• Activities capable of generating significant vibration effects with respect to human response (as per Table 9.9 in Chapter 9 (Noise & Vibration) of this EIAR) will be restricted to daytime hours only, as far as practicable; and • Appropriate vibration isolation shall be applied to plant (such as resilient mounts to pumps and generators), where required and where feasible.	

21.8 Population

Table 21.6: Population Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
P1	n/a	n/a	No additional mitigation or monitoring measures are considered necessary beyond those already identified in other environmental assessments	**n/a**

21.9 Human Health

Table 21.7: Human Health Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
HH1	11.5	Throughout (as required)	Any mitigation or monitoring requirements in relation to effects on human health are properly addressed by the measures set out in the chapters which assess effects on the vectors through which the scheme has potential to cause likely and significant effects on human health.	**Construction**

21.10 Biodiversity

Table 21.8: Biodiversity Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
BD1	12.6.1	Throughout (as required)	The Contractor will be required to enforce the CEMP which will include the following construction management measures. An Ecological Clerk of Works (EcOW) will be employed to maintain a watching brief on the proposed mitigation measures included for the protection of European sites.	**Construction**
BD2	12.6.1.1	Throughout (as required)	**Environmental Incident Response Plan** In the event of an environmental emergency, all personnel will react quickly and adhere to the Environmental Incident Response Plan procedure, refer to Section 5.6 of the CEMP included in Appendix 5.1 of Volume 4 of this EIAR (to be updated by the Contractor). The following outlines the information on the types of emergency which must be communicated to site staff: • Release of hazardous substance – fuel or oil spill. • Concrete spill or release of concrete. • Flood event – extreme rainfall or rising river level event. • Environmental buffers and exclusion zones breach. • Housekeeping of materials and waste storage areas breach. • Stop work orders due to environmental issue or concern (e.g. threat to ecological feature).	**Construction**
BD3	12.6.1.2	Throughout (as required)	**Invasive Species Management Plan** Refer to the CEMP (Appendix 5.1 of Volume 4 this EIAR) for full details on the management of the potential for invasive species.	**Construction**
BD4	12.6.1.3	Throughout (as required)	**Habitats & Flora**	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			In general, with regard to biodiversity any felling of trees will take place outside the Bird nesting season March 1st to August 31st.	
BD5	12.6.1.4	Construction Compounds and throughout (as required)	**Habitat Degradation – Surface Water Quality** The CEMP includes specific management measures for the prevention of the pollution of water courses from dust, suspended solids or chemicals. These measures accord with the principles set out in industry guidelines including CIRIA's report 'C532: Control of water pollution from construction sites'. The following mitigation measures will be employed: **River Corrib at Salmon Weir Bridge** • As a precaution, the control of dust emissions will be enforced by providing a suitable barrier to prevent dust entering the River Corrib at the Salmon Weir Bridge for the length of the Scheme required to prevent emissions to Persse's Distillery river, the main channel of the river and Friar's River at Newtownsmith from the proposed disturbance area. The barrier will be inspected on a weekly basis for gaps or displacement and reinstated when required. • A record of inspection and efficacy of the barrier will be noted in the printed version of the CEMP as an inspection sheet. The record of inspections will be maintained on site and will be available upon request by relevant authorities. • Details of the dust minimisation measures are included in a Construction and Demolition Resource and Waste Management Plan, as described in the CEMP. **University Road at Ward's Shop** • The control of surface water discharge will be enforced by providing a suitable barrier to prevent surface water entering the Eglinton Canal at gaps in the boundary wall leading to the canal and for the length of canal required to prevent drainage to the canal from the proposed disturbance area. The barrier will comprise a silt fence placed	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			with sand bags or a suitable supporting frame. The silt fence will be inspected on a weekly basis for gaps or displacement and reinstated when required. • A record of inspection and efficacy of the barrier will be noted in the printed version of the CEMP as an inspection sheet. The record of inspections will be maintained on site and will be available upon request by relevant authorities. **Lough Atalia Playground Outfall** • The works at Lough Atalia Playground will avoid potential disturbance to wintering birds by undertaking the works outside the Winter bird period October to March. • The works at Lough Atalia Playground will be timed to avoid 'spring' high water times and inclement weather (southerly/south-westerly winds) in order to avoid washing of surface water to the sea. Tide times are available from several websites. The delay time for the ebb and flow time to Lough Atalia will be determined by the Contractor or representative Resident Engineer. • The control of surface water discharge will be enforced by firstly providing a temporary sandbag dam at the headwall of the proposed outfall prior to work commencing in this area at low tide. The temporary dam will comprise 1 tonne bags (or similar suitable size) placed at low tide at the foot of the rock armour berm in this area. A silt fence or suitable geotextile barrier will be placed inside the dam and secured using smaller sandbags as required to form an impermeable barrier to prevent hydrocarbon and contaminated surface water runoff to Lough Atalia. • The control of surface water discharge will be enforced by providing a suitable barrier to prevent surface water entering Lough Atalia in the proposed trench leading to the outfall. The barrier will comprise a silt fence placed with sand bags or a suitable supporting frame. A typical silt fence consists of a piece of synthetic filter fabric (also called a geotextile) stretched between a series of wooden or metal fence stakes along a horizontal contour level, (see Diagram 12.12 in Chapter 12 (Biodiversity) of the EIAR) for sample details. The stakes will be installed on the downhill side of the fence, and the bottom edge of the fabric will be trenched into the soil and backfilled on the uphill side. The fence will be installed on a site before soil disturbance begins and is placed down-slope from the disturbance area. The design/placement of the silt fence will create a pooling of runoff, which then allows sedimentation to occur. The silt fence fabric becomes "blocked off" with fine soil particles and clean water can seep through the fabric. The silt fence will be inspected on a weekly basis for gaps or displacement and reinstated when required.	

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			• A record of inspection and efficacy will be noted in the printed version of the CEMP as an inspection sheet. The record of inspections will be maintained on site and will be available upon request by relevant authorities. **Lough Atalia adjacent to the Dublin Road** • The works at the Lough Atalia Dublin Road area will be timed to avoid 'spring' high water times and inclement weather (southerly/south-westerly winds) in order to avoid washing of surface water to the sea. Tide times are available from several websites. The delay time for the ebb and flow time to Lough Atalia will be determined by the Contractor or representative Resident Engineer. • The control of surface water discharge will be enforced by providing a suitable barrier to prevent surface water entering Lough Atalia. The barrier will comprise a silt fence placed with sand bags or a suitable supporting frame such as a staked fence. A typical silt fence consists of a piece of synthetic filter fabric (also called a geotextile) stretched between a series of wooden or metal fence stakes along a horizontal contour level, (see Diagram 12.12 in Chapter 12 (Biodiversity) of the EIAR) for sample details. The stakes will be installed on the downhill side of the fence, and the bottom edge of the fabric can be trenched into the soil and backfilled on the uphill side. The fence will be installed on a site before soil disturbance begins and is placed down-slope from the disturbance area. The design/placement of the silt fence should create a pooling of runoff, which then allows sedimentation to occur. The silt fence fabric becomes "blocked off" with fine soil particles and clean water can seep through the fabric. • The silt fence will be inspected on a weekly basis for gaps or displacement and reinstated when required. • A record of inspection and efficacy will be noted in the printed version of the CEMP as an inspection sheet. The record of inspections will be maintained on site and will be available upon request by relevant authorities. **All Working Areas adjacent to water courses/water bodies** • Tools and equipment will not be cleaned in grassland or aquatic areas. • Chemicals used will be stored in sealed containers. • Chemicals shall be applied in such a way as to avoid any spillage or leakage.	

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			• All refuelling, oiling and greasing will take place above drip trays or on an impermeable surface which provides protection to underground strata and away from grassland as far as reasonably practicable. Vehicles will not be left unattended during refuelling. • All plant shall be well maintained with any fuel or oil drips attended to on an ongoing basis. • Any minor spillage during this process will be cleaned up immediately. • Best practice in bulk-liquid concrete management addressing pouring and handling, secure shuttering / form-work, adequate curing times will be implemented. • Wash water from cleaning ready mix concrete lorries and mixers may be contaminated with cement and is therefore highly alkaline, therefore, washing will not be permitted on site. • Disposal of raw or uncured waste concrete will be controlled to ensure that the aquatic environment will not be impacted. For the management of excavation and spoil, the Contractor will: • Ensure all spoil and excavated materials will be stored in the construction compound or removed to an appropriate waste facility; • Ensure stockpiles and adjacent features of drainage infrastructure will be monitored and maintained appropriately; • Erect all protective fencing; • Implement the Surface Water Management Plan (including the installation of drainage infrastructure) as detailed in the CEMP (Appendix 5.1 in Volume 4 of this EIAR) prior to excavation and include areas dedicated to spoil storage with the drainage infrastructure; and • The Construction and Demolition Resource and Waste Management Plan, as described in the CEMP (Appendix 5.1 in Volume 4 of this EIAR) identifies any material such as dust, sand, rubble, concrete that may be generated during demolition works and address its storage and appropriate removal from the site to avoid pathways identified as having connectivity with the River Corrib. Site personnel will be trained in the importance of preventing pollution and the mitigation measures described here to ensure same. A record of this training will be maintained.	

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			The Construction Environmental Management Plan will be read and signed by the Contractor/Site Foreman and made available to the EcOW.	
BD6	12.6.1.5	Throughout (as required)	**Otters** A worst-case scenario may be considered where a pollution event would indirectly affect otters or food availability to otters. The Construction Environmental Management Plan (refer to Appendix 5.1 of Volume 4 of this EIAR) which includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals.	**Construction**
BD7	12.6.1.5	Throughout (as required)	**Bats** Ground level potential roost feature surveys conducted on trees within the study did not reveal any roosting bats. There are no further requirements for mitigation for bats. The roofs of buildings at the Headford Road and St. Brendan's Avenue are relatively recently upgraded and well-sealed with limited access for bats. However, as a precaution, an internal inspection of the attic spaces will be undertaken at an appropriate time prior to demolition in order to rule out the presence of bats. If any are recorded, specific mitigation measures which may require a derogation licence from the NPWS will be implemented.	**Construction**
BD8	12.6.1.5	Throughout (as required)	**Seals** A worst-case scenario may be considered where a pollution event would indirectly affect otters of food availability to seals. The Construction Environmental Management Plan (refer to Appendix 5.1 of Volume 4 of this EIAR) includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals.	**Construction**
BD9	12.6.1.5	Throughout (as required)	**Salmonids** A worst-case scenario may be considered where a pollution event would affect water quality and threaten salmonids. The Construction Environmental Management Plan (refer to Appendix 5.1 of Volume 4 of this EIAR) includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals.	**Construction**
BD10	12.6.1.5	Throughout (as required)	**Lamprey**	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			A worst-case scenario may be considered where a pollution event would indirectly affect lampreys. The Construction Environmental Management Plan (refer to Appendix 5.1 of Volume 4 of this EIAR) includes specific management measures for the prevention of the pollution of water courses from suspended solids or chemicals.	
BD11	12.6.1.5	Lough Atalia Playground	**Birds** Disturbance / Displacement Any felling, clearing or pruning of vegetation will take place outside the Bird nesting season March 1st to August 31st. The proposed works at the outfall at Lough Atalia Playground have the potential to disturb wintering birds in these areas. Potential impacts will be avoided by undertaking the works at Lough Atalia Playground outside the Winter bird period October to March.	**Construction**
BD12	12.6.2	Throughout (as required)	**Aquatic Environment** The Proposed Scheme will incorporate SuDS features in order to improve water quality and reduce the quantity of surface water discharging into the receiving system.	**Operational**
BD13	12.6.3.1	Throughout (as required)	An initial site environmental induction and ongoing training will be provided to communicate the main provisions of this environmental plan to all site personnel. Two-way communication will be encouraged to promote a culture of environmental protection. The following outlines the information which must be communicated to site staff: • Environmental procedures of the CEMP. • Environmental buffers and exclusion zones. • Housekeeping of materials and waste storage areas. • Environmental emergency response plan.	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			Prior to any works, all personnel will receive an on-site induction relating to operations adjacent to watercourses and the environmentally sensitive nature of the River Corrib and to re-emphasise the precautions that are required as well as the construction management measures to be implemented. Galway City Council will also ensure that the engineer setting out the works is fully aware of the ecological constraints and construction management requirements.	

21.11 Water

Table 21.9: Water Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
WT1	13.5	Throughout as required	Construction works will take place in accordance with the Construction Environmental Management Plan (CEMP) which will be developed by the appointed contractor (an Outline CEMP is included in Appendix 5.1 in Volume 4 of the EIAR). The outline Surface Water Management Plan (SWMP), which will form part of the CEMP sets out the mitigation and monitoring measures that are in place to minimise pollution discharge into local water courses.	**Construction**
WT2	13.5.1	Throughout (as required)	The mitigation measures proposed for management of surface runoff are generally contained in good practice guidance documents that should be adhered to during the construction over or near water bodies. Some of the relevant guidance documents include: • Guidelines on Protection of Fisheries During Construction Works in and adjacent to Waters - Inland Fisheries Ireland, 2016; • CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors; and • CIRIA C648 Control of Water Pollution from Constructional Sites	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			Following on from the above guidelines, the following general and specific mitigation measures are outlined: • Appropriate timing of the works to avoid flooding seasons and water pollution incidents; • A site boundary fence will be constructed around the construction footprint with adequate vegetation buffer to prevent unintentional discharge to adjacent watercourses; • A silt fence will be used during construction at the outfall at Lough Atalia where a sediment laden runoff is likely to be generated; • While working near water bodies (Corrib River and Lough Atalia), it is required to capture and treat all surface runoff before discharging to these water bodies; • Sampling and monitoring of storm water discharges from construction sites, the need, location, and frequency as determined by the Environmental Clerk of Works (ECoW). Parameters of interest may include Turbidity (or TSS), pH, and hydrocarbons. A SWMP is provided as part of the CEMP. The CEMP includes a list of control measures to be implemented during the Construction Phase: • A requirement for an Emergency Incident Response Plan (EIRP); • Construction Compound management including the storage of fuels and materials; • Control of sediment generation and discharge; • Provision of SUDs (attenuation pond and petrol interceptor) before discharge to the receiving waters; • Use of pre cast concrete where possible or construction method to be approved by the ECoW; and • Management of vehicles and plant including refuelling and wheel wash facilities – spills and discharge are contained and prevented from entering the surface water receptor.	
WT3	13.5.1	Throughout (as required)	As outlined in the SWMP, the Appointed Contractor shall carry out visual monitoring of surface water control measures (settlement tanks, silt fences, fuel storage areas etc.) on a daily basis. In addition, weekly visual	

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			inspections of the water bodies in proximity to Proposed Scheme will be carried out by the Appointed Contractor. Refer to the CEMP for further information.	
WT4	13.5.2	Throughout (as required)	In the Operational Phase the infrastructure including the maintenance regime for SuDS (Swales and Raingardens) will be maintained by the local authority and will be subject to their management procedures.	**Operational**

21.12 Land, Soils, Geology & Hydrogeology

Table 21.10: Land, Soils, Geology and Hydrogeology Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
LSGH1	14.5.1.1	Throughout (as required)	Loss or Damage of Topsoil The appointed contractor will ensure that excavations shall be kept to a minimum, using shoring or trench boxes where appropriate. For more extensive excavations, a temporary works designer shall be appointed by the appointed contractor to design excavation support measures in accordance with all relevant guidelines that minimises the excavation of contaminated ground.	**Construction**
LSGH2	14.5.1.1	Throughout (as required)	Loss or Damage of Topsoil The appointed contractor will be responsible for regular testing of excavated soils to monitor the suitability of the soil for reuse.	**Construction**
LSGH3	14.5.1.1	Throughout (as required)	Loss or Damage of Topsoil Samples of ground suspected of contamination will be tested for contamination by the appointed contractor during the ground investigation and ground excavated from these areas will be disposed of to a suitably licensed or permitted site in accordance with the current Irish waste management legislation.	**Construction**
LSGH4	14.5.1.1	Throughout (as required)	Loss or Damage of Topsoil Any dewatering in areas of contaminated ground will be designed by the appointed contractor to minimise the mobilisation of contaminants into the surrounding environment.	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
LSGH5	14.5.1.2	Throughout (as required)	Pollution of Soil and Groundwater Good construction management practices, as outlined in the CIRIA guidance, Control of Water Pollution from Construction Sites – Guidance for consultants and contractors (Masters-Williams *et al*., 2001), will be employed by the appointed contractor to minimise the risk of transmission of hazardous materials as well as pollution of adjacent watercourses and groundwater.	**Construction**
LSGH6	14.5.1.2	Throughout (as required)	Pollution of Soil and Groundwater The construction management of the site by the appointed contractor will take account of the recommendations of the CIRIA guidance Control of Water Pollution from Construction Sites – Guidance for consultants and contractors (Masters-Williams et al., 2001) to minimise as far as possible the risk of soil, groundwater and surface water contamination.	
LSGH7	14.5.1.2	Construction Compounds and throughout (as required)	Pollution of Soil and Groundwater Measures to be implemented by the appointed contractor to minimise the risk of spills and contamination of soils and waters include: • Employing only competent and experienced workforce, and site-specific training of site managers, foremen and workforce, including all sub-contractors, in pollution risks and preventative measures; • Ensure that all areas where liquids (including fuel) are stored, or cleaning is carried out, are in designated impermeable areas that are isolated from the surrounding area and within a secondary containment system, e.g. by a roll-over bund, raised kerb, ramps or stepped access; • The location of any fuel storage facilities shall be considered in the design of the Construction Compounds. These are to be designed in accordance with relevant guidelines and codes of best practice and will be fully bunded; • Good housekeeping at the site (daily site clean-ups, use of disposal bins, etc.) during the entire Construction Phase; • All concrete mixing and batching activities will be located in areas away from watercourse and drains; • Potential pollutants to be adequately secured against vandalism; • Provision of proper containment of potential pollutants according to codes of best practice; • Thorough control during the entire Construction Phase to ensure that any spillage is identified at early stage and subsequently effectively contained and managed; and	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			• Spill kits will be provided and kept close to the storage area. Staff to be trained on how to use spill kits correctly.	
LSGH8	14.5.1.2	Throughout (as required)	An Environmental Incident Response Plan will be implemented by the appointed contractor, which will identify the actions to be taken in the event of a pollution incident. It will address such aspects as containment measures, emergency discharge routes, a list of appropriate equipment and clean-up materials and notification procedures to inform the relevant environmental protection authority. Refer to Appendix 5.1 CEMP in Volume 4 of this EIAR.	**Construction**
LSGH9	14.5.1.2	Throughout (as required)	Sediment control methods are outlined in the Surface Water Management Plan within the CEMP (Appendix 5.1 in Volume 4 of this EIAR) and these will be implemented by the appointed contractor.	**Construction**
LSGH10	14.5.1.4	Lough Atalia	<u>Pollution of Soil and Groundwater</u> As detailed in the Land Contamination Remedial Strategy (Appendix 14.5 of Volume 4) a risk assessment shall be carried out to establish a concentration of cadmium in the soil that does not present a risk to the quality of water entering Lough Atalia. Soil, groundwater and surface water verification testing shall be carried out by the contractor during the construction stage to confirm the findings of the risk assessment.	**Construction**

21.13 Archaeological Cultural Heritage & Architectural Heritage

Table 21.11: Archaeological Cultural Heritage & Architectural Heritage

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
ACHAH1	n/a	Throughout (as required)	GCC will procure the services of a suitably-qualified archaeologist as part of its Employer's Representative team administering and monitoring the works.	**Construction**
ACHAH2	15.6.1.1	Throughout (as required)	Works impacting the sites of the National Monument, comprising Galway Town Defences (AH13/BH75), will require Ministerial Consent. A wade survey and underwater archaeological assessment of the area surrounding the new outfall towards the northern end of Lough Atalia will be carried out by a suitably qualified archaeologist under licence to the DoHLGH. If any features of archaeological potential are identified by the survey and assessment further archaeological mitigation may be required, such as preservation in-situ or by record. All ground disturbances associated with the Proposed Scheme will be monitored by a suitably qualified archaeologist. If any features of archaeological potential are discovered during the course of the works further archaeological mitigation may be required, such as preservation in-situ or by record. Any further mitigation will require approval from the National Monuments Service of the DoHLGH.	**Construction**
ACHAH3	15.6.1.2	Throughout (as required)	Works impacting the National Monument comprising Galway Town Defences (AH13/BH75) will require Ministerial Consent. All statues/historic street furniture (BH44, BH52, BH67) and works along historic bridges, which fall within the Proposed Scheme area will require hoarding during construction to protect from potential damage during ground disturbances. If hoarding in-situ is not possible, the statues/street furniture will require careful removal by a conservation specialist to be stored securely and re-installed at an appropriate location, in consultation with the Galway Heritage Officer.	**Construction**
ACHAH4	15.6.1.2	Throughout (as required)	Grave monument BH65 falls wholly within the Proposed Scheme area and will require hoarding to prevent damage during groundworks.	**Construction**
ACHAH5	15.6.1.2	Throughout (as required)	BH47 (Ceannt Station – a short section of retaining wall). To be subject to a full written and measured survey prior to construction going ahead.	**Construction**

ACHAH6	15.6.1.3	Throughout (as required)	Where cultural heritage sites such as statues/historic street furniture (CH03, CH04, CH05) fall within the Proposed Scheme area they will require hoarding during works to protect from potential damage during ground disturbances. If hoarding in-situ is not possible, the items will require careful removal by a conservation specialist to be stored securely and re-installed at an appropriate location, in consultation with the Galway Heritage Officer.	**Construction**
ACHAH7	15.6.1.3	Throughout (as required)	A cobbled road surface to the front of Town Hall Theatre and historic paving/kerbing and bollards along St Vincents Street/Waterside/Courthouse Square (CH11) fall within the Proposed Scheme area. These features will be recorded and photographed before being lifted under supervision of a suitably qualified conservation specialist, for secure storage and re-use (where appropriate), in consultation with the Galway Heritage Officer. A full written and photographic record will be made of Eyre Square (CH10) and its current character and landscape layout. This will be carried out by a suitably qualified professional. Lough Atlia dock walls (CH12) will be hoarded off during construction and all excavation works to the rear of the wall supervised by an archaeologist. The methodology for repair of the dock wall will be agreed in advance with Galway Heritage Officer.	**Construction**
ACHAH8	15.6.2.1	Throughout (as required)	A full written and photographic record will be made of AH16 and its current character and landscape layout. This will be carried out by a suitably qualified professional.	**Operational**

21.14 Landscape (Townscape) & Visual

Table 21.12: Landscape (Townscape) and Visual Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
LV1	16.5.1.1	Throughout (as required)	Prior to the commencement of works, the appointed contractor will prepare a detailed Construction Environmental Management Plan (CEMP). The purpose of the CEMP is to ensure good working practices are implemented on site, including the mitigation measures set out in this chapter, thereby minimising and managing any potential negative environmental effects.	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
LV2	16.5.1.1	Throughout (as required)	In addition to the management of all construction works in accordance to best methodologies and practice, the following measures are proposed for the mitigation of landscape/townscape and visual impacts: • Retained existing trees, planting, features etc. will be protected with temporary protective fencing at the boundary of proposed works areas. Existing trees along will be protected with fencing in accordance with BS5837:2012: Trees in relation to Construction and TII's Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub. • Where existing trees, hedges, and/or plantings are removed from temporary acquisition areas, new planting and paving will be provided in replacement of those removed. In general, unless not feasible or practicable, new plant species will match that of those removed. Replacement plant sizes will be that readily available and therefore, is unlikely to match the maturity of plants removed (especially in the case of trees or larger plants). However, being of the same or similar species, maturity similar to that of the existing can be achieved in time. • New boundaries to match the existing will be established on the setback line to match the existing boundary. The construction and provision of the new boundaries is to take account of the location of existing trees, other plantings, gradients, drainage, property features and access arrangements so as to minimise additional indirect effects. • The Proposed Scheme will provide for the planting of new street trees both for mitigation of tree removal and for overall enhancement of streetscape environment. Species selected shall be appropriate to the urban street environment and to the characteristics of the specific location. This measure is applied along the full length of the Proposed Scheme. • Proposals for the treatment of the public realm within the streetscape effected by the Proposed Scheme will have regard to the existing character of the street or location, Galway Public Realm Strategy and to opportunities for enhancement of the public realm and the streetscape. Proposals will have regard to historic details and features,	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			to the quality of existing and proposed materials, to the reduction of clutter, ease of legibility, and management and maintenance requirements.	
LV3	16.5.1.2	Throughout (as required)	The design process of the Proposed Scheme has considered the potential for negative landscape / townscape and visual effects. Opportunities to avoid, reduce or remediate these have been taken wherever feasible, and landscape measures are integrated within the design as far as possible. It should be noted, that wherever feasible, the Proposed Scheme proposes improvements of the townscape / streetscape along the full length of the route.	**Operational**
LV4	16.5.1.3	Throughout (as required)	The works will have continuous monitoring under the Construction Environmental Management Plan to ensure adequate protection of trees, built heritage features., amenity and public realm areas outside of the construction works.	**Construction**
LV5	16.5.1.3	Throughout (as required)	Any construction within close proximity to the retained trees will be undertaken in accordance with approved method statements prepared by the construction contractor under the direct supervision of a suitably qualified consultant Arboriculturist. Therefore, during the construction works, a professionally qualified Arboriculturist is proposed to be retained by the principal contractor or site manager to monitor and advice on any works within the root protection area (RPA) of retained trees to ensure successful retention and planning compliance.	**Construction**
LV6	16.5.1.3	Throughout (as required)	On the completion of the construction works, all trees and vegetation retained is to be reviewed by the project Arboriculturist and any necessary remedial tree surgery works required to promote health and safety are to be implemented.	**Construction**

21.15 Waste and Resources

Table 21.13: Waste and Resources Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
WR1	17.5.1	Throughout (as required)	A Construction and Demolition Resource and Waste Management Plan (CDRWMP) has been prepared and this will be implemented (and updated as necessary) by the appointed contractor - refer to the CDRWMP within Appendix 5.1 Construction Environmental Management Plan (CEMP) in Volume 4 of this EIAR.	**Construction**
WR2	17.5.1	Throughout (as required)	The following measures will be implemented during construction, where practicable, by the appointed contractor, to ensure the maximum quantity of material is reused on the Proposed Scheme and to contribute to achieving the objectives set out in the National Waste Action Plan as follows: • Stockpiling of existing sub-base, capping layer and topsoil material generated on-site for direct reuse in the Proposed Scheme where practicable in the proposed construction compounds (subject to material quality testing to ensure it is suitable for its proposed end use); and • Recycled aggregates and reclaimed asphalt will be specified in the Proposed Scheme, where practicable.	**Construction**
WR3	17.5.1	Throughout (as required)	The following management measures will be implemented in so far as reasonably practicable: • Where waste generation cannot be avoided, waste disposal will be minimised; • Opportunities for reuse of materials, by-products and wastes will be sought throughout the Construction Phase of the Proposed Scheme; • Possibilities for reuse of clean non-hazardous excavation material as fill on the site or in landscaping works will be considered following appropriate testing to ensure material is suitable for its proposed end use; • Where excavated material cannot be reused within the Proposed Scheme works, material will be sent for recovery or recycling; • Source segregation: Metal, timber, glass and other recyclable material will be segregated (and waste stream colour-coding will be used) during construction works and removed off site to a permitted / licensed facility for recycling;	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			• Material management: 'Just-in-time' delivery, where practicable, will be used to minimise material wastage; • General construction waste and by-products will be reused within the Proposed Scheme, where practicable, or appropriately reused (in accordance with Article 27 of the Waste Directive Regulations), recovered, recycled or disposed of off-site, as arranged by the appointed contractor; and • Any hazardous waste arising will be managed by the appointed contractor in accordance with the applicable legislation. • Waste Auditing: The quantity and types of waste and materials leaving site during the Construction Phase will be recorded by the appointed contractor. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity to each facility. Records will show material which is recovered, which is recycled and which is disposed of. • Where Article 27 notifications are required in relation to the Proposed Scheme, the appointed contractor will complete and submit these Article 27 notifications to the EPA for by-product reuse. • Any off-site interim storage or waste management facilities for excavated material will have the appropriate EPA licence, Waste facility permit or Certificate of Registration, as appropriate, in place. • The relevant appropriate waste authorisation will be in place for all facilities that wastes are delivered to (i.e., EPA Licence, Waste Facility Permit or Certificate of Registration).	

21.16 Material Assets

Table 21.14: Material Assets Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
MA1	18.6.1	Throughout (as required)	Where there are interfaces with existing utility infrastructure, protection in place or diversion as necessary is proposed to prevent long-term interruption to the provision of the affected services.	**Construction**
MA2	18.6.1	Throughout (as required)	All possible precautions will be taken by the appointed contractor to avoid unplanned interruptions to any services during the Construction Phase of the Proposed Scheme. This will include appropriate investigation by the appointed contractor to identify the location of all utility infrastructure within the working areas prior to the commencement of excavation works. Where works are required in and around utility infrastructure, precautions will be implemented by the appointed contractor to protect the infrastructure from damage in accordance with best practice methodologies and the requirements of the utility companies where practicable. Protection measures during construction will include warning signs and markings indicating the location of utility infrastructure, safe digging techniques in the vicinity of known utilities, and in certain circumstances where possible, isolation of the section of infrastructure during works in the immediate vicinity.	**Construction**
MA3	18.6.1	Throughout (as required)	All utility companies for which diversions are proposed will continue to be consulted when designing any diversions to ensure that proposed diversions conform to the utility provider's requirements, where practicable, and to ensure that service interruptions are kept to a minimum.	**Construction**
MA4	18.6.1	Throughout (as required)	Where diversions or modifications are required to utility infrastructure, service interruptions and disturbance to the surrounding residential, commercial and/or community property may be unavoidable. Where this is the case, it will be planned in by the appointed contractor in consultation with each utility provider, as relevant. Required service interruptions will generally only occur for a set period of time per day (a set number of hours not exceeding eight hours where reasonably practicable) and will generally not be continuous for full days at a time.	**Construction**

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
			Prior notification will be given to all impacted properties. This notification will include information on when interruptions and works are scheduled to occur and the duration of such interruption. Any required works will be carefully planned by the appointed contractor to ensure that the duration of interruption is minimised in so far as is practicable.	
MA5	18.6.2	Throughout (as required)	Consideration will be given to the sustainability of material being sourced for the construction of the Proposed Scheme by the appointed contractor. In so far as is reasonably practicable, materials required for the construction of the Proposed Scheme will be sourced locally to reduce the amount of travelling required to get the material to the site. Key issues to be considered when sourcing materials for the Construction Phase will include the source, the material specification, production and transport costs, and the availability of the material. Only quarries which are included in local authority quarry registers will be used by the appointed contractor to source any quarried material.	**Construction**
MA6	18.6.2	Throughout (as required)	Construction materials will be managed on site by the appointed contractor in such a way as to prevent over-ordering and waste. Materials will be stored in appropriate storage areas or receptacles to reduce the potential for damage requiring replacement. “Just In Time” ordering principles will be implemented by the appointed contractor where practicable in order to reduce over-ordering.	**Construction**

21.17 Major Accidents

Table 21.15: Major Accidents Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
n/a	n/a	n/a	No additional mitigation or monitoring measures are considered necessary beyond those already identified in other environmental assessments and the CEMP (Appendix 5.1 in Volume 4 of this EIAR).	**n/a**

21.18 Cumulative Impacts

Table 21.16: Cumulative Impacts Mitigation Measures

Mitigation Number	EIAR Section Reference	Location	Description of Mitigation or Monitoring Measure / Environmental Commitment	Implementation Stage
CI&EI1	20.5.1	Throughout (as required)	Other infrastructure projects could directly interface with the construction of the Proposed Scheme. Interface liaison will take place on a case-by-case basis through GCC, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.	**Construction**

21.19 References

British Standards Institution (BSI) (2010). BS 3998:2010 'Tree Work – Recommendations'

British Standards Institution (BSI) (2012). BS 5837:2012 'Trees in relation to in relation to design, demolition and construction. Recommendations'

British Standards Institution (BSI) (2014). BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise

CIRIA (2001). CIRIA C532: Control of Water Pollution from Construction Sites – Guidance for consultants and contractors.

EPA (2021). Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects [Online] Available from https://www.epa.ie/publications/circular-economy/resources/C_and_D_Guidelines-.pdf

European Commission (2018). EU Construction and Demolition Waste Protocol and Guidelines.

ISO (2016). ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures.

ISO (2017). ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels.

TII (2013) Specification for Road Works Series 600 - Earthworks (including Erratum No. 1, dated June 2013) CC-SPW-00600

TII (2020a). The Management of Invasive Alien Plant Species on National Roads – Technical Guidance

TII (2020b). The Management of Invasive Alien Plant Species on National Roads – Standard

Directives and Legislation

S.I. No. 126/2011 - European Communities (Waste Directive) Regulations 2011 as amended

Waste Management Act 1996, as amended

S.I. No. 241/2006 – European Communities (Noise Emission by Equipment for Use Outdoors) (Amendment) Regulations 2006

S.I. No. 419/2007 - Waste Management (Shipments of Waste) Regulations 2007, as amended

S.I. No. 820/2007 - Waste Management (Collection Permit) Regulations 2007, as amended.

S.I. No. 549/2018 – European Communities (Environmental Noise) Regulations 2018

Chapter 22
Summary of Significant Residual Impacts

Contents

22 Summary of Significant Residual Impacts

This Chapter summarises the potential Significant residual impacts, which may result from the Construction and Operational Phases of the BusConnects Galway: Cross-City Link (University Road to Dublin Road (hereafter referred to as the Proposed Scheme). Please refer to Chapter 6 to Chapter 20 of this Environmental Impact Assessment Report (EIAR) for the full impact assessments.

Residual impacts are the final or intended impacts which occur after the proposed mitigation measures have been implemented. They refer to the degree of change that will occur after the proposed mitigation measures have taken effect.

Table 22.1 presents the residual impact significance, following the implementation of mitigation as set out in Chapter 6 to Chapter 21 of the EIAR, and as summarised in Chapter 21 (Summary of Mitigation & Monitoring Measures).

The terminology used in this Chapter to describe the residual impact significance reflects the assessment terminology and guidelines used within Chapter 6 to Chapter 21 of the EIAR. While the terminology in the Environmental Protection Agency's (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022) is predominantly used, some chapters use discipline specific guidelines, and this terminology is presented within this summary Chapter to maintain consistency with the assessments undertaken in Chapter 6 to Chapter 21.

Table 22.1: Summary of Significant Residual Impacts from the Construction and Operational Phases of the Proposed Scheme

Environmental Aspect / Chapter	Residual Impact Description	Impact Significance (Pre-Mitigation)	Residual Impact Significance (Post-Mitigation)
Chapter 6 (Traffic & Transport)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
Chapter 7 (Air Quality)	**Construction Phase**		
	No significant adverse residual effects on air quality are envisage during the construction phase of the Proposed Scheme.		
	Operational Phase		
	There are no significant adverse effects expected as a result of the operational phase of the Proposed Scheme.		
Chapter 8 (Climate)	**Construction Phase**		
	Embodied carbon	Neutral, long-term	Neutral, long-term
	Operational Phase		
	Operational Traffic	Neutral, long-term	Neutral, long-term
Chapter 9 (Noise & Vibration)	**Construction Phase**		
	General Road Works & Urban Realm Landscaping: • Monday to Friday: Daytime (07:00 – 19:00hrs)	• Negative, Significant to Very Significant and Temporary at NSLs within 15 m of the works. • Negative, Slight – Moderate and Temporary at NSLs between 30 and 150 m of the works	Negative, Moderate to Significant and Temporary at NSLs within 15 m of the works.
	General Road Works and Urban Realm Landscaping: • Saturdays (08:00 – 16:30hrs)	• Negative, Significant to Very Significant and Temporary at NSLs within 30 m of the works.	Negative, Moderate to Significant and Temporary at NSLs within 15 m of the works.

Environmental Aspect / Chapter	Residual Impact Description	Impact Significance (Pre-Mitigation)	Residual Impact Significance (Post-Mitigation)
		• Negative, Moderate to Significant and Temporary at NSLs between 30 and 50 m of the works.	
	Road Widening / and Utility Diversion Works; • Monday to Friday: Daytime (07:00 – 19:00hrs)	• Negative, Significant to Very Significant and Temporary at NSLs within 30 m of the works. • Negative, Moderate to Significant and Temporary at NSLs between 30 and 50 m of the works.	Negative, Significant to Very Significant and Temporary at NSLs within 10 m of the works. Negative, Moderate to Significant and Temporary at NSLs between 10 and 15 m of the works.
	Road Widening / and Utility Diversion Works; • Saturdays (08:00 – 16:30hrs)	• Negative, Significant to Very Significant and Temporary at NSLs within 50 m of the works. • Negative, Moderate to Significant and Temporary at NSLs between 50 and 100 m of the works.	Negative, Significant to Very Significant and Temporary at NSLs within 15 m of the works. Negative, Moderate to Significant and Temporary at NSLs between 15 and 30 m of the works.
	Construction Compounds; • Monday to Friday: Evening: (19:00 – 23:00hrs) or Saturdays (08:00 – 16:30hrs)	• Negative, Slight – Moderate and Temporary at NSLs within 30 m of the works.	
	Construction Compounds; • Saturdays (08:00 – 16:30hrs)	• Negative, Moderate to Significant and Temporary at NSLs within 10 m of the works.	
	Operational Phase		
	Opening year (2023) traffic noise – Surrounding road network	• Indirect, Positive, Imperceptible to Slight, Short to Medium-term to indirect, Negative, Significant, Short to Medium-term	Indirect, Positive, Imperceptible to Slight, Short to Medium-term to Indirect, Negative, Significant, Short to Medium-term
Chapter 10 (Population)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		

Environmental Aspect / Chapter	Residual Impact Description	Impact Significance (Pre-Mitigation)	Residual Impact Significance (Post-Mitigation)
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
Chapter 11 (Human Health)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
Chapter 12 (Biodiversity)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
Chapter 13 (Water)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
Chapter 14 (Land, Soils, Geology & Hydrogeology)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
Chapter 15 (Archaeological Cultural Heritage & Architectural Heritage)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
	Construction Phase		

Environmental Aspect / Chapter	Residual Impact Description	Impact Significance (Pre-Mitigation)	Residual Impact Significance (Post-Mitigation)
Chapter 16 (Landscape (Townscape) & Visual)	Loss of 61 early mature and mature trees	Negative, Significant, Short term	Negative, Significant, Short term
	Planting of 186 new street trees	Positive, Long term	Positive, Long term
	Operational Phase		
	Urban townscape setting in Galway City	Positive, Significant, Permanent	Positive, Significant, Permanent
	Connectivity and accessibility for pedestrians	Positive, Significant, Permanent	Positive, Significant, Permanent
	Connectivity and accessibility for cyclist	Positive, Significant, Permanent	Positive, Significant, Permanent
Chapter 17 (Waste & Resources)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
Chapter 18 (Material Assets)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
Chapter 19 (Risk of Major Accidents and / or Disasters)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		
Chapter 20 (Cumulative Impacts & Environmental Interactions)	**Construction Phase**		
	No Significant residual impacts predicted as a result of the Construction Phase of the Proposed Scheme		
	Operational Phase		
	No Significant residual impacts predicted as a result of the Operational Phase of the Proposed Scheme		

22.1 References

Environmental Protection Agency (EPA) (2022). Guidelines of the Information to be contained in Environmental Impact Assessment Reports.

NTA
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Project Ireland 2040
Building Ireland's Future