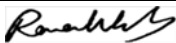


CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

GLASHABOY RIVER (GLANMIRE/SALLYBROOK) DRAINAGE SCHEME

Project Number and Title:			Revision No.:
CEMP - GLASHABOY RIVER (GLANMIRE/SALLYBROOK) DRAINAGE SCHEME			08
Prepared by:	Name: Ronan Walsh	Signed: 	Date: 26/07/2023
Reviewed by:	Name: Brian Snow	Signed: 	Date: 26/07/2023
Revision Detail:			
Revision No.:	Revision Detail & Issue Status:	Completed by:	Issued Date:
00	First Issue	R. Walsh	06/06/2023
01	Reviewed Following ER Comments	R. Walsh	26/07/2023
02	Reviewed Following Updates to ARUP CEMP	S. Dale	04/12/2023
03	Reviewed Following Client Comments	S. Dale	21/03/2024

04	Updated Following Compiling Issue	S. Dale	22/03/2024
05	Reviewed Following Amendments	D. Scanlan	22/04/2024
06	Reviewed Following Client Comments	S. Dale	04/10/2024
07	Reviewed Following Client Comments	S. Dale	19/12/2024
08	Amendments to Sections 2.4, 2.5, 3.11.1, 3.11.2 and 3.9.6	L. Dolan	11/06/2025
Note: Further amendments by L. Dolan are in preparation.			

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1 Introduction

1.1 Purpose

This Plan sets out how Sorensen Civil Engineering Ltd will manage environmental, pollution prevention and control aspects of the construction and development of this CEMP for the **GLASHABOY RIVER (GLANMIRE/SALLYBROOK) DRAINAGE SCHEME**. Works in Glashaboy will include the construction of new flood defence walls, embankments, bridges, culverts, pumping stations, drainage and utility diversions, landscaping and other associated works.

This document provides the framework to identify where environmental impact can occur, the pathways for these impacts and the controls that will be implemented to prevent, manage or limit these impacts. It will be maintained and used for:

1. Providing project staff with instruction and guidance on the project specific arrangements for managing and monitoring environment and pollution controlled related activities.
2. Issued to the Client, designers, subcontractors and third parties for their information and use.
3. The basis for the Project specific induction training.
4. Demonstrating and monitoring compliance with legal and contract requirements.
5. To comply with the requirements of **BS EN ISO 14001:2015 Environmental Management Systems** [SEE Appendix 3].
6. Prevent adverse environmental impacts.
7. Ensure mitigation measures are implemented for non-preventable environmental impacts and reinstate/restore, as far as is practicable, the environment to its pre-project state where required.

1.2 Preparation & Development

Sorensen Civil Engineering Ltd management team shall ensure that this Plan and its supporting documentation are:

1. Developed to comply with the requirements of the Contracts specification (Work Requirements Volume A2), this includes all documentation to which that document refers to.
2. Reviewed, authorised, and issued for use.
3. Submitted to the Client or their representatives for review before starting work on the Project.
4. Issued and made available to Project staff so that they are aware of its content and requirements.
5. Updated and reviewed regularly to reflect changing design and/or project circumstances during the 'lifetime' of the Project.

Sorensen Civil Engineering Ltd Health, Safety, Environment, Quality and Training department will provide advice and guidance to the Project Management team and will monitor activities to ensure compliance.

1.3 Structure

This Plan comprises three main sections:

1. Description of the Project.
2. Management of the environmental impacts.
3. Arrangements for controlling environmental risks.

1.4 Status

It is our aim that in carrying out this project we will avoid, control and manage all foreseeable risks to the environment and any third parties who may be affected by our work and construction activities.

The requirements of this Plan and its supporting documents are mandatory on all Project staff and will be implemented in all aspects of the works to deliver a safe site and working environment.

2 Description of the Project

2.1 Scope and Description of the Project

This scheme is being undertaken for the purpose of preventing or substantially reducing the periodical localised flooding of lands and properties in the area of this watercourse. The Glashaboy River (Glanmire/Sallybrook) Drainage Scheme will include the construction of direct flood defences and conveyance improvement measures along the Glashaboy River and its tributaries. The direct defences include flood walls and embankments with the conveyance improvements consisting of channel widening, localised channel widening and deepening and the introduction of or replacement of culverts.

Sorensen ensures all relevant works have (and are being carried out in accordance with) the required permits, licences, certificates, planning permissions, etc. The Project Ecologist will liaise with the designated licence holders with respect to licences granted pursuant to the Wildlife Act, 1976, and as amended with the Wildlife (Amendment) Act, 2000. Any timing and legal constraints that may be imposed on the carrying out of certain tasks will be brought to the attention of the project team to ensure full compliance with environmental licensing requirements.

There is a history of flooding in the Glashaboy River catchment, leading to the urban areas of Glanmire and Sallybrook experiencing flooding and considerable damage to residential and commercial properties. The Catchment Flood Risk Assessment and Management (CFRAM) Study for the Lee Catchment, which includes the Glashaboy River catchment, identified a preferred option for the alleviation of flood risk in the Glashaboy catchment. As a result, Cork City Council, acting as Agents for the OPW has commissioned the development of the Glashaboy River (Glanmire/Sallybrook) Drainage Scheme, or GLASHABOY FLOOD RELIEF SCHEME (GFRS). Works on the Scheme will involve the improvement of flood defence and conveyance in the Glanmire/Sallybrook area, through the construction of new flood defence walls, channel widening, embankments, bridges, flood relief culverts, pumping stations, drainage and utility diversions, landscaping and other associated works. The Scheme has been designed to provide protection to properties from the 1 in 100 year fluvial and 1 in 200 year tidal flood events.

The main aspects of this scheme comprise construction works entailing the following:

- Replacement of a number of existing culverts with either new culverts or bridges
- New flood relief channel and culvert at Hazelwood Avenue
- Replacement of Hazelwood Shopping Centre bridge with a new bridge
- Construction of new flood defence walls
- Construction of a new earthen flood defence embankment at Sallybrook
- New 4 no. surface water pumping stations
- Localised in-channel conveyance improvements at culvert/bridge structures
- Local channel widening, deepening, realignment and re-grading of river channel
- Provision of civil works such as road/footpath re-grading at a number of locations
- Protecting drainage outlets along the line of flood defence works with nonreturn flap valves
- Retaining walls
- Flow control structure on a millrace
- Removal of vegetation and trees to facilitate construction works
- Reinstatement of boundary walls and fences
- Landscaping and replanting of trees on completion in agreement with landowners
- Junction upgrade works at the R639/Hazelwood Avenue

The main environmental and ecological sensitivities/constraints associated with this Project are; habitat preservation (river water quality and riparian habitat), invasive alien plant species (IAPS), protected mammals (otters, bats, badgers, etc.), protected birds, the nesting bird season (March – August inclusive), the bat hibernating and maternity seasons (December/January and May – August inclusive, respectively) and the Fisheries permitted instream season (July – September inclusive).

Flood Warning – We note the Employer's advice that no flood warning can be provided for the watercourses in the works areas due to the "flashy" nature of these catchments. However, we attentively monitor weather forecasts and warnings as provided by Met Éireann to inform daily and weekly planning.

2.2 Contract Details

Contract Details	
Full Title:	GLASHABOY RIVER (GLANMIRE/SALLYBROOK) DRAINAGE SCHEME
The Client:	Cork City Council Conor O'Leary Infrastructure Development Cork City Council City Hall, Cork.
The Designer:	Arup One Albert Quay Cork
PSDP:	Arup One Albert Quay Cork
The Main Contractor and PSCS:	Sorensen Civil Engineering Ltd Forge Hill Cross Kinsale Road Cork
Managing Director:	John Wallace, john.wallace@sorensen.ie & 087-9681612
Contracts Manager:	Brian Snow, brian.snow@sorensen.ie & 087 6307751
Project Manager:	Mark Snow, Mark.Snow@Sorensen.ie & 086 183 1437
HSEQT Manager:	TBC
Site Ecologist:	Sorcha Dale, 086 1920869 Lisa Dolan, 085 1998632
Project Notification [AF2]:	A copy of the AF1 & AF2 is held in project files and on the Project notice board
HSA Regulator:	Health and Safety Authority The Metropolitan Building James Joyce Street Dublin 1 D01 K0Y8 wcu@hsa.ie 1890 289 389
Planning Authority:	Cork City Council
Contract Start Date:	Contract Date is 29.06.23
Contract Completion Date:	Completion Date is 05.02.26
Project Address:	Sorensen Compound Circus Field R639 Riverstown Road Riverstown,

Contract Details	
	Glanmire
Project Working Hours:	Construction will occur within the hours: - Monday to Friday 07:00 to 19:00 Saturday 08.00 to 16.00 Sunday no working allowed

2.3 Existing Conditions & Environmental Surveys

Sorensen Civil Engineering Ltd recognise that its operations can have a significant impact on the environment. The following tables summarise the results of surveys carried out during the preconstruction stages. To enable the Project to manage these issues effectively, we are carrying out surveys throughout the construction stage to monitor for any changes from preconstruction survey conditions.

2.3.1 Ecology

The ecology, habitat, protected and invasive species surveys that have been carried out on this project during the pre-construction stages are summarised in the following table:

Date of Survey	Surveyor	Ecology	Comments
July – September 2023	Drew Reid	IAPS – All Areas	IAPS located in Area 1 and Area 2. No visible JK growth in Area's 3 & 4.
July/August 2023	Sorcha Dale	Nesting Birds – Area 1 & 2	No nests located
July/August 2023	Sorcha Dale	Badgers – Area 1 & 2	No setts located
August/September 2023	Ross Macklin	Otters – All Areas	2no. Active Holts (Sallybrook & Circus Field) and 1no. Active Couch (Funeral Home)
September 2023	Brian Keeley	Bats – Area 1, 2 & 3	No bat roosts present in trees to be felled.
November 2023	Pat Smiddy	Dipper – All Areas	Presence/absence of suitable dipper nesting habitat in various structures on the Scheme was provided.
January 2024	Ross Macklin	Otters – Area 1 & 2	3no. Active Holts (Sallybrook & Meadowbrook (x2) – 1 holt at Meadowbrook potentially a fox den) and 1no. Active Couch (Funeral Home)
2023/2024	Remote wildlife trail cameras	Otters – Area 1 & 2	3 no. Active Holts (Sallybrook & Meadowbrook)
March – August 2024	Sorcha Dale	Nesting Birds – All Areas	Completed on a case-by-case basis as vegetation clearance needs arose and prior to works commencing on/near stone walls, culverts and bridges.
March 2024	Sorcha Dale	Kingfisher (Meadowbrook)	Completed in consultation with NPWS – no nesting activity was observed during the survey period.
March 2024	Sorcha Dale/Lisa Dolan	Badgers – Area 3 & 4	No setts located
March 2024	Lisa Dolan/Sorcha	IAPS – All Areas in advance of	IAPS located in Area 1 and Area 2. No visible JK

	Dale	works	growth in Area's 3 & 4.
April 2024	Dr Isobel Abbot	Bats – Riverstown Bridge	No bats roosting in the bridge structure despite optimum crevices.
May 2024	Sorcha Dale	Dipper – Cois na Gleann Culvert	Dipper nest identified. Monitoring undertaken until young birds had fledged.
April – August 2024	Lisa Dolan	IAPS – All areas in advance of works	Vector material of JK, down to formation level within the footprint of the works, was recovered and transported to the temporary holding facility. Himalayan balsam was hand pulled and allowed to desiccate within the various works areas.
September 2024	Lisa Dolan	IAPS – All Areas	JK located in Area's 1, 2 and 4 – chemical herbicide applied to all active JK growth.
2024	Lisa Dolan/Sorcha Dale	Rare Plant - Little-robin	All areas in advance of works to remove stone walls and undisturbed areas of stone fill material
January 2025	Ross Macklin	Otter – Areas 1 & 2	7 no. active holts (GAA field, Meadowbrook, J 'O Callaghan Park), 1 no. active couch (GAA field)
2025	Remote wildlife trail cameras	Otters – Area 2	2 no. Active Holts (Meadowbrook)
March 2025	Lisa Dolan	Kingfisher (Meadowbrook)	Completed in consultation with NPWS – no nesting activity was observed during the survey period.
April 2025	Dr Isobel Abbot	Bat Boxes – Bleach Hill	No bats roosting in 2 no. bat boxes despite optimum positioning in the trees along the stream. Vegetation to be removed from in front of 1 no. box.
May 2025	Lisa Dolan	Sand Martin – Hazelwood Bridge	7 no. Sand martin nests identified. Monitoring will be undertaken until young birds have fledged.
2025 to date	Lisa Dolan	IAPS – All areas in advance of works	Vector material of JK and Spanish bluebell, down to formation level within the footprint of the works, was recovered and transported to the temporary holding facility. Himalayan balsam was hand pulled and allowed to desiccate within the various works areas. American Skunk Cabbage in Area 1 at Sallybrook Stream has been fenced off.
2025	Lisa Dolan	Rare Plant - Little-robin	All areas in advance of works to remove stone walls and undisturbed areas of stone fill material
March 2025 to date	Lisa Dolan	Nesting birds – Area 2 & 3	2 no. nests located. 1 no. Firecrest nest at Hazelwood Shopping Centre Bridge had been abandoned due to exposure to elements. 1 no. Blackbird nest at Copper Valley Vue was from previous season.

The full ecological reports, where completed, containing the results of the surveys are kept in the Project HSEQT Files.

2.3.2 Archaeological & Built Heritage

Archaeological permissions and licences on this project are summarised in the following table:

Archaeologist	Description	Duration	Location	Comments
DNAC	Licence	18/08/2023 - 30/06/2025	Area 1 and 2	Excavation licence to monitor and test excavations on the Glashaboy Flood Relief Scheme
DNAC	Consent	18/08/2023 - 30/06/2025	Area 1 and 2	Consent to use a detection device on the Glashaboy Flood Relief Scheme
DNAC	Licence	24/01/2024 - 30/06/2025	Area 1 and 2	Excavation licence to monitor and test excavations on the Glashaboy Flood Relief Scheme
DNAC	Consent	24/01/2024 - 30/06/2025	Area 1 and 2	Consent to use a detection device on the Glashaboy Flood Relief Scheme
DNAC	Licence	24/01/2024 - 30/06/2025	Area 3	Excavation licence to monitor and test excavations on the Glashaboy Flood Relief Scheme
DNAC	Consent	24/01/2024 - 30/06/2025	Area 3	Consent to use a detection device on the Glashaboy Flood Relief Scheme
DNAC	Licence	01/1/2025 - 30/06/2025	Area 4	Excavation licence to monitor and test excavations on the Glashaboy Flood Relief Scheme (applied for)
DNAC	Consent	01/1/2025 - 30/06/2025	Area 4	Consent to use a detection device on the Glashaboy Flood Relief Scheme (applied for)

2.3.3 Noise, Vibration & Dust

The noise, vibration and dust monitoring that have been carried out on this project during the preconstruction stages and construction stage are summarised in the following table:

Survey Type	Surveyor	Location	Comments
Property Condition Surveys	PJ Brett	All Areas	All properties highlighted to be surveyed in the works requirements have been/are scheduled to have property condition surveys carried out. The completed surveys for Areas 1, 2 and 3 have been issued to the client. Area 4 will be issued to the client in due course.
Noise	NVM Ltd.	All Areas	All active work sites have a noise monitor located between it and the nearest receptor (residential building/business/etc.). The monitor notifies the Senior Engineer and Project Ecologist to limit exceedances. See Section 4.3.4. of this document for limits.
Vibration	NVM Ltd.	All Areas	All active work sites have a vibration monitor located between it and the nearest receptor (residential building/business/etc.). The monitor notifies the Senior Engineer and Project Ecologist to limit exceedances. See Section 4.3.4. of this document for limits.
Dust	Management Staff NVM Ltd	All Area	All areas are visually checked by staff for dust pollution daily and the weather forecast is monitored to inform daily decisions on the implementation of dust mitigation measures. See Section 4.3.4. of this document for further details. Bergerhoff dust monitoring by NVM Ltd. is undertaken at Hazelwood and Meadowbrook with reports issued monthly.

The full noise assessment, vibration impact assessment and air quality surveys, where completed, containing the results of the surveys are kept in the Project HSEQT Files.

2.4 Designated Conservation Areas, Sensitive Receptors & Constraints

The following are the main sensitive receptors/constraints on this Project:

Habitat Preservation: Sorensen Civil Engineering Ltd. will put measures in place to prevent site personnel, plant machinery and equipment from accidentally straying outside of work areas to ensure habitat preservation. Our Site Ecologist, along with Ecological Specialists, have carried out surveys all areas for bats, bird nests, otters, rare plants and other species.

IAPS: All Third Schedule invasive plant species within the site are demarcated prior to works starting in that area. Invasive plant species impacted by the works will be managed in accordance with the **Invasive Alien Plant Species (IAPS) Biosecurity Plan Rev 02** and in compliance with current best practice guidelines. All plant machinery, equipment, and tools will be regularly cleaned to prevent the spread of invasive species. Brush box or footwear wash facilities are provided for site personnel.

Felling of Trees: All scheduled tree felling has been undertaken outside of the bird nesting season which is **March-August inclusive** and outside of the main bat maternity and hibernation season, **May - August** and **December-January**, respectively. Where unforeseen tree felling is required during the bird nest or bat maternity or hibernation season, a bird nesting survey and/or a potential roost feature (PRF) survey for bats will be completed by the Project Ecologist prior to felling. A Permit to Clear Vegetation (PTCV) will be prepared by the Project Ecologist for the felling of trees. The felling will only be completed if the Project Ecologist confirms there are no birds nesting, PRFs in the tree to be felled, other protected animals or plants or invasive species within the works area. Where a nest with eggs or young birds is confirmed present, the tree will be retained until the young birds have fledged. If a bat roost is present, the licenced bat specialist will undertake an assessment to identify control measures to be deployed. Every effort will be made to ensure the requirement for tree felling is kept to a minimum and avoided where possible.

Clearance of Vegetation (Hedgerows, ornamental hedges, scrub, rank grassland): All scheduled vegetation clearance has been undertaken outside of the bird nesting season which is **March-August inclusive**. Where unforeseen vegetation clearance is required during the bird nesting season, a bird nesting survey will be completed by the Project Ecologist prior to removal of vegetation. A Permit to Clear Vegetation (PTCV) will be prepared by the Project Ecologist for the clearance of the vegetation. The clearance of vegetation will only be completed if the Project Ecologist confirms there are no birds nesting, other protected animals or plants or invasive species within the area to be cleared. Where a nest with eggs or young birds is confirmed present, the vegetation will be retained until the young birds have fledged. Monitoring will be undertaken by the Project Ecologist to determine when the young birds have fledged. Every effort will be made to ensure the requirement for vegetation clearance is kept to a minimum and avoided where possible.

Fisheries: In stream works are only permitted in **July, August, and September** unless otherwise agreed with the OPW/EMG/IFI. All water pumped from excavations will be completed under a Permit to Pump (PTP). All pumped water will be discharged to a watercourse via silt control measures unless otherwise agreed with the Employers Representative/IFI. Silt curtains will be provided while working at or near rivers. IFI are consulted on all instream work activities.

Birds and Mammals: All areas have/are surveyed for nesting and protected birds, **March-August inclusive**, prior to works commencing. Particular care is being taken in Meadowbrook where there is potential for Kingfishers to nest. All areas have/are surveyed for protected mammals (Otters, Bats, Badgers) year round prior to works commencing in a given area.

The Glashaboy (Glanmire/Sallybrook) Flood Relief Scheme involves a substantial amount of work that will have to take place along and within the Glashaboy River and its tributaries. Water levels and flows in the rivers will strongly influence the timing of the works. Sorensen Civil Engineering Ltd. notes our responsibility for maintaining flows in open channels, culverts, drainage ditches, stormwater and foul lines affected by the works. Sorensen Civil Engineering Ltd. will ensure that the flood risk to any property will not be increased due to our works.

Rare Plants: A total of 5 no. protected rare plant species were identified during the desktop study for the 10km grid square W77 which overlaps with the footprint of the Glashaboy River (Glanmire/Sallybrook) Drainage Scheme. Meadow barley (*Hordeum secalinum*), Chives (*Allium schoenoprasum*), Red hemp nettle (*Galeopsis angustifolia*), and Wood small-reed (*Calamagrostis epigejos*) are categorised as 'Vulnerable', while Pennyroyal (*Mentha pulegium*) is considered 'Endangered' on the Ireland Red List No. 10: Vascular Plants (Wyse Jackson *et al.*, 2016). All are listed under the Flora Protection Order (FPO) 2022. A further 11 no. plants known from the 10km grid square W77 are considered 'Near Threatened', 'Regionally Extinct' or have yet to be fully evaluated. These species are not offered any protection. Of the 16 no. plants known from W77, Little-robin (*Geranium purpureum*) is the only species which has been recorded to date within the footprint of the Scheme.

Little-robin

Little-robin (*Geranium purpureum*) assessed as 'Near Threatened', is an upright annual of lowland stony or rocky places near the sea, on sheltered cliffs, disused railway lines, and particularly by roads and fields on the earth-and-stone sides of hedges (<https://plantatlas.brc.ac.uk/plant/geranium-purpureum>). In terms of its Irish distribution, Little-robin has a mainly southern distribution. It is known from walls and waste ground in Cork City and in Dungarvan Co Waterford. It has not been recorded recently at Dungarvan. In terms of distribution, it has a Mediterranean-Atlantic element. The presence of this species on stone walls and areas of undisturbed stone fill material within the footprint of the Scheme was confirmed by Paul

Green botanical taxonomist and Vice County Recorder for the British Isles and Ireland for Wales (formerly for Co.s Wexford and Waterford). A Permit to Clear Vegetation (PTCV) will be prepared by the Project Ecologist for the removal of stone walls, undisturbed areas of stone fill material, where required, prior to the commencement of works. Little-robin plants and soil containing the soil seed bank of Little-robin have been translocated to the grounds of the church at Springhill and to the site compound at Circus Field.

Records for Rare, Threatened or Protected Flora, Bryophytes & Lichen for W77 are provided in the following table:

Scientific Name	Common Name	Latest Record	NBDC W77	NPWS N77	Annex II or V	Red List	FPO 2022
Vascular Plants							
<i>Geranium purpureum</i>	Little-robin	2024	✓	-	-	NT	-
<i>Allium schoenoprasum</i>	Chives	2012	✓	-	-	VU	✓
<i>Linaria vulgaris</i>	Common toadflax	2023	✓	-	-	NT	-
<i>Centaurea cyanus</i>	Cornflower	2022	✓	-	-	WL	-
<i>Glebionis segetum</i>	Corn marigold	2022	✓	-	-	NT	-
<i>Hordeum secalinum</i>	Meadow barley	1894	✓	✓	-	VU	✓
<i>Silybum marianum</i>	Milk thistle	2010	✓	-	-	NT	-
<i>Linum bienne</i>	Pale flax	2023	✓	-	-	NT	-
<i>Galeopsis angustifolia</i>	Red hemp nettle	1856	-	✓	-	VU	✓
<i>Calamagrostis epigejos</i>	Wood small-reed	2012	-	✓	-	VU	✓
<i>Mentha pulegium</i>	Pennyroyal	1850	-	✓	-	EN	✓
Bryophytes & Lichens							
<i>Calypstrochaeta apiculata</i>	Southern hookeria	2009	✓	-	-	NE	-
<i>Tortula wilsonii</i>	Wilson's Pottia	1872	✓	-	-	RE	-
<i>Tortula lanceola</i>	Lance-leaved Pottia	1845	✓	-	-	CE	-
<i>Dicranella cerviculata</i>	Red-neck Forklet-moss	1845	✓	-	-	NT	-
<i>Entosthodon fascicularis</i>	Hasselquist's hyssop	2006	✓	-	-	NT	-

NT = Near Threatened, VU = Vulnerable, EN = Endangered, RE = Regionally Extinct, WL = Waiting list, NE= Not Evaluated as per the Ireland Red List No. 10 Vascular Plants (Wyse Jackson et al., 2016). Denoted in blue native status under review.

The designated sites and sensitive receptors that fall within the site boundary, or which could be affected by this project, are marked on the site plan kept in the Project File. Their locations and the procedures to be adopted are summarised in the following table:

Designated Area/Receptor	Location	Procedure
European Designated Conservation Areas i.e. SACs, SPAs	Downstream/downgradient of the Project	Cork Harbour SPA, Great Island Channel SAC.
National Designated Conservation Areas i.e. NHAs, pNHAs	Downstream/downgradient of the Project	Glanmire Wood pNHA. Dunkettle Shore pNHA, Douglas River Estuary pNHA, Great Island Channel pNHA, Rock Farm Quarry, Little Island pNHA
Semi-natural Habitats	Throughout Project	Please see IRE HSEQT/PCD-901-914
Birds	Throughout Project	Please see IRE HSEQT/PCD-901-914
Otters	Throughout Project	Please see IRE HSEQT/PCD-901-914
Badgers	Throughout Project	Please see IRE HSEQT/PCD-901-914
Bats	Throughout Project	Please see IRE HSEQT/PCD-901-914
Fish	Throughout Project	Please see IRE HSEQT/PCD-901-914
Invasive Species	Throughout Project	Please see IRE HSEQT/PCD-901-914
Little-robin	Throughout the Project	On stone walls and areas of stone fill material
Surface Water Quality	Throughout Project	Please see IRE HSEQT/PCD-901-914
Groundwater Quality	Throughout the Project	Please see IRE HSEQT/PCD-901-914
Soils, Geology and Hydrology	Throughout Project	Please see IRE HSEQT/PCD-901-914
Drinking Water Intake	*Glashaboy Public Water Scheme	Near Glanmire Area Community Association Playing Pitches, Riverstown, Glanmire, Co. Cork

*Note : The **Glashaboy Public Water Supply Scheme (PWSS)** [0500PUB3303] serves a population of 24,602 and produces 17,397m³/d of treated water (EPA, 2021). Raw water is abstracted from the Glashaboy River downstream of John O' Callaghan Park in the vicinity of the Glanmire Area Community Association (GACA) Playing Pitches at Riverstown and pumped to the Glashaboy Water treatment Plant (WTP) at Richmond in Dunkettle. Treatment includes coagulation, flocculation, clarification, filtration, disinfection, fluoridation and final pH correction. The supply serves Glanmire, Glounthane, Little Island and parts of Cobh and Carrigtwohill. As the intake is located downstream of the Glashaboy River (Glanmire/Sallybrook) Drainage Scheme it is within the zone of influence of the works.

2.5 Surface Water & Groundwater/Baseflows

Sorensen Civil Engineering Ltd recognise that construction activities in or near water have the potential to impact directly on a river, stream, drainage ditch, pond, lake or wetland habitat.

The quality or quantity of water, both above i.e. in rivers, streams, drainage ditches, ponds, lakes and wetland habitats, and below ground in baseflows and the aquifer can be impacted as a result of the accidental release or spillage of polluting substances and activities which require the diversion or pumping of water. Some activities with the potential for affecting surface waterbodies, wetlands and groundwater/baseflows may require consent.

Types of activity that may directly impact on a surface waterbody (river, stream, drainage ditch, pond or lake) or wetland habitat include:

- Working within a river, stream, drainage ditch, pond, lake or wetland habitat
- Works which may disturb the bed or banks of a watercourse e.g. river, stream, drainage ditch or pond

- Works which may disturb a wetland habitat
- Repair, maintenance or improvement of any structure, over a watercourse or wetland habitat
- Erection or construction of any structure, either permanent or temporary, in, over or above a watercourse or wetland habitat
- Diversion of flows/overpumping of flows from a watercourse or wetland habitat
- Any works likely to increase the risk of flooding

Surface Water

Types of activity that have the potential to cause pollution of surface water include:

- Use of potentially polluting substances near surface waterbodies (river, stream, drainage ditch, pond, lake) or wetland habitat
- Use of potentially polluting substances near a surface water intake for drinking water and industrial use e.g.
- Use of potentially polluting substances in areas where a vulnerable surface water feature is present e.g. pond or lake
- Works within 10m of a surface waterbody or wetland habitat

Types of activity that may direct surface water away from vulnerable surface water features or affect other water users include:

- Diversion of overpumping of surface water

Groundwater/Baseflows

Types of activity that have the potential to cause pollution of groundwater include:

- Use of potentially polluting substances near groundwater abstraction borehole/well or spring utilised for drinking water purposed or industry
- Sub-water table construction and use of materials containing potential polluting substances.
- Use of potentially polluting substances in areas where groundwater is vulnerable e.g. a high water table, thin covering of soil to the bedrock aquifer, caves, enclosed depressions, swallow holes, springs, fault zones, karstified (limestone) features
- Works within 10m of an abstraction borehole/well or spring utilised for drinking water purposes or industry, and vulnerable groundwater features

Types of activity that may lower groundwater/baseflow levels or affect other water users include:

- Dewatering of excavations, particularly abstraction of large amounts of groundwater/baseflows.

2.6 Flow Management Strategy

Sorensen Civil Engineering Ltd. has appointed Byrne Looby to complete a flow management plan in accordance with work requirements Volume A2 Appendix 1/37. The purpose of this document is to describe and outline the flow management procedures for each area included in the proposed works. This report is a live document and therefore will be frequently updated and amended to continue to reflect conditions and findings on site. This document is compiled with reference to the 'Glashaboy Flood Relief Scheme, Hydraulics Report, v4 Final Issue, November 2016' (Consulting, 2016), prepared by JBA ARUP Consulting Engineers Consulting on behalf of Cork County Council. The hydraulics report outlines the predicted flood flows, velocities and flood levels in the watercourses based on various storm events from Q2 to Q100 within areas of proposed works in Glanmire Co. Cork. Byrne Looby have considerable expertise and experience in the management of water flows on various flood schemes throughout Ireland and abroad. Byrne Looby has assigned their experienced director of water Sean Harrington to oversee this Project.

Sorensen Civil Engineering Ltd recognise that its operations may have an impact on designated statutory sites or environmentally sensitive features. In order to minimise this, we need to recognise where these are located, how we could affect them and what mitigation measures we need to take. Some sensitive features may need specific or unusual treatment. If this is the case, we will produce detailed method statements for these operations.

Details of these specific treatments/ tasks will be addressed as per the following:

- Within task specific RAMS
- Methodology documentation will be developed by the Project manager, Site Engineers, Site Ecologist and Foreman on the site.
- These will be submitted to the RE's/ECOW by the PM and site engineers.
- Works will be monitored by the Site Ecologist, who holds the relevant qualification to monitor these activities.

2.7 Licences & Consents

Sorensen Civil Engineering Ltd recognise that it needs the benefit of various licences and consents to carry out certain operations legally. These may be discharge, sewerage, abstraction and flood defence consents, waste exemptions, wildlife licences for specific species [bats, badgers, great crested newts] or Noise consents.

Sorensen will ensure that all relevant works have (and are being carried out in accordance with) the required permits, licences, certificates, planning permissions, etc. The Project Ecologist will liaise with the designated licence holders with respect to licences granted pursuant to the Wildlife Act,

1976, and as amended with the Wildlife (Amendment) Act, 2000. Any timing and legal constraints that may be imposed on the carrying out of certain tasks will be brought to the attention of the project team to ensure full compliance with environmental licensing requirements.

The following licences and consents are foreseen as a requirement and have been obtained or will be obtained for the completion of this project:

Issuing Authority	Issue Date	Expiry Date	Type of Licence & Reference No.	Location	Summary of Conditions
NPWS	28/08/2023	31/12/2023	Derogation licence - Otter	Sallybrook- Holt N2 Circus Field – Holt N6	2023 works authorised up to 20m from holts N2 and N6. Otter activity at holts to be monitored via trial camera during and construction phase.
NPWS	22/02/2024	31/12/2024	Derogation licence - Otter	Sallybrook – Holt N2 Meadowbrook – Couch C2, Holt N6C & N6D J. O'Callaghan Park – Holt N8	2024 works authorised up to 20m from active, non-breeding, holts. Timber hoarding/noise barriers erected at Sallybrook & Meadowbrook
NPWS	N/A	N/A	Derogation licence – Bats	N/A	Not required for 2023 tree felling activity. Not required for 2024 bridge works
NPWS	N/A	N/A	Derogation licence – Badger	N/A	
NPWS	31/08/2023	31/06/2024	Licence to remove/transport Japanese Knotweed-infested soil	All	The transport of Japanese knotweed infested soil is authorised for movement within Scheme extent.
NPWS	02/01/2024	31/06/2024	Licence to remove/transport Japanese Knotweed-infested soil	All	The transport of Japanese knotweed infested soil is authorised for movement within Scheme extent.
NPWS	06/07/2024	30/06/2025	Licence to remove/transport Japanese Knotweed-infested soil	All	The transport of Japanese knotweed infested soil is authorised for movement within Scheme extent.
Dept. Housing, Local Government and Heritage	24/01/2024	31/07/2024	Archaeological Excavation	All	

The individual licences and consents are kept in the Project HSEQT Files.

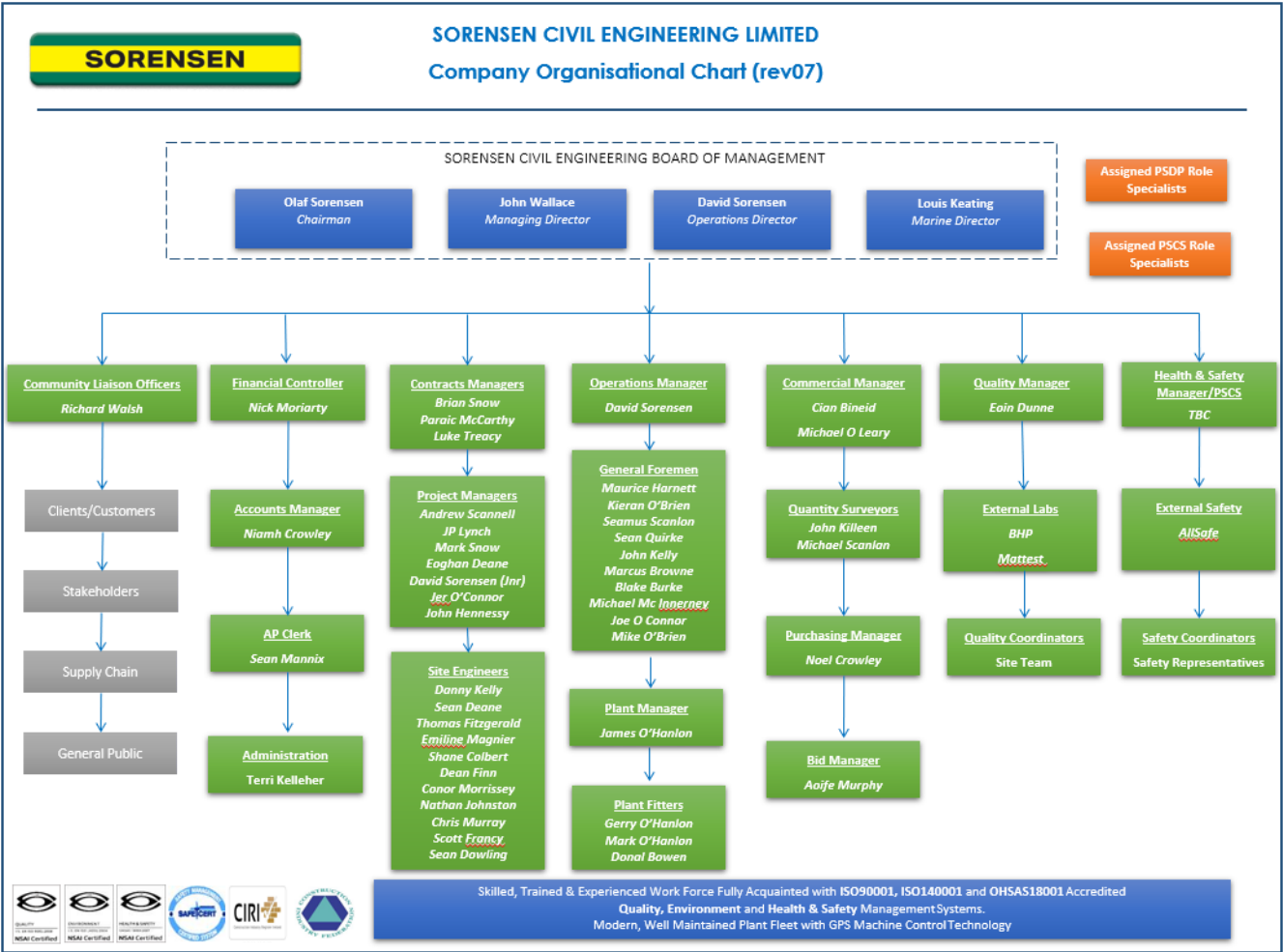
2.8 Planning Conditions & Requirements

Sorensen Civil Engineering Ltd recognise that to carry out certain operations legally, planning, licensing, and/or Ministerial conditions and requirements are to be met during the completion of this Project as per the EIAR and NIS.

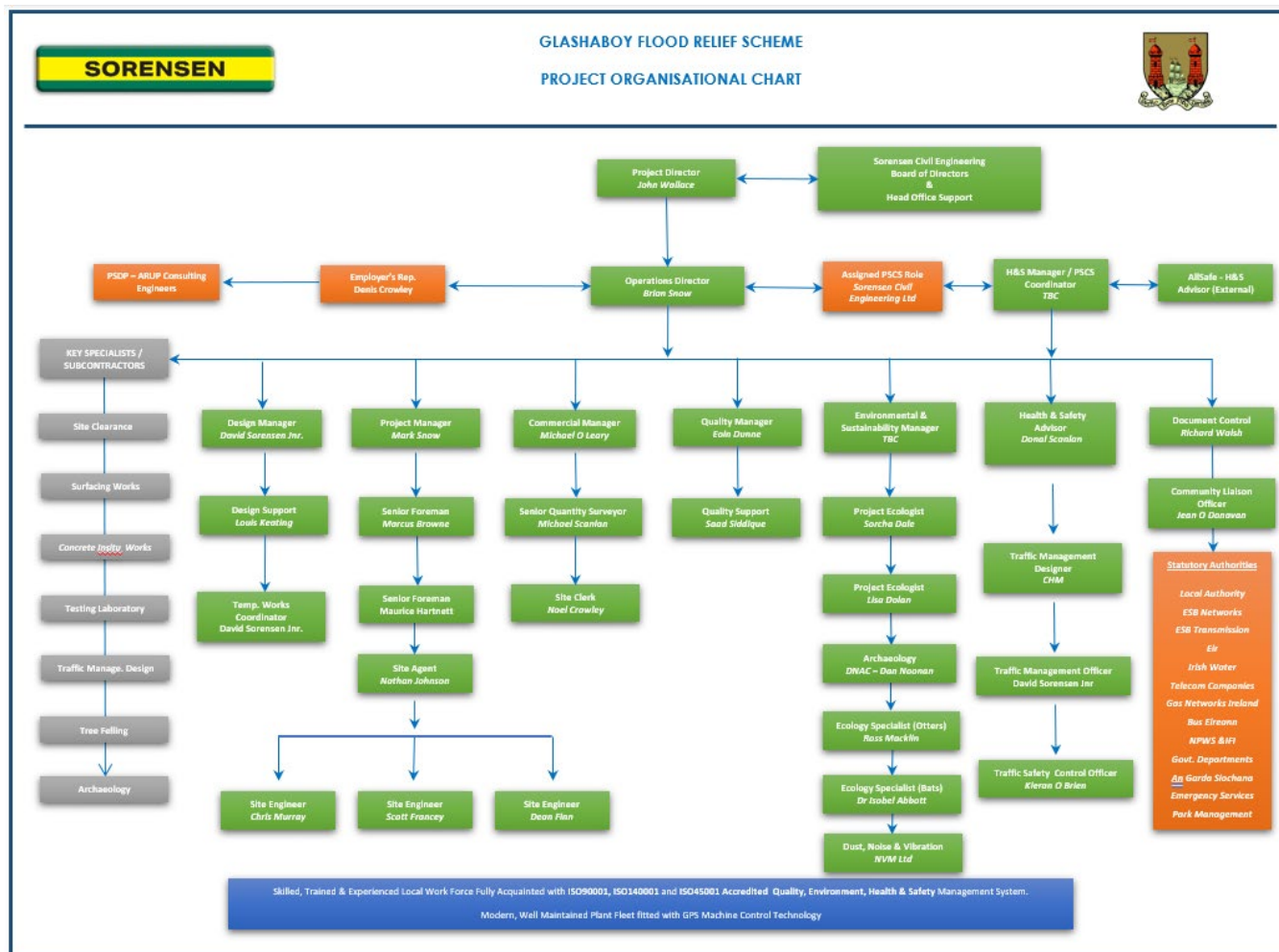
The scheme is being carried out in its entirety in accordance with all the plans, particulars, specifications, undertakings including those contained in the Environmental Impact Assessment Report (EIAR), Natura Impact Statement (NIS) and in the supplementary information including the Response to Request for Supplementary Information document and addenda to the EIAR and NIS, also mitigations identified by specialist surveys and licences, save as may be required by other conditions.

3 Management of Environmental Impact

3.1 Company Organisation



3.2 Project Organisation



3.3 Management Responsibility

The Management Responsibilities of key staff are defined at site level. Each member of staff involved in the Project is responsible for:

- Reading and understanding the requirements of the System and integrating these requirements into their regular working methods.
- Ensuring that employees under their control are familiar with relevant procedures and instructions and have ready access to them.
- Providing clear and unambiguous instructions to employees under their control.
- Ensuring that work under their control is planned, controlled and completed in accordance with Company, Contract and Statutory requirements.
- Verifying the standard of work carried out under their control by supervision, surveillance and inspection.
- Recording all instances of failure in the System, incidents and near misses with the agreed corrective action to remedy the immediate problem and minimise the probability of recurrence.
- Controlling documents received and prepared.

3.4 Management Policy

Our corporate policy on managing environment on every project is defined in our Sorensen Civil Engineering Ltd Environment Policy Statement [see Appendix 1]. This Policy will be implemented in full on this project and a copy of the Policy will be prominently displayed on the site office notice board at all operating locations to remind people of its requirements and expectations.

3.5 Objectives & Targets

Our Project specific and Employer or Contract specific environmental objectives and targets are:

- To ensure minimum disruption to Flora and Fauna while delivering the project on time and to the client's satisfaction.

3.6 Management Review

We use a structured series of reviews to assess our performance and initiate corrective action.

Review	Leader	Purpose	Record
Project Performance Review	Project Manager	Project and subcontractor review of site performance & future operations, EMP review – as required;	Minutes & Action List
Progress & Performance Review Meeting	Managing Director	Project and management review of progress, performance & future operations;	Minutes & Action List
HSEQT Employee Consultation Meeting	HSEQT Manager	Review performance, site issues, concerns & future operations with the Workforce	Minutes & Action List
End of Project Management Review	Managing Director & Sorensen Civil Engineering Ltd HSEQT Manager	Review performance, monitoring results, SMS, EMS & QMS system feedback, accidents and incidents, sub-contractor management and performance.	Post Contract review HSEQT/SFM-815
HSEQT Advisor Audits	HSEQT Manager/Local Safety Advisor	A formal Audit of the Project to the appropriate Project HSEQT Audit. Reviews performance, identifying good practice, areas for improvement and NCR's.	Audit Record
HSEQT Advisor Inspections	HSEQT Manager/Local Safety Advisor	An Inspection of the Project using HSEQT Inspection. Reviews performance, identifying good practice, areas for improvement and NCR's.	Inspection Record

3.7 Best Practice Schemes

We are committed to achieving best practice on our sites and this can be recognised by registering for award schemes. All projects are required to register with the Considerate Constructors Scheme to encourage and foster good relations with the local community.

3.8 Communication & Co-operation.

3.8.1 Issue of Information

This Construction Environmental Management Plan (CEMP) is available to all sub-contractors tendering for work and any updates made to the EMP affecting or having an impact on their works will be communicated to them.

This CEMP is also issued to all contractors assigned to complete works on behalf of the Client directly. These Contractors will be expected to comply with the requirements for co-ordination and co-operation in the execution of the Project and the CEMP.

The Project Manager holds Project Performance Meetings and ensures that all HSEQT issues concerning the project are being suitably addressed, monitored and maintained to the required standards.

3.8.2 Co-ordination & Co-operation of Subcontractors

The general co-ordination of subcontractor's activities is planned and agreed by Sorensen Civil Engineering Ltd and demonstrated on the project programme. A programme overview is issued by the Project Manager to all relevant sub-contractors on a weekly basis.

Detailed co-ordination of work activities being undertaken by groups of subcontractors working in the same or similar vicinity will be achieved by holding regular co-ordination meetings with the relevant subcontractors, or at each subcontractor's progress meeting. The first item on either agenda will be HSEQT related items.

3.8.3 Project Performance Review Meetings

The purpose of these meetings is to review recent HSEQT performance, to plan future activities and to ensure that all HSEQT issues associated with the Project are suitably addressed. Resultant information will be issued to all affected contractors.

3.8.4 Employee Consultation

Initial consultation and communication will be completed via the Site Induction process. This process will provide Project Specific detail and information to all persons working on the Project.

Sorensen Civil Engineering Ltd will ask representatives from the Project to report any concerns on site-to-Site Management via the HSEQT Employee Consultation. We ask for feedback from the site employees on areas of concern, for improvement or issues that require addressing to improve safety and performance on site.

All immediate environmental risks and concerns are reported directly to the Project Manager and/or the HSEQT Manager.

3.8.5 Public Consultation

Sorensen Civil Engineering Ltd will work with the Client to ensure active consultation is undertaken with the Public. This consultation addresses any concerns, fears, queries and questions the Public may have. Feedback, aspects and concerns raised or highlighted during public consultation will be reported to the Project team and the Client.

Communication methods being used are:

- Pre-construction Meeting
- Project Information and Data/KPIs
- Project Progress reports
- Project Website, Information and Feedback forms.

3.9 Site Set Up

3.9.1 Site Layout Plan for the Works

The Project Manager will ensure that a detailed Site Layout Plan is produced, periodically reviewed to reflect the project programme, maintained and displayed on the Site's HSEQT Board at the entrance points to the Site [see Appendix 2].

3.9.2 Construction Compound

Sorensen Civil Engineering Ltd has taken into account the impact of the compound location on the local population and environment when choosing the site. To reduce our impact further, we have:

- Set up the Compound/Offices prior to project start.
- Covered/dampened down stockpiles of dusty material in dry weather.

- Made a connection to the foul sewer to dispose of sewage and wash effluent. Prior to connection, the necessary consents required were obtained.
- Stored fuel, oils and other hazardous chemicals/materials in accordance with the legislation, away from drains and watercourses.
- Ensured all drainage systems are known – type, location, flow and emergency response required contamination or spillage of drainage system.
- Operated within the planning guidelines.
- Consulted with the OPW, Cork City Council, Cork County Council and the project Ecologist as well as the EMG.
- Prior to construction, all works areas, site compounds and access routes were surveyed for badger setts and Third schedule IAPS.
- Store fuel in a double skinned, bunded container located within a designated works compound at a location that is removed from the river. All other construction materials and plant shall be stored in this compound. The compound shall also house the site offices and portable toilets (of Portaloo type or equal). This compound shall be located on ground that is not prone to flooding.

3.9.3 Site Rules

The Site Manager will produce a set of project specific Site Rules [see Appendix 5]. These will be included in the induction and a copy is maintained on the IRE HSEQT Notice Board.

If any employee, contractor or visitor is in breach of any of the site rules, or is observed carrying out an environmental non-conformity, Sorensen Civil Engineering Ltd will take appropriate action to make the site safe and notify both the individual and their company in writing of the breach. Our Site Unsafe Action/Condition Notification form [IRE HSEQT/SFM-710] will be used for this purpose.

Sorensen Civil Engineering Ltd require that those personnel involved are disciplined appropriately and in the case of a serious breach, are removed from site.

3.9.4 Visitors

All visitors must sign in before they enter site, they will only be allowed on to site if they have read, understood and signed to confirm their understanding of the Site Rules and are accompanied by a fully inducted person and/or completed the site induction.

It is the host's responsibility to ensure that the visitor is accompanied at all times and complies with the site rules. Those persons failing to comply with the site rules will be dealt with appropriately, and where persistent offences occur, the right to bring visitors to site or accompany visitors around the site will be withdrawn.

3.9.5 Sewerage

Site Offices

All site offices, Sallybrook and Circus field compounds, are connected to the main sewerage system.

Site Toilets

The tanks within portable or mobile toilet facilities will be emptied regularly. A regular removal contract has been established with a waste contractor who will remove sewage from site and dispose of it at a licensed facility. All waste removed from site will be appropriately disposed of and recorded within the Site Waste Management Plan.

3.9.6 MSDS & Fuel Storage

Sorensen Civil Engineering Ltd and its sub-contractors will avoid any environmental damage, as a result of the inadequate storage or misuse of any substance hazardous to health, through strict adherence to the company MSDS procedures and the measures identified in project specific risk assessments and references in Contract specification documents:

- NIS (2020), Section 7.2.3 Water Quality – Measures to avoid/mitigate pollution and water quality issues.
- CEMP Issue 2 (2023), Sections 5.7.1 Construction – Mitigation Measures (Soils, Geology and Hydrogeology).
- CEMP Issue 2 (2023), Sections 5.8.1 Construction – Mitigation Measures (Hydrology).
- Appendix 1/28: Requirements for Works in, over or Adjacent to Watercourses.
- Appendix 1/37: Section 6 Mitigation Measures to Prevent Loss of Habitat.
- Appendix 1/37: Section 12 Mitigation Measures to Prevent Harm to Soils, Geology and Hydrogeology.
- Appendix 1/37: Section 13.5 Mitigation Measures to Prevent Potential Contamination of Water; and
- Appendix 2/5: Hazardous Materials

The substances to be used on site will be recorded and added to HSEQT/SFM-312 MSDS Register and will be continually updated as works progress.

Fuel will be stored in a bunded area away from the watercourse. Locks will be fitted to all fuel storage tanks.

MSDS materials, oils and lubricants will be stored in suitable containers within a bunded unit, providing the appropriate capacity required. Locks will be fitted to all bunded units to prevent unauthorised access.

No potentially polluting materials or substances will be stored near watercourses or in such a situation that these materials can fall, or be carried into a watercourse, e.g. near surface water drains. All static plant will have integral/separate drip trays and secure fuel tanks.

In areas of potential risk, emergency procedures will be prepared and pollution control equipment provided, such as 'grab packs' and absorbent granules. All spill kits will be replaced or replenished after use and a record of any spillages or their use noted.

In areas of potential risk, emergency procedures will be prepared and pollution control equipment provided, such as "grab packs" and absorbent granules. These will also be carried by some vehicles on the site. All spill kits will be replaced or replenished after use.

The spill kits are located at the following points:

Type of Spill Kit	Location
20 litre Spill Kit (Grab Pack) (socks, pads)	On board plant machinery (excavators) and site vehicles (Foremen jeeps, Environmental Unit Van, Pick Up Truck & bowser used for refuelling pumps, Ecologists jeeps)
240 litre Onsite Spill Kit Bin (granules, socks, pads)	Site Compounds (Area 1: Sallybrook & Area 2: Circus Field) and in close proximity to active works areas (locations changed as required in line with activity at various works areas)
Oil booms, Granules, Bioversal	Environmental Unit Container (Area 1: Sallybrook Compound), Environmental Unit Van and Foremen jeeps

3.9.7 Refuelling

Proper use and storage of oils, fuels and other materials includes the following measure:

- Plant/machinery shall be re-fuelled at the site compound at the start of each working day and additionally as required (refuelling will take place 20m or more from all watercourses and at least 10m from any drains/gullies, where possible, where this is not practicable fuel is transported in a double skinned mobile bowser, drip trays are placed beneath fuelling points and an emergency spill kit is on hand at all times). Drip-trays will be employed at the refuelling location within the compound, and a spill kit will be kept there for the duration of the contract and be checked weekly to ensure fit-for-purpose.
- The refuelling area at the compound is inspected daily during operation of the compound to verify that drip-trays are being used consistently by site staff (and are being regularly emptied to a bowser).
- Vehicles are not left unattended during refuelling operations, and drip trays are placed under the fuelling points during fuelling.
- All fuel/oil storage areas shall be covered and bunded to 110% of storage capacity.
- Drip trays will be used underneath mobile plant and drums whilst in use on site.
- There will be no stockpiling of excavated materials within 10m of a watercourse, to avoid runoff entering them.
- Stockpiles are kept to a minimum to control erosion from areas of exposed ground. Stockpiles are minimised to reduce silty runoff and located away from drains and dewatering points.
- Leaking or empty oil drums shall be removed from site immediately and disposed of via an appropriately licensed waste disposal contractor.
- All hazardous substances on-site are controlled within enclosed storage compounds that are fenced off and locked when not in use to prevent theft and vandalism.
- Care is taken whilst using shuttering oils when preparing formwork. Operatives are trained in the proper handling of materials, the sensitive nature of the wider drainage system, and the consequences of accidental spillage.
- Concrete mixing is undertaken in designated impermeable areas, at least 10 m away from drainage or dewatering points to reduce the risk of runoff entering a watercourse, or the sub-surface, or groundwater environment.

A double skinned fuel bowser is used for refuelling throughout the project. Where possible, this remains in a static position and the refuelling position restricted to a designated area within the site compound. The bowser is stored in a suitable position, on level ground, away from drains, watercourses and sensitive receptors. Where this is not practical, the bowser is used as a mobile unit.

The bowser driver is responsible for ensuring that refuelling of mobile plant does not take place within 20m of a watercourse. Where this is not possible (large pumps/generators in use within 20m of a watercourse), drip trays/nappies are placed under the nozzle while refuelling. The operator of the bowser is trained in the use of spill kits. The refuelling bowser is equipped with a 'Grab Pack' spillage control kit. Special attention is paid to spillage control at watercourses. Spill mitigation measures from the refuelling activities are in line with the measures identified in the documents referenced within section 3.9.6. above.

3.10 Information & Training

3.10.1 Induction

Everyone intending to work on site must first attend a Sorensen Civil Engineering Ltd induction. At the induction, details of the Site Rules and other related items e.g. project outline, the main site hazards, organisational arrangements, emergency and evacuation procedures etc. are discussed.

All staff and operatives, including subcontractors, employed on the project will receive an environmental induction as part of the overall site induction. Training of all site staff and personnel will include as a minimum:

- Induction training including environmental requirements of all operatives and sub-contractors:
 - Environmental legislation and its relevance to this project
 - Individual environmental responsibilities and environmental constraints to specific operations
 - Areas of environmental sensitivity, how activities may affect them, methods and timing necessary to protect them and activities to be avoided
 - Procedures and equipment to use in case of an incident
- More detailed training for staff or sub-contractors with specific environmental responsibilities
- Toolbox talks, depending on the type of works being undertaken and the environmental impacts that may result from these activities e.g., training on water pollution prevention before works near watercourses.

All those who have attended the site Induction must sign a HSEQT Site Induction Record [IRE HSEQT/SFM-401].

3.10.2 Toolbox Talks

Toolbox talks are provided to the workforce at the relevant time to supplement the induction.

Environmental information will be given to employees, direct and subcontract, through a minimum of one Toolbox Talk monthly. The subject of these talks will be chosen to suit current site activities but may also include project specific incidents or environmental issues [Appendix 6 – Lists TBT's]. List may change in line with site needs.

Subcontractors conducting their own internal Toolbox Talks are required to supply copies of records showing communication.

Training is given on, but not limited to, the following:

- Protected species/habitats
- Environmental incidents
- Invasive species
- Water pollution prevention
- Spill control/spill kits
- Dust and air quality
- Erosion and sediment control
- Storage/use of petrol, diesel, and oils.

3.10.3 External Training

Training records of the site team are maintained through the Competence and Training Matrix [HSEQT/SF403]. To ensure the appropriate levels are maintained on site and within the team, this is cross referenced with the roles and responsibilities of the individuals, and any areas that require additional up skilling will be identified and the appropriate training provided.

The training requirements of individuals will be based on Project activities and Project requirements.

3.10.4 Training Records

All persons attending site must prove competence through the supply of the relevant Training Certificates. All Training providers completing training on the Project must ensure that Training Attendance Record [HSEQT/SFM-406] is completed by those receiving training.

The completed form is issued to the Project Management team and the Sorensen Civil Engineering Ltd HSEQT Department Training Manager. Copies of all certificates must be issued via the Sorensen Civil Engineering Ltd Department Training Manager

3.11 Environmental Incident Management

3.11.1 Emergency Response

Where there is a risk of an environmental incident or where an environmental incident has occurred, Sorensen Civil Engineering Ltd will deploy all necessary control measures to avoid or minimise environmental impacts/effects without putting any person at risk.

Spillage of Hydrocarbons/Chemicals

At all times the approach adopted is to:

- **Stop** – prevent further spillage by stopping the flow from a leaking hydraulic hose, turning off the pump/generator, righting the oil storage drum which has fallen over, etc.
- **Contain** – by using absorbent pads, socks, granules, Bioversal, booms, sand or soil, or digging trenches etc.
- **Report** – all pollution incidents to the Foreman/Site Ecologist/HSEQT Manager who will take the appropriate administrative action.

Release of Suspended Solids

At all times the approach adopted is to

- **Stop** – prevent further release by diverting the flow of silty water, turning off the pump, halting works etc.
- **Contain** – by using silt curtains, straw bales, silt fences, coir mesh, digging trench, soil berm, etc.
- **Report** – all pollution incidents to the Foreman/Site Ecologist/HSEQT Manager who will take the appropriate administrative action.

The **Spillage Response Plan** will be activated by SCE in the event of a significant hydrocarbon/chemical spillage or accidental release. Site Contact Details are as follows:

- Project Manager - Mark Snow 086 1831437
- HSEQT Manager - TBC
- Site Ecologist - Lisa Dolan 085 1998632

The **Emergency Response Plan** will be activated by the HSEQT Manager and/or the Site Ecologist where a significant environmental impacts/effect has been deemed to have occurred. Steps will be taken with oil spill clean-up specialists to facilitate a rapid response in the event of a major incident, where additional pollution control equipment may be required.

The probability of small spillage on land is greatest during refuelling operations. Staff are made familiar with all the refuelling equipment. Refuelling will be carried out using only the correct equipment i.e. nozzles of the appropriate size, funnels etc.

Each refuelling bowser carries an appropriate spill kit and the driver is fully trained in its use.

Action in the event of spillage on land:

- Stop the leak.
- Use a spill kit/oil boom to bund any pathways to a watercourse, i.e. gullies.
- Use a spill kit to clean up the spill.
- Report spill to the Foreman/Site Ecologist.
- In the event of a more significant spillage, obtain assistance from the Foreman and other members of the workforce. If necessary, construct an earth barrier or trench to contain the spilled material.
- Ensure all contaminated materials are removed and disposed of to a licenced waste bin/facility – remove sufficient clean material along with the contaminated material to ensure spillage is fully cleared.
- Dispose of contaminated soil, pads and booms in appropriate, heavy-duty plastic bags for hazardous waste..
- Dispose of plastic bags at an approved licensed facility in accordance with the Site Waste Management Plan (SWMP) and record.

To prevent or reduce the risk of fuel spillage into water, storage tanks will not be located near any watercourse or peaty soil. Refuelling within 20 metres of a watercourse will not be permitted where possible, where this is unavoidable fuel will be transferred in a double-skinned bowser and drip trays/nappies placed under fuelling points during refuelling activity.

To ensure that water quality is not adversely affected through spill/pollution incidents:

- All material including oils, solvents and paints are stored within temporary bunded areas or dedicated bunded containers.
- Refuelling takes place in a designated bunded area away from surface water gullies, drains and water bodies, in the event of refuelling outside of this area, fuel is transported in a mobile double skinned tank.
- All machinery and plant used are regularly maintained and serviced and comply with appropriate standards to ensure that leakage of diesel, oil and lubricants is prevented.
- Spill kits and hydrocarbon absorbent packs are available and drip trays used during refuelling. All relevant personnel are fully trained in the use of this equipment.

Prior to starting instream works, an emergency response location is established. This provides clear access to the watercourse with suitable currents allowing effective use of a boom if required.

Action in the event of a spillage to a watercourse:

- Every effort is made to prevent a spillage reaching a watercourse.
- All spills are to be reported to the Project Ecologist.
- In the event of a spill reaching a watercourse, a boom will immediately be deployed downstream of the spillage.
- The boom will be secured on each bank and span the entire watercourse.
- To enable the recovery of the pollutant, the boom will be deployed at an angle to direct the pollutant to one bank.
- The pollutant will be removed using floating absorbents pads, socks or booms..

All contaminated material and absorbents will be disposed of in accordance with the Site Waste Management Plan.

All significant and major spillages into a watercourse will be reported to the EPA and IFI.

In the event of a discharge of suspended solids into a watercourse, immediate action will be taken to prevent further contamination.

- Every effort will be made to prevent water with a high suspended solids loading from entering the watercourse.
- Any activity causing pollution will stop immediately.
- Silt curtains, gravel check dams, Kelly blocks, straw bales, silt fencing, and coir mesh will be used extensively instream and along riverbanks to slow down the discharge rate of suspended solids.
- On land, silt socks (including manifold system), settlement tanks, gravel check dams, straw bales and settlement ponds will be used to reduce the level of suspended solids in discharged waters from site. The silt mitigation used will depend on the location of the site being dewatered and the condition of the water being discharged.
- Where possible, civil engineering controls will be installed to manage the incident.

Emergency Flood Response - In the event of a predicted or actual flood the following measures will be taken:

- Flow management works will be undertaken to permit the passage of flood waters freely through the works.
- All mobile plant and equipment will be relocated from flood prone areas.
- Static plant and/or compounds within flood-prone areas will be made safe.
- An emergency response crew with appropriate equipment and plant will be on call on a 24-hour basis.
- We will provide mitigation measures to local properties as requested to prevent ingress of water due to a flood event.
- Sandbags will be available to form temporary dams to flooding waters

3.11.2 Investigation & Reporting

All Environmental Incidents

All environmental incidents will be investigated to determine both immediate and root causes and the findings recorded.

All environmental incidents or third-party complaints will be recorded.

Significant / Reportable Environmental Incidents

The **Emergency Response Plan** will be activated by the HSEQT Manager and/or the Site Ecologist where a significant environmental incident has been deemed to have occurred.

The HSEQT Manager/Site Ecologist will inform the Employer's Representative regarding the environmental incident, who in turn will notify the appropriate regulatory authorities such as National Parks and Wildlife Service, Inland Fisheries Ireland, Uisce Eireann, local authority and EPA, if deemed necessary.

In the event that an environmental incident has the potential to become significant, or a significant complaint, communication or visit from a regulatory authority such as NPWS, IFI, EPA, or Local Authority has been received, the HSEQT Manager will inform the Employers Representative, who in turn will notify the appropriate regulatory authorities

Sorensen Civil Engineering Ltd. will take appropriate action following liaison with the regulatory authority.

All significant environmental incidents will be investigated by the Site Ecologist/HSEQT Manager and Project Manager. An Environmental Incident Report (EIR) will be prepared. The causes of an environmental incident, learning points and control measures identified through the investigation completed by the Site Ecologist/HSEQT Manager and Project Manager will be implemented and communicated across all sites. All completed Environmental Incident Reports (EIRs) are recorded and notified to the Managing Director, Operations Director, Project Manager and HSEQT Manager.

4 Arrangements for Controlling Environmental Risks

4.1 Aspects & Impacts

Sorensen Civil Engineering Ltd has identified the environmental aspects within the scope of the environmental management system, taking into account the inputs and outputs associated with its activities and services. This process has considered both normal and abnormal operating conditions as well as reasonably foreseeable emergency situations.

The approach selected for identifying environmental aspects includes, but are not limited to, the following:

- Emissions to air.
- Releases to watercourses.
- Releases to land.
- Use of raw materials and natural resources.
- Use of energy.

In addition to those environmental aspects the organisation can control directly, we also consider those aspects that we can influence, e.g. those related to goods and services used by the organisation and those related to products and services provided.

Consideration is given to related activities, products and services such as, but not limited to, the following:

- Development.
- Packaging and transportation.
- Waste management.
- Environmental performance and practices of sub-contractors and suppliers.
- Extraction and distribution of natural materials such as soil.
- Wildlife and biodiversity.

4.2 Significant & High-Risk Project Activities

During the completion of the Project, the following aspects and impacts have been identified as high risk for the completion of Glashaboy River (Glanmire/Sallybrook) Drainage Scheme.

It is anticipated that the following pollutants may arise from construction operations on this Project:

- Plant fuels and lubricating oils
- Concrete/Cement
- Silt laden water [surface water runoff from construction site and excavation dewatering]
- Sewage and Trade Effluent
- Noise [from construction operations]
- Vibration [from construction operations]
- Dust [from construction operations]

4.3 Construction Controls & Mitigation Methodologies

4.3.1 Ecology, Habitat Protection & Protected Species

Sorensen Civil Engineering Ltd recognise the importance of protecting ecology, habitat and protected species during construction and will take all practical measures to achieve this. Where possible, we will carry out habitat enhancement to improve the ecological value of the local environment. Specific mitigation measures are outlined in detail in the Project Natura Impact Statement (2018), EIAR (2018), EIAR Addendum (2020), Appendix 5.1 CEMP (2020), Section 5.2 Biodiversity, and the Contract Specification, Appendix 1/37 (Section 4 to 13 inclusive).

The following are the controls and mitigation methodology for sensitive features and protected species.

All works and mitigation measures will be designed, implemented and monitored by the Project Ecologist and supervised by the Resident Engineer's (RE) Ecologist during the construction period.

Habitats and Flora

The main risk associated with the proposed scheme in relation to habitats is silt delivery to the watercourse. Details on pollution prevention measures to be implemented to ensure the water quality of the Glashaboy River is not adversely affected through pollution incidents and silt and nutrient mobilisation are described below.

In order to mitigate identified construction and operational impacts on the habitats and flora of the scheme, the following mitigation measures are being implemented:

- In-channel working are minimised and avoided where possible.

- Erosion control measures, geotextile matting and/or coir-mesh and/or straw bales/Kelly blocks, will be installed at key changes in flow regime, such as at culvert entrances and exits, so that local erosion does not precipitate a disruption or acceleration of the sediment regime. A transition from hard to soft erosion control measures will be included at all culverts and hard defences.
- Upon completion of the works, instream (aquatic) vegetation will be allowed to re-colonise naturally, if deemed necessary by the Project ecologist additional planting of suitable aquatic plant species will be undertaken.
- Upon completion of in-channel works, in-channel sediment features will be reinstated. This may be in the form of placing boulders at intervals along sections of channel where the natural riverbank is being altered by hard structures.
- A silt fence will be installed at the base of the new embankment at Sallybrook. This silt fence will be installed prior to the exposure of unvegetated overburden. Sections of embankment will be appropriately covered at the end of each workday to ensure unvegetated overburden is not left exposed.
- It is anticipated that any alteration of the sediment transport processes will be localised to the main channel works, such as bridges and culverts. A review of the construction works to capture immediate local channel geomorphological response will be undertaken by a qualified Geomorphologist. Erosion control measures will be extended further downstream if deemed required.
- Upon completion of the works to the new embankment, and in any other grassland areas disturbed during the construction works, the area will be re-sown with an appropriate species-rich grass and/or native wildflower seed mix option.
- Hedgerow/tree planting will be undertaken to address the loss of hedgerow/treeline to accommodate the new drainage scheme. As outlined in the drawing series -070- only native, locally sourced species appropriate to the locality will be planted.

Measures to mitigate disturbance from temporary piling

- Piling activities do not take place during the hours of darkness.
- Vibratory piling methods are used as a low noise alternative to impact piling.
- Piling methods use a 'soft-start' approach to allow adequate time for wildlife to respond and move away from the disturbance if desired.
- Where possible, works will be conducted from the dry side to limit damage to riverine/estuarine and intertidal habitats along the toe of the walls and works.

Habitat Loss Prevention

The footprint of works is identified at the onset of works in each new area and is demarcated to avoid unnecessary disturbance to habitats outside of the works area. Method Statements of works detail the construction footprint and access routes to the proposed works prior to construction.

Mitigation measures are implemented at all work sites in the vicinity of a watercourse to ensure that water quality is not adversely affected through pollution incidents and silt mobilisation. The mitigation includes:

Where soil/made ground and subsoil stripping occur, the resulting excavated soil fractions shall be segregated into inert, non-hazardous and/or hazardous fractions. Testing will be conducted on the basis of visual or olfactory contamination indicators.

The excavation and handling of material is carefully managed in such a way as to prevent potential negative impact on the receiving water environment. As stated above, silt curtains/fencing, erosion control matting (coir-mesh) and straw bales will be utilised along riverbanks to prevent waters receiving excess silt from any works site.

Whenever possible the excavated spoil is not stored beyond the working day, in the event that this is not practical precautions such as placement location away from the watercourse and covering with plastic, or a similar material, are taken to ensure the watercourse is protected from potential runoff.

All associated hazardous construction waste shall be stored within temporary bunded storage areas prior to removal by an appropriate EPA or Local Authority approved waste management contractor.

The guidelines provided by the Department of the Marine and Natural Resources, with respect to concrete wash waters, CIRIA, the UK Environment Agency and Environment and Heritage Service, the UK Department of the Environment and Inland Fisheries Ireland (IFI) shall be adhered to in order to ensure that there is a neutral impact on the water environment during the construction phase of the proposed development. Discharged waters are monitored with a handheld pH monitor by the Site Ecologist – it is ensured that waters outside the pH range 6 – 9.03 are not allowed to enter any watercourse, discharged waters likely to alter a watercourses pH by +/-0.5 are also not allowed to enter any watercourse as per the Work Requirements.

The weather forecast is monitored daily, in the event that flooding/overtopping of the river is likely all plant, pumps and generators will be removed from the flood plain, silt mitigation in the attenuation area at Sallybrook house (silt curtains, straw bales) will be removed to prevent them from entering the watercourse during a flood and thus becoming pollutants. All areas will be checked to ensure equipment is secure and no pollutants will enter the watercourse from any work sites.

The following mitigation measures are being implemented to prevent harm to soils, geology and hydrogeology:

- Designated fuel storage facilities, designed in accordance with guidelines produced by CIRIA, are provided and are fully bunded.
- All vehicles and plant are inspected daily by the driver for fuel, oil and hydraulic fluid leaks. All plant contain an emergency spill kit.
- Where feasible, soil excavation is completed during dry periods and undertaken with excavators and dump trucks. Topsoil and subsoil is not mixed together.
- Use collection systems to prevent any contaminated drainage entering groundwater or draining onto the land.

- Minimise the use of cleaning chemicals.
- To minimise any impact on the underlying subsurface strata from material spillages all oils, solvents and paints used during construction are stored in temporary bunded areas. The design (volume and construction) of all bunds conforms to standard bunding specifications.
- Spill kits/absorbent pads and boom are used in the event of a spillage.
- Spill kits are retained on site, in particular at refuelling areas and other high-risk areas, to ensure that any spillages or leakages are dealt with immediately.
- All dispensing of fuels and hazardous materials occurs over areas of concrete hardstanding or other impermeable surface with drainage directed to an oil/water interceptor or a suitably constructed bund.
- All associated waste residuals are stored within temporary bunded storage areas prior to removal by an appropriate waste disposal contractor for off-site treatment/recycling/disposal.

Water Quality

To ensure that the water quality of the Glashaboy River and estuary is not adversely affected through pollution incidents and silt and nutrient mobilisation:

- Works are carried out in accordance with, but not limited to, the following best practice guidelines where appropriate and possible:
 - CIRIA C532 Control of Water Pollution from Construction Sites. Guidance for consultants and Contractors (2019)
 - CIRIA C648 Control of Water Pollution from Linear Construction Projects - Site Guide (2006)
 - CIRIA C649 Control of water pollution from linear construction project - Technical guidance (2006)
 - CIRIA C750 Groundwater control – design and practice (2016)
 - Inland Fisheries Ireland Guidance on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016)
 - National Roads Authority Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (2008).
- Sediment control measures in the form of silt socks/silt dewatering bags, settlement tanks, settlement ponds/attenuation areas, silt fencing, silt curtains, straw bales, Kelly blocks, gravels and erosion control matting will be utilised across the project. One or more of the above will be used at each site depending on the level of sediment control needed, site location (instream/proximity to a watercourse or pathway to a watercourse) and the site allowances for a given control, i.e., availability of space and ground conditions may dictate the ability to implement a settlement pond. Pumping of groundwater will be done under a permit system to ensure silt mitigation is installed.
- Chemical, fuel and oil stores will be located on an impervious base within a secure bund with a storage capacity 110% of the stored volume.
- Biodegradable oils and fuels are used where possible.
- Drip trays are placed underneath standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery is carried out on an impermeable surface in one designated area at least 20m from a watercourse or drainage system.
- Emergency spill kits are available on site and staff are trained in their use. All plant machinery contain an emergency spill response kit.
- Operators check their vehicles daily before starting work to confirm the absence of leakages. Any leakages are reported immediately.
- Daily checks are carried out and records kept on a weekly basis. Any items that have been repaired/replaced/rejected are noted and recorded. Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed. All items of plant will be checked prior to use before each shift for signs of wear/damage.
- All washing out of grout pumps is carried out in designated areas. At no point will grout pumps be washed out at the worksite.
- All material including oils, solvents and paints shall be stored within temporary bunded areas or dedicated bunded containers.
- Refuelling shall take place in a designated bunded area $\geq 20\text{m}$ from surface water gullies, drains and water bodies where possible. Where this is not possible due to the nature of the scheme, fuel is transported in a mobile double skinned tank and drip trays are placed beneath the nozzles point of refuelling.
- All machinery and plant are checked daily by the drivers for leaks, etc. maintenance and services are completed as required and comply with the appropriate standards to ensure that leakage of diesel, oil and lubricants is prevented.
- Spill kits are located in each machine as well as yellow bin spill kits being located close to all work sites.
- One spill kit will be maintained at both site compounds, spill kits contain:
 - Terrestrial oil booms (80mm diameter x 1000mm; 10 no)
 - Water booms and attachment clips (130mm diameter x 3000mm; 10 no.)
- Spill kit stocks are checked every 6 months and/or after use to ensure contents remain adequate.
- All relevant personnel are fully trained in the use of this equipment.

Bankside Works/Surface Water Quality

The key mitigation approaches proposed to address bankside works are as follows:

- Adoption of surface water controls including appropriate erosion and silt controls such as silt curtains, straw bales, erosion control matting, etc., to prevent any flow of surface water from the work site into the adjacent watercourses. Silt traps/settlement ponds/settlement ponds/straw bales or other forms of containment and treatment will be constructed at locations that will intercept construction run-off to streams and rivers where practicable.
- A multi-faceted approach will be implemented at the Sallybrook embankment works, using the following techniques:
 - Areas of bare soil will be covered with coir-mesh or an erosion protection geotextile.
 - Only areas under immediate construction will be disturbed in order to limit the amount of erosion and sediment control that is required throughout the project - natural vegetation will be kept in place and topsoil undisturbed as much as possible.
 - Silt fencing coupled with a sump will be implemented to interrupt the pathway along the slope towards the river and intercept any fine sediment.

- The site will be segmented into manageable sediment storage areas for using multiple silt fence runs. The drainage area above any fence will not exceed a quarter of an acre.
- Low permeability imported material used to construct the core of the embankment will be stored within a controlled buffer zone a minimum distance (at least 20m) away from the river edge to prevent overland run off during stockpiling.
- Straw bales and Sedi-mats™ will be used downstream of works to act as a filter for suspended sediment. The Project Ecologist will provide ongoing advice on type and positioning of silt control at bank works e.g. prior to set up and during works
- Landscaping of banks near watercourses will be carried out during a period of dry weather. Rainfall will be monitored and works carried out ideally during consecutive dry days.
- Re-seeding of banks will take place immediately after construction. Recommended suppliers of native Irish wildflowers will be approved by the Project Ecologist.
- A buffer zone will remain between the sumps and/or silt fence and watercourse with natural vegetation left intact, or imported materials such as geotextile, straw bales, coarse to fine gravel will be used either separately or in combination to remove any excess suspended matter.
- Excavations that arise from the removal and root balling of trees along the riverbank will adhere to the following measures to prevent run-off of fines from the excavation into the watercourse:
 - Root balls of trees located 2m or less from the edge of the river channel will not be removed but will be cut to ground level instead.
 - Prior to removal of the root ball a silt fence will be installed downgradient of the excavation area to intercept any run-off to the river channel.
 - Excavated areas where root balls have been removed will be backfilled and reinstated on the same day to limit the exposure of soils and potential run-off.
 - Landscaping of banks near watercourses will be carried out during a period of dry weather. Rainfall will be monitored and works carried out ideally during consecutive dry days.
- All bankside works are overseen by the Project Ecologist, who is also responsible for the design and implementation of the mitigation measures as described above. The Project Ecologist ensures that control measures are effective and sufficient.

All works undertaken on the banks shall be fully consolidated to prevent scour and run off of silt. Consolidation may include use of erosion protection membrane on the banks and also the sowing of grass seed on bare soil.

The following measures are being implemented to limit the loss of soils as a result of erosion due to surface water run-off:

- Vegetation and soil are left in place for as long as possible prior to excavation and stockpiling of soil is minimised during wet weather periods.
- Soil stockpiles are shaped so as to shed water.
- Surface water run-off from exposed soil surface is intercepted and channelled to sumps and silt traps thereafter (silt traps detailed above).
- A granular layer is installed over bare soil if erosion control matting is not suitable for the area, particularly in the vicinity of watercourses, to prevent erosion of fines and/or rutting by construction machinery.

Mitigation Measures to Prevent Potential Contamination of Water include:

- All concrete works being carried out in dry conditions with no instream pouring of concrete.
- No refuelling of machinery within the river channel.
- No vehicles are left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads are on site at all times.
- Fuel stored on the site is in a double skinned, bunded container that is located within a designated works compound at a location that is removed from the river. All other construction materials and plant are stored in this compound. The compound also houses the site offices and toilets. This compound is located on ground that is not prone to flooding.
- Refer to the "Glashaboy Flood Relief Scheme Hydraulic Modelling Report – Final" prepared by JBA Consulting (November 2016) for information regarding predicted flood flows, velocities, and flood levels along the watercourses in the works areas. The report is available for download on the project website (<http://www.glashaboyfrs.ie>). Extracts from the report are also included in the Information Pack.
- All vehicles are regularly maintained and checked for fuel and oil leaks.

Mitigation Measures to Prevent Residual Impacts include:

- Ensuring tress and vegetation are retained where possible and replanting is completed where possible.

Instream Works

Instream works are divided into those which (a) require flow diversion or 'working in the dry' techniques, coupled with over pumping or fluming, and (b) those where machinery is required to track within the channel due to constraints in access. Working in the 'dry' will be favoured wherever possible.

(a) Areas requiring stream diversion or 'working in the dry' include

- Bleach Hill/Cúil Cluthair Culvert
- Cois na Gleann culvert

- Gas Diversion Works at Hazelwood Avenue
- New wall above Hazelwood
- Riverstown Bridge regrading works
- Glenmore river regrading works
- Brook Lodge & Copper Valley Vue bridge
- M8 New line Bridge

(b) Work areas requiring machinery entering watercourse:

- Sallybrook piling works near Eurofins
- Riverstown Bridge and Meadowbrook flood defence walls

Mitigation for instream works are described below.

- All instream works will be carried out in accordance with the following method and in consultation with IFI.
- All instream works will be undertaken during the instream period of July to September inclusive. After this, the river is effectively 'closed' to protect the spawning activity of resident salmon and trout, which occurs during October to May. However, where delays in the work programme occur, due to unforeseen circumstances, the Contractor will apply for an extension to the instream window from IFI and the Client.
- All instream works will be scheduled for completion by the end of, or before, September with re-established bed and bank profiles left with no risk of silt mobilisation.
- All construction machinery operating instream will be mechanically sound to avoid leaks of oils, hydraulic fluid etc. Machinery will be checked daily prior to entering the river for instream works.
- Where dewatering and pumping of water is required the works will be assessed by the Projects Ecologist to establish if a fish salvage operation via electrofishing under licence from the Department of Communications, Climate Action and Environment (DoCCAE) and in consultation with IFI, will be required.
 - Where short-term diversion channels are required, they will be sized to accommodate surface water flow that might reasonably be expected over the period in question and provide for passage of fish and macroinvertebrates.
 - All instream works will be capable of being made safe in the event of a storm event.
 - IFI personnel will be informed of when the watercourse will initially be diverted.
 - All pumped water will be passed through silt mitigation measures, as described above, to reduce the release of sediment to the watercourse.
- Abstraction points will be screened to ensure that fish and aquatic plants are not removed from waters. If required, fish populations which become isolated, will be salvaged via electrofishing under licence from the DoCCAE.
- All instream works will be monitored by the Project Ecologist in consultation with the ECoW and IFI and in accordance with the IFI (2016) *Guidelines on protection of fisheries during construction works in and adjacent to waters*.
- Fording of the watercourse at Meadowbrook will be done to facilitate the proposed flood defence piled wall on the eastern bank. The works will be carried out following consultation with IFI, as species protected under the Wildlife Act, Habitats Directive and the Freshwater Fish Directive occur in significant numbers.
- Operation of machinery instream will be kept to an absolute minimum at all times.
- Any instream area which will be accessed by machinery will be effectively isolated prior to commencement of works. This includes works that run parallel to the riverbank on the 'wet side' as well as the temporary crossing at Riverstown. The temporary crossing will:
 - Include the provision of instream and bank-side preparation, and rehabilitation of the area once the works are complete.
 - Allow for safe crossing of the widest items of plant and equipment without cover material being dislodged and entering waters.
 - Prevent the erosion of stream beds and banks.
 - Natural bank and riverbed stabilisation techniques such as willow-faggoting, rock armour, logs, conifer tops or composite protection using coir-mesh matting will be utilised. Concrete will not be used.
 - Instream crossings will be composed of suitable material both clean and inert, that will allow water to pass through and not give rise to silt run-off. The crossing will be fenced with geotextile or similar material to prevent wind blow carrying dusts etc. to water.
 - Where instream bed material is to be removed, coarse aggregates, if present, will be stockpiled for replacement in the reformed channel.
 - Provide for passage of fish and macroinvertebrates (where fording of river is required), as well as prevent erosion and sedimentation.
 - Have capacity to convey the river flows expected without the crossing being overtopped.
 - Restrict to one crossing point and where feasible, traffic movements are limited.
- Where trench excavations into the riverbed are required (for example to access services), these works will be completed in the dry whereby water will be diverted from upstream to downstream through water diversion techniques.
- Following completion of backfilling after excavation, riverbed and banks will be reformed to match their original profile, with the exception of limited sections of riverbank which will be augmented for flood conveyance.
- Channel modifications, which will occur at Glenmore Stream at Brooklodge Grove and de-silting, which will occur at Riverstown Bridge, will follow the mitigation measures as described above.
- As part of the installation of new culverts, some minor regrading and widening of channels are required. To minimise run-off of soil into watercourses a multifaceted approach will be taken whereby:

- Silt pollution caused by working in surface waters will be minimised or prevented by working in dry conditions with water diverted or over pumped during the construction period. Surface water will be managed using appropriate isolation techniques as previously outlined.
- Measures to prevent the release of sediment due to run-off, will include (but not limited to) the use of silt fences, silt curtains, settlement ponds, and filter materials.
- Excavated material will be transported off site to a licenced facility or stored for reuse on site where appropriate.
- For the installation of culverts, machinery access to the watercourse will be confined to a single bank, where possible, to limit disturbance of ground.
- Instream floating river vegetation (e.g. *Ranunculus* sp. *Callitriche* sp.), will be retained wherever possible, and any disturbance to stands of river plant life minimised.

Instream Diversion Works

Where culvert installation, bridge construction and flood relief channel construction are proposed, isolation of a dry instream area, through cofferdam construction is required. The following steps will be adopted by the Contractor on appointment.

- Temporary bunding will divert the river around individual works areas thereby allowing for continued flow through the majority of the channel. This will minimise disturbance to the flow regime. Bunding will consist of cobble stone and sandbags covered with impermeable sheeting. The exterior of the bunds will be supported by rock armour laid in layers.
- Pumping of excavations will be directed away from the river and into settling ponds where possible, or through a silt mitigation system as described above, to a location which meets the approval of the RE Ecologist, Employer's Representative and IFI/NPWS.
- Over pumping activity will have a filter on the intake hose to prevent fish entering the system. The outfall of the pipe will flow into a silt bag and/or settlement pond/tank as required, prior to release back to the river channel.
- Completion of cofferdams/bunds may isolate certain life stages of species of conservation concern from the main river channel such as Atlantic Salmon and River Lamprey. Prior to dewatering, the area within the bunds will be electro-fished under licence and all specimens will be translocated to suitable location instream away from the works area. A sump will be excavated within the bund and pumped continuously. A mini excavator will be lifted into the dewatered bunded area.
- Following the completion of diversion works, the bunding and its supports will be the last works elements to be removed from the river channel.

Fisheries

In order to mitigate identified construction and operational impacts on fisheries the above mitigation measures have been implemented, the following lists specific mitigation measures for fisheries in detail:

- All instream and bankside works follow the measures outlined above (*Water Quality*) and in the EIAR and IFI 2016 Guidelines on protection of fisheries during construction works in and adjacent to waters.
- All instream mitigation works will be designed and monitored by the Site Ecologist, under the agreement of the Employer's Representative and in consultation with the IFI.
- Consultation with IFI was carried out prior to works and is ongoing throughout the construction phase of the Scheme.
- Instream working will be kept to a minimum wherever possible. Where instream working is unavoidable, works are preferentially done in the dry where possible through the use of temporary coffer dams and dewatering. Fish rescues will be undertaken by a licenced person prior to dewatering activities. A section 14 licence will be obtained prior to commencement of electrofishing. The Contractor shall allow for a minimum of 30 working days for the processing of its licence application by the Department.
- Instream works only occur during the instream window, July – September inclusive. Extension of the July – September working window will only be in consultation with IFI and subject to approval from the EMG/OPW.
- During the construction phase it will be ensured that, where fish passage existed prior to works, fish passage will be maintained past areas of instream works.
- Where piling is required, a press-in piling technique has been, and will be, used where possible.
- Any pumps used for over-pumping/de-watering will be fitted with a fish screen.
- Method statements will be drafted and agreed with IFI for instream works relating to fitting of all non-return drainage outlets to new flood defence walls.
- Hard engineering of the river bed will be avoided.
- Any riverbed materials removed as part of the works will be stored and replaced where possible and any areas where new bed materials are installed will consist of washed gravels agreed with IFI and approved with the RE team. Existing bed material will be used to cover new bed materials, wherever possible. Bed material removed from the river will be stored on the bankside. The storage facility will be such that there will be no loss of sediments from the material stored and no external contamination (e.g. a bunded plastic sheet or sealed plastic container). Once excavations are complete, and any new material has been introduced, the stored material will be replaced over the bed. Once normal flows are restored after demobilisation, the replaced material will be redistributed by the currents. These measures will ensure no net loss of material and no significant changes to bed sediment morphology or composition.
- All culverts will be installed in line with published best practice guidelines for fish passage (e.g. CIRIA 2010; Armstrong et al 2010; Turnpenny & O'Keefe 2005).
- The existing timber weir and remnants of an older hydropower wheel at Area 2 – Springmount, will be removed as part of the works. The removal of the timber weir will facilitate fish passage and improve the conveyance of the channel.
- In key sections of bankside and instream works where release of silt is of highest risk to spawning gravels, upstream Kelly blocks will be placed to direct the flow away from the works area. Silt curtains will be installed downstream of works at a diagonal angle to the bankside on which works are occurring to help slow and catch any mobilised silt particles. All silt mitigation measures will be discussed with, and under the advice of, IFI.

- Gravel cleaning will be used on suitable spawning habitat around Hazelwood and Meadowbrook. A 1" (25.4mm) nozzle low power water jet will be used as per Environment Agency (UK) current techniques.
- The impact on fisheries due to the proposed scheme may be mitigated in part by enhancement works. For example, lowering of the Glenmore stream bed could benefit from features that create sinuosity through the low-flow channel, or stepped pools, to create increased flow diversity and habitat opportunities for fish within this reach. Similarly, the reach at Hazelwood at the downstream exit of the flood relief culvert will benefit from increased flow diversity through strategic placement of small boulders on the bed of the channel as approved by IFI.
- The root system of trees removed within 2m of the watercourse will be left in-situ and not removed.
- Trees and hedgerows will be retained along the riverbanks wherever possible.
- Hedgerow/tree planting will be undertaken as outlined in drawing series -070-. Hedgerows and trees will be replanted close to the existing alignment and location where feasible and will use native, locally sourced species appropriate to the locality.
- All instream works will be overseen/monitored by the Site Ecologist. The Site Ecologist will also provide on-site ecological advice to teams completing the works.
- Water quality monitoring sondes will be placed upstream of works and no more than 100m downstream of works to monitor the impact of our works on water quality. The sondes are capable of recording pH, temperature, electrical conductivity, dissolved oxygen and suspended solids with real time data available via telemetry system.
- The live stream feed will be utilised to dictate daily decisions on how/when works proceed and immediate actions will be taken by the Site Ecologist to rectify silt mitigation measures should turbidity exceed the agreed upon limits (300mg/l – Main Channel; 180mg/l Culvery Replacement Works). The sondes alarm in real time if limits are exceeded. Note that limits will be measured through disparities in upstream and downstream water quality rather than due to the effects of weather events. However, should the upstream sonde be reading an unacceptable level of turbidity, for example a during heavy rainfall event, works will be paused so as not to exacerbate the silt event.
 - The level of suspended solids in any discharges to fisheries waters as a consequence of construction works (i.e. difference in concentration from upstream to downstream) will not exceed the agreed upon limits set out in correspondence FN002.
 - The pH from all discharges made from and during construction works will be in the range 6.0 to 9.03 units and will not alter the pH of any receiving fisheries waters by more than +/- 0.5 pH units (IFI, 2016).
- A correlation calculation has been performed to convert TSS (mg/l) to turbidity (NTU) for the Glashaboy River using linear regression analysis:
 - $(0.47564) (300\text{mg/l}) + 6.181364 = 149 \text{ NTU}$
 - $(0.47564) (180\text{mg/l}) + 6.181364 = 92 \text{ NTU}$
 - $(0.47564) (25\text{mg/l}) + 6.181364 = 18 \text{ NTU}$
- Pumping of water will be conducted under a permit system issued by a member of the Environmental Team.
- Handheld monitoring of turbidity is completed at all areas where pumping activity has potential to influence the main water channel.
- In the event that either a water quality alarm is triggered by the instream monitoring system or unacceptable impacts on water quality are observed, the works will cease until the cause of the issue has been identified and rectified. Appropriate remedial measures will be designed by the Site Ecologist in conjunction with the ECoW based on the nature and scale of any impact identified to restore the river water quality and aquatic habitat.
- Detailed method statements shall be prepared by the Contractor in consultation with the site ecologist.

Hydromorphology

- Hydromorphology walkovers are undertaken following major high-flow events and on an annual basis.
- Such walkovers will document any change in the sediment and flow dynamics in the system, as a result of the scheme construction.
- Any points of note will be communicated to the Employer's Representative and recommendation for remedial action (such as bank reinforcement, in channel feature installation or others, where appropriate) will be made.
- Further details are provided in the Geomorphic Audit.

Birds

In order to mitigate identified construction and operational impacts on birds, the following mitigation measures are being implemented:

- All foreseen vegetation clearance works, and site preparatory works are conducted outside of the bird nesting season (March to August inclusive). If vegetation clearance is required within the bird nesting season, a nesting bird survey is undertaken by the Project ecologist in advance of the works to ensure no detrimental impact to nesting birds. In the event that an active nest is located during such a survey, no vegetation clearance will be undertaken, a buffer zone appropriate to the site will be enforced (min. 10m) and the nest monitored. The buffer zone will be revoked only once chicks have fledged.
- Areas of the works hold potential nesting habitat for riverbank nesting birds, Kingfisher and Dipper, specifically Meadowbrook.
- Bank/Kingfisher surveys were undertaken by the project ecologist in March 2024, in consultation with the NPWS, to establish burrow occupancy. Burrows were found to be unoccupied during this survey period and therefore, works in this area were permitted to commence.
- Hedgerow/tree planting will be undertaken to mitigate for habitat loss during the construction phase. Hedgerows will be replanted as close to the existing alignment and location as possible and will use native, locally sourced species appropriate to the locality. The planting of unstable banks will be carried out to assist the re-establishment of habitat cover to the river corridor.
- Existing walls and bridge structures requiring work during the nesting bird season will be surveyed for nesting birds prior to the commencement of works to ensure there will be no impacts on birds particularly Dipper and Grey wagtail.
- If nests are found, they will be safeguarded, with an appropriate buffer (as above), and monitored until the chicks have successfully fledged. If areas are identified as Dipper and Grey wagtail nesting sites during the survey and will be damaged or lost by the proposed

works, enhancement measures structures will include the installation of nest boxes in these areas. This will be undertaken by the project ecologist in consultation with independent Ornithologists.

Otter

In order to mitigate identified construction and operational impacts on Otter the following mitigation measures have been implemented:

- The river is surveyed periodically by Triturus Ltd. to locate new/existing otter holts and determine their status (active/inactive). Holts are monitored via camera under licence from the NPWS between surveys.
- A derogation licence for the scheme has been obtained from NPWS with respect to otter. The derogation licence application details all works occurring within 150m of identified Active and potentially active otter holts.
- Requirements of the licence will be implemented and adhered to at all times by all site personnel.
- As of January 2024 four holts are considered to be within the vicinity of works – two at Meadowbrook, one at J.O'Callaghan Park and one at Sallybrook Industrial Estate. Signage has been erected and noise barrier is being installed as per licence requirements.
- Any lighting required on the Scheme is directional away from the river corridor, preventing unnecessary light spillage and light pollution. Lighting is controlled by a timeclock/sensors.
- Night-time working is avoided, within 20m of known otter holts and resting places.
- The design of new structures includes the provision of ledges for the movement and passage of otters in accordance with 'Guidelines for the treatment of otters prior to the construction period of national road schemes' (NRA, 2008) and 'Guidelines for the crossing of watercourses during the construction of national road schemes' (NRA, 2008). Ledges will tie into the adjoining riverbanks, or river bed where practicable. A 500mm wide ledge will be constructed from concrete with its top at 150mm above the 1 in 5 year flood event. It will be on one side of the bridge/culvert structure only. These ledges will be provided at culverts:
 - Hazelwood shopping centre bridge
 - All new structures on the Glenmore Stream (three)
- To minimise the potential for otters becoming trapped in excavations, all excavations will be left open for the minimum possible time, and not overnight. If excavations have to be left open over-night, they will be fitted with an escape ramp (at a slope of no more than 45°) to allow accidentally trapped animals to escape. Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site.
- All materials stored on site will be stacked securely so as to prevent accidental collapse if investigated by an otter, or any other large mammals.

Badger

No badger setts have been recorded within the area of the Scheme. However, given the high mobility of this species and the suitable habitat offered by the works area with respect to commuting and foraging activities, all work sites will be resurveyed for badger setts prior to clearance/plant entering the site. Area 1 and Area 2 were resurveyed in February 2024 with no findings of badger activity. Area 3 and Area 4 were surveyed in March 2024 with no findings of badger activity.

Bats

In order to mitigate identified construction and operational impacts on bats the mitigation measures listed below are being implemented:

- Prior to tree felling activity, Sept 2023, all trees scheduled to be felled were surveyed by a licenced Bat Specialist. No roosts were identified on the scheme and no felling activity required supervision by the licenced bat specialist.
- All tree felling will be done outside of the bird nesting season (March – August) and outside the main bat maternity season (May-July/August) and the main bat hibernation season (Dec/Jan – this is weather dependent). Where trees require felling during an important bat season, they will first be assessed for bat roost features (BRFs) by a suitably qualified ecologist. If BRFs are present a licenced bat specialist will supervise felling activity.
- Trees and vegetation along riverbanks adjacent to bridge structures will be retained where feasible.
- Treelines and shrubs will remain in-situ where possible.
- The removal of mature trees will be minimised where possible.
- Tree felling may take place in December and January in mild conditions (i.e. >8°C daytime temperature). This will be undertaken in consultation with a Bat Specialist. New planting will mitigate tree removal. Planting will be in accordance with the Brady Shipman Martin's Planting Plan (Appendix D of 2020 EIAR Addendum) and will comprise of native species.
- Any trees with bat suitable crevices/hollows, will be soft felled under the supervision of a licenced Bat Specialist. Large trees will be gradually dismantled and gently lowered to the ground. These trees will be left on the ground for a minimum of 24 hours. If bats are found, they will be retained in a box until dusk and released on-site by a licenced bat specialist.
- Any ivy-covered trees, which require felling, will be left to lie for 24 hours after felling to allow bats beneath the cover to escape.
- Open areas required to facilitate works will be limited, where feasible, to areas where tree and hedgerows are not present. Lighting of such workspaces will be limited, as far as is practical, having regard for workplace health and safety, particularly during the foraging period (30 minutes prior to sunset to 30 minutes after sunrise).
- Temporary construction lighting may be required at some locations especially during the winter months where daylight hours are short. Site lighting will generally be provided by tower mounted 1000W metal halide floodlights, which will be angled downwards to minimise spillage of light from the site.

Bats – Riverstown Bridge

Riverstown Bridge is the only bridge within the scheme that has potential to be used by bats as a roosting site as per 2018 EIAR.

- A Licenced Bat Specialist completed surveys of the bridge and surrounds between May and July 2024, prior to works commencing.
- No bats were recorded to be roosting in the bridge structure during these surveys and works are not expected to impact upon the existing crevices in the bridge that have roost potential.

- Therefore, a new derogation licence is not required from the NPWS for instream works occurring beneath, and in close proximity to, the bridge structure.
- The works are being undertaken outside the main maternity season (May- July/August) and the main hibernation season (Dec/Jan – this is weather dependent). Works are underway in September 2024 and will be avoided during freezing conditions.

Alternative roosting sites – Bat Boxes

Bat boxes will be installed as per design/drawing requirements. Where unforeseen trees require felling, the number of bat boxes to be installed will be calculated by a bat specialist according to the below values:

- For every one High-value tree felled – one bat box will be installed.
- For every three Moderate-value trees felled – one bat box will be installed.
- For every five Low-value trees to be felled – one bat box will be installed.

The bat box design which will be used is:

- 'Schwegler' woodcrete bat box designs – 1FF design (flat box, self-cleaning).
- Or similar approved by the ER Team via MAR.

The bat boxes will be sited carefully following the below general points:

- Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 3 metres above and below position of bat box.
- Diameter of tree will be wide and strong enough to hold the required number of boxes.
- Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations will be sheltered from prevailing winds.
- Bat boxes will be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of resident bats.
- A number of bat boxes will be erected on one tree at an array of aspects. South facing boxes will receive the warmth of the sun, which is necessary for maternity colonies. In large bat box schemes, it is generally recommended to have three bat boxes arranged at the same height facing North, South-East and South-West. This ensures a range of temperatures are available all day. If the South facing boxes become warm, bats can safely remove to the cooler North facing box.

Two bat boxes have been installed (April 2024) at Cuil Chluthair at approx. coordinates: 51.945986, -8.398770 as agreed in consultation with the ECOW.

Enhancement work – tree planting

A large array of trees have been felled as part of the flood relief works. Tree planting will be undertaken to mitigate for the loss of habitat. Tree species such as alder and birch grow quickly and also develop suitable roosting sites for bats quickly, while slow growing tree species develop suitable roosting sites for bats at a slower rate. Therefore, a mix of Irish native trees species such as alder, birch, oak with undershrub layer of hawthorn, blackthorn and holly will be planted in line with landscaping drawing series -070-.

Site Environmental Inspections and Monitoring

Informal site walks are completed daily by the Site Ecologist, joint environmental tours are completed bi-weekly by the site ecologist's and Clients ECOW and an Environmental audit is completed monthly by the Site Ecologist. All examine environmental performance and adherence to this CEMP. The bi-weekly joint tour reports are drafted and issued by the Client's ECOW, the monthly Environmental Audit is written by the Site Ecologist(s) and submitted to the Client Representatives via DTN and to the client as part of the Monthly Progress Report Package. The Site Ecologist ensures all works are being carried out in accordance with the Environmental Control Measures and relevant site-specific Method Statements. Results of the audits (internal and any external audits) will be reported back to the project teams through a variety of mechanisms including site toolbox talks, construction meetings and inspection reports. All environmental monitoring data will be made available to the Environmental Monitoring Group as the monitoring data becomes available.

Non-Conformances

Sorensen will implement a non-conformance reporting system on the GLASHABOY RIVER (GLANMIRE/SALLYBROOK) DRAINAGE SCHEME. Environmental non-conformances will be identified through site audits, inspections and public reporting. It will be the Site Ecologist's and Project Manager's responsibility to investigate any non-conformity and action the necessary corrective action utilising all the resources available to complete the corrective action. The action will be discussed and agreed with the originator of the non-conformance. If the problem cannot be resolved easily through the above process, then the corrective action will be decided by Sorensen management.

Once a non-conformance/improvement notice has been issued to a site, department, sub-contractor, supplier, etc., a Non-conformance/improvement Report will be opened. All non-conformances are required to be closed out within a maximum period of 28 days. All non-conformances issued on the project will be reviewed on both a weekly and monthly basis to ensure that all non-conformances are closed out in a timely manner. Non-conformance Reporting will help Sorensen ensure that high standards of quality performance are being met. Improvement measures will be implemented to all non-confirming departments/areas to ensure continuous improvement. The Project quality plan will be updated to reflect any improvement measures introduced to ensure that all non-conformances are eradicated.

Environmental Incidents

Sorensen will carry out a full investigation into any environmental incidents. The root cause will be examined, inspection findings will be reported to the Board of Directors. Corrective measures will be introduced and the EMP and procedures will be updated with improvement measures to ensure that the chance of reoccurrence is reduced.

Site Housekeeping

Good housekeeping is an important part of good environmental practice and helps to maintain a more efficient and safe site. The site is kept tidy, secure, and has clear access routes that are well signposted. The appearance of a tidy, well-managed site can reduce the likelihood of theft, vandalism, complaints and/or specific hazards that could affect the safe operation of the other businesses in the area, such as bird hazards and wind-blown litter.

Sorensen will implement the following steps for environmental good practice on site in regard to good housekeeping:

- Adequately plan the site with designated areas of materials and waste storage.
- Segregate different types of waste as it is produced and arrange frequent removal.
- Keep the site tidy and clean.
- Ensure that no wind-blown litter or debris leaves the site, use covered skips to prevent windblown litter.
- Keep hoardings tidy – repair and repaint when necessary, removing any fly posting or graffiti.
- Keep roads free from mud by using a road sweeper; and,
- Ensure site is secure.

Flow Management

Please refer to Appendix 4 for flow management procedures.

Surface Water

Rivers will be clearly identified on all maps in method statements and site plans, in addition to the ditches, pond, and wet grassland habitats identified in the mapping.

Vegetation Removal and Soil Management

Throughout the course of the project Sorensen are:

1. Minimise areas stripped of vegetation using a phased approach during the planning and construction phase i.e. stripping during periods of dry weather etc.
2. Fell trees only once felling is approved by the relevant parties (OPW, CCC, ARUP, Site Ecologist)
3. Removal of hedges and trees in winter, cutting of vegetation to maintain short sward will also reduce run-off and erosion.
4. Consideration shall be given to groundwater level and ground saturation to prevent excessive overland flow and associated scouring and mobilisation of suspended solids

Pumping water is potentially one of the most hazardous operations to the environment carried out on site. Pumping is done under permit only with site specific silt mitigation designed and implemented by the Site Ecologist.

4.3.2 Control of Invasive Alien Plant Species

Non-native invasive plant species have a significant impact on Ireland's natural habitat. Construction sites can spread IAPS easily through ground disturbance and transport via plant and personnel. IAPS can be difficult to eradicate, can damage structures, contaminate soils and cause an imbalance in the natural fauna and flora.

Sorensen Civil Engineering Ltd have undertaken specialised surveying and subsequent management of Third Schedule IAPS within the red line boundary. An IAPS Biosecurity Management Plan Rev 02 has been developed to deal with invasive species legally and in an environmentally responsible manner. The IAPS BMP puts in place working practices that prevent the spread of invasive plants as per CEMP (2020), Appendix 5.1 Invasive Species Management Plan, Section 5.4.3. Contract Specification, Appendix 1/37, Section 14.5. Section 4.3 of the TII Guidelines on The Management of Noxious and Non-Native Invasive Plant Species on National Roads (Revision 1, December 2010)

Invasive Alien Plant Species (IAPS), as noted under the Third Schedule: Part 1 of the European Communities (Birds and Natural Habitats) Regulation 2011, are recorded on the GFR site, as per EIAR field surveys and 2023 Japanese Knotweed Solutions Ltd. field surveys. The species identified are Japanese knotweed (*Fallopia Japonica*) and Himalayan balsam (*Impatiens glandulifera*).

The contents of the Invasive Species Reports carried out in 2020/21 is noted. Independent surveys have been completed in 2023/24 at the various

construction sites for invasive alien plant species in advance of any construction activity that could impinge on areas with IAPS. The IAPS BMP REV 02 has been prepared by specialist Ecosystem Services Ltd on behalf of SCE, it includes site specific recommendations for the management and treatment of Japanese knotweed and Himalayan Balsam as well as other non-Third schedule invasive plant species. The Employer's Representative has been issued the BMP for comment. All procedures/control measures in the BMP, including but not limited to chemical treatment, have been implemented when encountering IAPS on site. It is noted that the treatment of Japanese knotweed has been on-going for a number of years within the proposed construction sites which has led to difficulty in segregating infested areas from non-infested ground due to a lack of above ground growth despite the potential of viable rhizomes existing in the soil in a semidormant state post chemical treatment. Therefore, all areas requiring excavation and marked as potentially infested as per drawing series -040- will be excavated under the supervision of an Ecologist and abiding by biosecurity procedures as outlined in the IAPS BMP Rev 02.

Please see Appendix 7 IAPS BMP Rev 2 for full biosecurity procedures implemented for the management of IAPS on the Schem , the biosecurity measures include:

- Pre-construction IAPS surveying, in order to update existing information.
- The demarcation of areas where Third schedule IAPS are recorded or potentially exist as per drawing series -040-. As well as installation of appropriate signage.
- All machinery and personnel entering these areas are required to sign in, and washdown footwear/plant via boot brush/boot bath and wheel wash/power washer upon exiting.
- All site personnel, plant operators and subcontractors have received induction/TBTs detailing the identification and management of Japanese knotweed and where it is located on site. All persons are required to adhere by the site protocols and avoid the spread of IAPS within and outside of the works area. This includes any site investigation works in advance of commencement of excavation works.
- Only vehicles required for the works within an infested works area will be brought on site and the number of visits minimised as much as practicable. Vehicle movements within this area will be kept to a minimum.
- Any trucks used to transport infested material will do so under a Reg 14 licence and measures will be taken to ensure no infested material accidentally exits the transport vehicle via overtopping, etc.
- The Site Ecologist will be present on site to identify Japanese Knotweed rhizome fragments and determine the volume of spoil to be removed. In the case of mature stands spoil from a +7m buffer around the parent plant will be removed, or as is deemed required by the Ecologist.
- Imported material will be sourced from a reliable site and checked for invasive species prior to bringing on site.
- As a secondary measure, silt curtains will be employed downstream of works within areas contaminated with Japanese knotweed as required to prevent the transport of rhizomes via the watercourse. However, every effort is made to prevent rhizomes from entering the watercourse.
- The Ecologist will supervise works associate with the removal and disposal of IAPS.
- Wherever possible, the disturbance and removal of infested ground will be avoided.
- Site hygiene protocols are implemented on all works sites.

The BMP requirements are communicated to all relevant site personnel through toolbox talks and induction.

Management Options

There are many management options that may be taken to control and prevent the spread of Japanese knotweed, options are covered in the BMP Rev 02. In consultation with the Project ecologists and Ecosystem Services Ltd., a decision was made on which option is suitable for the Scheme. Japanese knotweed requiring excavation will be temporarily stored at Compound 1 and then buried in a permanent knotweed burial cell. Japanese knotweed stands throughout the site will receive herbicidal treatment. The proposed management plan has been issued to the National Parks and Wildlife Service (NPWS) and ARUP. It is understood that it will not be possible to completely eradicate the invasive species before or during the construction phase. Where flood relief structures are proposed at sites that contain Japanese Knotweed, root barrier membranes will be installed to protect the structures from the plant as per the schemes design.

It should be noted that:

- The Biosecurity Management Plan details all management options including cell burial and/or removal off site.
- Where any infested material (soil containing Japanese Knotweed) is to be taken off site, a Section 49 license has been received to transport the material from NPWS.
- If going offsite, a permitted landfill will be sourced which can accept such material. The landfill site operator will be informed of what the material contains.
- For all management plans, site hygiene protocols will be implemented. These protocols include sites which are infested with Knotweed and those where Knotweed is not growing to prevent contaminated material being spread across site. Site hygiene is detailed below.

Excavation and Burial - Sorensen propose to bury the Japanese knotweed infested material encountered within a root barrier membrane cell in accordance with TII guidelines (Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads). This will be designed by and undertaken under the supervision of the IAPS specialist. Value Engineering Proposal 2 details the methodology of the process of Japanese knotweed burial. The proposed location of burial is Circus Field, Glanmire. Typical cell construction will commence with excavation to the required levels, based on the calculation of the volume of material to be accommodated. If the material is to be drawn from another location, a protected temporary haul route, protected by a proprietary root barrier, will be provided. The cell root barrier membrane will then be laid in position using the largest possible sheet sizes, which will minimise the extent of on-site jointing required. The protective layers will be installed to both faces of the root barrier membrane, both around the entire cell surface and in other places where the membrane is being used, to safeguard it from any risk of puncture. Strict biosecurity measures will be deployed for the entire duration of the contract. The infested the barrier will be protected by a

layer of sand, material will then be laid within the cell, in compacted layers, to the required depth. A barrier membrane will be placed on top of the material and the cells will be backfilled to surface level with inert fill and topsoil. A layer of rockfill will be placed above the completed cells to protect the cell membrane from burrowing animals and future ground disturbance. Root barrier membranes will be used to protect vehicles from invasive species contaminated soil which will also be buried with the Japanese knotweed contaminated soil. Records of the quantity of material that is buried will be kept and a map showing the location of the burial pit and its depth. Signs will be erected to mark the burial pit and keep heavy tracked machinery away from the area. We will consult with and receive approval in advance of burial from the Employer.



Figures above illustrate the burial disposal method that was employed by Sorensen on the previous project, Youghal.

Excavation and Bund method - Where the burial option is not achievable such excavated material can be placed in a structured bund. The bund would comprise of a raised area above ground level or a shallow excavation, no more than 0.5m deep, and lined with a root barrier membrane. The membrane must stay intact for at least 50 years and a manufacturer's guarantee is required. This method of treatment can also be used where Knotweed material needs to be moved from a location and there is another ideal area of the site available to contain it. The aim of this method is to concentrate the rhizome material into the upper surface of the bund, where it will grow and be controlled by herbicide. If the rhizome is buried deep, it will become dormant when inside the bund and regrow when the apparently clean soil is used for landscaping on the site. The bund location would be clearly signed and protected from potential accidental damage. Reapplication of herbicide may be required for up to five years after the initial application, the management would be handed back to the Client upon the completion of works.

Excavation and removal from site – Where the above treatment options are not achievable removal of excavated material may be the only option. Where there are small amounts of Japanese knotweed material to be removed it is possible to double bag the material and send to a licenced waste facility capable of taking JK material for disposal.

Where the amount of material is larger in volume it would be necessary to haul from site to the licenced waste facility. It is noted that in the process of excavating Japanese knotweed if it has been treated with a persistent herbicide, the excavated material will need to be classified as hazardous waste and disposed of to a hazardous waste facility.

If any invasive species plant material is collected, it will be disposed of in a way that will not lead to a risk of further spread. A section 49 licence will be in place if transporting infested material.

Measures to prevent the spread of non-native invasive species

In order to mitigate the possible spread of non-native invasive species, mitigation measures are outlined in the IAPS Biosecurity Plan Rev 02. The below are some measures considered to prevent the spread of IAPS:

- All works are conducted according to the NRA Guidelines 'The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads'.
- Working in areas where Japanese Knotweed is present is avoided wherever possible; all areas within 7m of visible above-ground growth are avoided, where possible and clearly demarcated.
- See Appendix 7 for procedures to be followed, when required to work in a Japanese knotweed infested area, to prevent its spread.
- All site personnel will adhere to the Biosecurity Plan for working in areas containing IAPS.

Site Hygiene

Maintaining site hygiene at all times in a Japanese knotweed infested area is essential to prevent the cause of its spread. Where there is risk of contaminated material being brought to site, for example, site machinery being used on multiple site, construction staff travelling between infested and not infested sites, preventative measures must be taken.

The following site hygiene measures are taken for each site where applicable:

- The possible extent of the rhizome (root) system underground – up to 7m horizontally and 3 meters vertically – is relayed to all site personnel via induction and TBTs.
- Where possible the infested area is avoided and fenced off or clearly marked off.
- Areas where infested soil is to be stockpiled on site is clearly marked out and bunded from the watercourse.
- Designated entry and exit points for operators on foot and for small mobile equipment are applied to infested work sites. A delineated access track to be maintained free of Japanese knotweed is established through the site to minimise the spread of Japanese knotweed by permitted vehicles accessing the site.
- A dedicated footwear & vehicular wheel wash down facility is in place in a contained area within the site.
- Vehicles used in the transport of contaminated material will be visually checked and washed down into a contained area before being used for any other work, either on the same site or at a different site.
- For any material entering the site, the supplier will provide an assurance that it is free of Japanese Knotweed.
- All site users are aware of measures to be taken and alerted to the presence of the IAPS Biosecurity Plan.
- Site hygiene signage has been erected in relation to the management of non-native invasive plant material.

4.3.3 Contaminated Land Management

Sorensen Civil Engineering Ltd are committed to minimising the impact of our works on the environment and will manage works involving contaminated land to prevent the mobilisation, spread or transfer of contaminated land on the site and beyond the perimeter of the construction works.

These mitigation measures include:

- Designated fuel storage facilities, designed in accordance with guidelines produced by CIRIA, are provided and fully bunded – see above section of fuel storage.
- All vehicles and plant are regularly inspected for fuel, oil and hydraulic fluid leaks. Suitable equipment to deal with spills are maintained on site.
- Where feasible, soil excavation is completed during dry periods and undertaken with excavators and dump trucks. Topsoil and subsoil are not mixed/stored separately.
- To minimise any impact on the underlying subsurface strata from material spillages it is ensured that all areas where liquids, oils, solvents, paints and/or cleaning products are stored in a designated impermeable area that is isolated from the surrounding area, by a roll-over bund, raised kerb, ramps or stepped access. The design (volume and construction) of all bunds shall conform to standard bunding specifications.
- Spill kits/absorbent pads and booms are located at each work site to be used in the event of a spillage.

4.3.4 Control of Nuisance – Noise, Vibration, Dust & Light

Statutory nuisance refers to problems caused by noise, vibration, dust, mud on the road, intrusive light and disruption to local people and businesses. Sorensen Civil Engineering Ltd are committed to minimising the impact of these nuisance issues by employing best practice construction techniques as per appendix 1/9 of the contract specification.

Noise & Vibration

Sorensen Civil Engineering Ltd will comply with Code of Practice for Noise & Vibration Control on Construction Sites to manage noise and vibration to avoid disturbance to local neighbours, businesses and wildlife, or structural damage to buildings and utilities.

Noise and Vibration monitoring is being undertaken by external specialists, NVM, on the Works on the Glashaboy River Drainage Scheme (GRDS) project and reports are issued to the client weekly.

Works will occur staggered, with peaks of high activity separated by periods of relative inactivity to reduce noise and vibration impact on the local community.

Where 24hr operations are necessary, discussions will take place with the Local Authority before such operations begin.

Noise and vibration impacts associated with the Project will be managed through the 'best practicable means' by use of low noise and vibration construction techniques [where practicable, use of low noise equipment [e.g. broadband alarms], use noise abatement measure [e.g. localised screening] and noise and vibration monitoring.

Noise pollution measures such as silenced equipment, controlled working hours and screening are implemented on site. Areas of traffic movement are designed to minimise reversing alarm use principally by the use of one-way systems. Natural features and buildings will be used to minimise noise from operations where practical.

The recommendations for the control of noise and vibration on construction and open site in the approved code of Practice BS 5228 Part 1:2009 will be adopted. As such, the following general measures are being taken in order to control the noise and vibration on the site:

- Plant and equipment are turned off when not in use.
- Where practicable, deliveries to site are conducted during normal working hours.
- All vehicles and mechanical plant are fitted with effective exhaust silencers and are maintained in good effective order.
- Machines in intermittent use will be shut down in intervening periods of non-use or, where this is impracticable, they will be throttled down to a minimum.
- Where reasonably practicable, fixed items of construction plant will be electrically powered in preference to petrol or diesel driven.
- All plant enclosures will be kept closed when in use.
- Plant will be isolated from transfer medium by sitting the equipment on a heavy base, reducing vibration transfer.
- All compressors and generators shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever machines are in use.
- Hydraulic bursting or breaking activities will be trialled and over pneumatic breaking techniques.
- Air lines will be maintained to reduce leaks.
- Methods of construction and plant have been selected so as to minimise noise and vibration and reduce the use of percussive and vibratory equipment.
- Static plant will be located so as to optimise screening and/or distance attenuation in relation to occupied residential properties and fitted with suitable enclosures where practicable.
- Where practicable, concrete pours will be programmed to avoid overruns and enable work to be carried out in core hours.
- All relevant plant will be maintained to a high level to ensure it is running efficiently, as designed and to the manufacturers designed 'permissible noise levels.
- Enclosures or three-side screens will be erected around static plant where necessary to attenuate noise.
- Good practice guides will be provided to all operatives through the provision of toolbox talks and an appropriate induction routine. The induction will inform operatives of good practice to be employed during normal working hours including, amongst other issues, ways of limiting unnecessary noise.
- As far as reasonably practicable, noise from reversing alarms will be controlled and limited in accordance with consent requirements. This will be achieved in the following way:
 - The site layout will be designed to limit and where reasonably practicable, avoid the need for reversing of vehicles. Measures will be undertaken to ensure that drivers are familiar with the site layout.
 - Banksman will, where reasonably practicable, be used to avoid the use of reversing alarms.
 - Reversing alarms will be reviewed to assess the possibility of utilising one of the following noise reduction techniques:
 - Highly directional sounders
 - Use of broadband signals
 - Self-adjusting output sounders
 - Flashing warning lights.
- Should the above measures be unfeasible, reversing alarms will be set to the lowest minimum output noise level required for health and safety compliance.
- The normal working hours within the site shall be Monday to Friday between 08.00 hours and 19.00 hours, and Saturday between 08.00 hours and 16.00 hours, with no working on Sundays or Public Holidays. Exceptionally, the Employer's Representative's consent for work outside these hours may be given after any necessary consultation. Seven working days' notice is required from the Contractor when seeking such consent.
- The ambient noise level, Leq from all sources when measured 2.0 metres above the ground shall either not exceed the appropriate level given in the below Table taken from the Work Specifications or not exceed by more than 3dB(A) the existing ambient noise level, Leq, whichever is greater.

Assessment Category and Threshold Value Period (L_{Aeq})	Threshold Value (dB)		
	Category A	Category B	Category C
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings & Weekends ^D	55	60	65
Daytime (07:00 – 19:00hrs) and Saturdays (09:00 – 16:00hrs)	65	70	75

- In exceptional circumstances, permission may be requested from the Employer to carry out works which exceed the noise levels in the schedule, all reasonable measures to mitigate the noise nuisance will be taken regardless of permissions granted. A minimum of 21 days' notice of the date and timing of these proposed works will be given to the Employer's Representative, as well as details of the proposed mitigation measures.
- The vibration levels shall not exceed the appropriate level given in the below Table taken from the Work Specifications.

Category of Building / Structure	Threshold of potential significant effect (Peak Particle Velocity - PPV - at foundation) for Transient Vibration
Structurally sound and non-protected buildings / structures	12mm/s
Protected and/or potentially vulnerable or sensitive buildings / structures	6mm/s

- Residents/occupiers of nearby dwellings will be notified in advance of works to assist in managing expectations with regard to length and duration of works, to minimise upset and aggravation.
- Continuous noise and vibration monitoring is carried out in areas where residential, commercial and/or industrial properties are adjacent to the works, or in any area requested by the Employer's Representative.
- Noise monitoring locations monitor construction noise levels throughout the scheme with respect to:
 - Residential properties adjacent to Works areas.
 - Adjacent to any generators set up on site.
 - Commercial premises adjacent to Works areas.
- Noise and vibration monitoring is completed by NVM Ltd. on behalf of the contractor, NVM issue noise and vibration reports weekly which are issued to ARUP via the "Weekly Reports" package.

Dust

The site will provide effective control of potential dust generation to safeguard local receptors and prevent nuisance from dust. Consideration will be given to a full range of measures that may be appropriate to employ to ensure effective control of dust with special consideration given to periods of dry weather. These include:

- A 10 mph/15kph speed limit on the site to reduce excessive airborne dust during dry spells. Haul lorries carrying dusty loads will be covered.
- Use of road sweepers on hard-standing surfaces when a requirement to remove excess mud arises, thereby preventing future dust generation once mud dries.
- Bowsers are used to deposit water to keep compounds and road surfaces dampened down.
- Damping down of temporary stockpiles with sprinklers under windy conditions.
- Covering of such stockpiles with suitable sheeting (plastic or textile) where weather conditions and/or stockpile life-span dictate.
- Where localised works generate dust, these will be addressed through the operational safe system of work to remove the risk of dust nuisance e.g. cutting of slabs and paving products – localised dust suppression systems.

- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, shall be minimised through regular servicing.
- Where practicable, a 2.4m hoarding shall be provided around the site works to minimise the dispersion of dust from the working areas.
- Staff training and the management of operations shall ensure that all dust suppression methods are implemented and continuously inspected.
- In the event of dust nuisance occurring outside the site boundary, movement of materials shall be immediately terminated, and satisfactory procedures implemented to rectify the problem before the resumption of the operations.

In addition, the weather forecast will be checked daily, the aim being to provide notice of adverse windy conditions which will dictate extra vigilance and possible need for increased control of dust and use of mitigation measures. Bergerhoff dust monitoring is being carried out by NVM Ltd on site boundaries by sensitive receptors, i.e. Hazelwood site adjacent to a coffee shop, NVM report Bergerhoff dust monitoring results monthly, these reports are issued to the client as an appendix of the Contractor's monthly progress report.

Light

When task lighting is required for works in large open areas or security lighting is used in compounds and temporary storage areas it can lead to local residents in nearby properties and/or wildlife being adversely affected. Therefore, the impact of lighting spillage outside the work area is minimised and controlled.

To manage the impact of light, the following mitigation measures are considered and adopted where required:

- Sensitive location of lighting units and directional lighting.
- Minimising the number of units used, ensuring the numbers used are appropriate.
- Screening or shuttering of lighting units to provide directional control and avoid light spillage.
- Use of low intensity lights, wherever possible.
- Effective planning of works to avoid times when lighting is required, wherever possible.
- Switching off all lighting at the end of each working day, other than low level lighting that may be required for security purposes.

4.3.5 Concrete Work

As per Appendix 1/37 of the contract specification, wet concrete or dry cement will not be allowed to enter any watercourse or ground water. This is prevented by:

- Developing suitable safe system of work and methodology appropriate to the works.
- Increasing the design 'factor of safety' of formwork and falsework, reducing the risk of formwork failure.
- Diverting the flow away from the working area where possible and practicable e.g. creation of temporary cofferdam for completion of works or damming upstream and over-pumping the flow beyond the working area [these methods will not be suitable for all works/situations].
- Reviewing of forecasted weather systems to ensure works will not be completed when there is a risk of flooding or localised breach of protective systems.
- All concrete pump systems will be cleaned away from sensitive areas in a designated concrete wash area. The inlet to the pump will be screened to reduce risk of blockages.
- Loose concrete will be removed prior to the return of the watercourse to its original course.
- Tools and equipment will not be cleaned in the watercourse. Should it be necessary to clean tools and equipment on site, this will be done well away from watercourses. Wash water will not be poured away into watercourses or surface drains or disposed of in any way as to cause/permit a discharge into a watercourse.
- If concrete must be sprayed, sheeting will be used to cover the water surface and the open faces of the structure to prevent deposits of concrete dropping into the water. The area will be thoroughly cleaned before removing the sheeting.
- A concrete wash out area has been created (Circus Field) for contractors to wash out their delivery wagons. This will be appropriately signed and all drivers will be made aware of it.

4.3.6 Archaeological & Built Heritage Protection

Sorensen Civil Engineering Ltd understand the need to preserve the archaeological and built heritage of the local area in which we are working and will ensure all mitigation measures are implemented in line with Appendix 1/29 and Appendix 5.1 of the EIAR addendum 2020 for requirements for sites of Archaeological interest. We will liaise closely with Dan Noonan archaeology services.

- It is ensured that the Specialist Archaeologist provides adequate numbers of suitably qualified and experienced archaeologists to carry out all archaeological services required to enable the construction of the Works in a timely fashion including, but not limited to:

- Survey (including dive surveys).
 - Recording.
 - Monitoring (including monitoring of dredging works).
 - Testing and investigation/excavation (including underwater investigations as necessary).
 - Geophysical survey, metal detection for archaeological purposes (including metal detection of dredged spoil),
 - Post-excavation services including reporting.
- This shall include sufficient numbers of licence-eligible archaeological personnel to direct all required elements of the archaeological works.
- The programme of works accounts for the period of licence application, test excavations, survey, reporting, approval and mitigation of any identified archaeological impacts
- All archaeological requirements are considered in their tender and in their programming and scheduling of the works.
- Where necessary, suitable dedicated temporary storage facilities for archaeological objects including waterlogged materials (e.g. water tanks, etc.), shall be provided as required for the Specialist Archaeologist and his/her team, to allow for the proper immediate care and first aid conservation of all identified artefactual material and to facilitate the post-excavation strategy. All methodologies and provisions for archaeological objects will be in line with National Museum of Ireland guidelines.

The full details of the measures to protect the archaeological and built heritage features on this project are contained in the Archaeological Assessment Report completed by Dan Noonan Archaeology which is kept in the Project HSEQT File.

4.4 Public Rights of Way

Through co-ordination and consultation with the Client and Local Authority, Sorensen Civil Engineering Ltd will work with the Client to ensure active consultation with the Public to ensure any concerns, fears, queries and questions can be answered to ensure good communication with the Public over any potential closures or works affecting Public Rights of Ways.

There are no Public Rights of Way directly affected by this Project.

4.5 Waste Management

All waste management on site will be managed through the HSEQT/SFM-218 Site Waste Management Plan. This applies to all activities throughout the project. All personnel will be made aware of the relevant requirements in the Plan at the initial site induction and in subsequent tool box talks.

Sorensen Civil Engineering Ltd acknowledge the statutory Duty of Care. This imposes a vicarious liability on Sorensen Civil Engineering Ltd and others in the chain of waste handling, making the producer of the waste ultimately responsible for the storage, transportation and disposal of all waste generated throughout the project.

Sorensen Civil Engineering Ltd ensures that:

- A Waste Champion is appointed to drive the waste minimisation culture on the Project.
- Each waste stream is identified and appropriate storage and disposal measures provided in line with Duty of Care.
- Wherever practical, the production of a waste will be prevented, reduced, re-used, recycled and recovery of secondary energy sources before opting for the final disposal of our waste.
- Targets for re-use and recycling will be recorded at the start of the project and monthly progress towards this monitored.
- Waste is segregated, secured, labelled and disposed of safely and completely.
- Any incidents of incompetence or mishandling or illegal disposal are reported.
- Waste Transfer Notes are correctly completed for each consignment of inert or non-hazardous waste.
- Hazardous Waste Consignment Notes are correctly completed for each consignment of hazardous waste.
- Waste contractors' carriers' licences are verified with the EPA [copies to be placed in the Project File].
- The procedures detailed in the HSEQT/SFM-218 Site Waste Management Plan are brought to the notice of all employees and subcontractors' employees.
- A summary of all the Duty of Care information required by the Sorensen Civil Engineering Ltd environmental management system is contained in Project HSEQT Files.

4.6 Site Demobilisation of Plant and Equipment

Post-constructions Sorensen Civil Engineering Ltd will ensure:

- No cementitious, oils or lubricants are left on site. Any contaminated materials such as oil booms will be disposed of to a licenced waste facility.
- Fencing and geotextile matting will be removed and public access will be reinstated.
- The RE's Ecologist will be notified of the post-work site to ascertain if the Contractor has met the standards as outlined by the Employer's Representative.
- The Contractor will notify IFI and NPWS within 7 days of completion of the works and the RE's Ecologist and Project Ecologist will visit the site with the IFI, NPWS and Employer's Representative to ensure satisfactory completion of the works.

Appendix 1

Sorensen Civil Engineering Ltd HSEQ Policy Statement

HSEQ POLICY

IRE-IMS-PCY-001

Sorensen Civil Engineering Ltd. delivers a wide range of Civil Engineering Projects ranging from the following:-

- Project Management.
- Heavy Civil Engineering and Construction Works.
- Civil Marine and Tunnelling Works.
- Large Pipeline Works.
- Water and Wastewater Treatment Plants including Network land and Marine pipelines.

The organisation recognises its responsibilities to its Staff, Clients, Supply chain and the General Public and is committed to the continual improvement of the operating environment of its sites.

To this end Sorensen Civil Engineering Ltd maintains a fully integrated Management System (IMS) which conforms to: ISO9001:2015, ISO14001:2015 and ISO 45001:2018, and shall take into account all regulatory and legislative requirements pertinent to its sector, local operating environment and client requirements.

The organisation's objectives include the following:

- Setting of objectives and the continuous improvement at all levels of the organisation.
- Minimisation and elimination of risks, hazards, injury or ill-health to employees, contractors, subcontractors, stakeholders and all doing work on our behalf.
- Provision of all reasonable and adequate resources as required.
- Maintenance of a detailed company safety statement including applicable risk assessments.
- Communicating its policies both internally and externally.
- Ensuring that all employees are aware of their HSEQ obligations.
- Creating a better environment for all, through the reduction, recycling and reuse of waste, the optimum usage of resources and the elimination of polluting releases to the environment.
- Compliance with all pertinent applicable regulations and legislation
- Prevention of pollution
- Supply of services in a safe environment to client specifications and requirements.
- Promoting the concept of energy efficiency at all levels in the business and communication of our Sustainability Policy.
- Full Promotion and commitment of companywide Zero Risk - everyone goes home safely campaigns.
- Committing to the consultation and participation of workers.

The above policy is supported by the Management of the Board of Directors of Sorensen Civil Engineering Ltd. who shall commit the necessary resources to ensuring that the objectives and targets can be achieved. These objectives and targets will be reviewed and updated at least 12 monthly.



Managing Director

John Wallace
Date: November 03, 2022, Revision 00 (IRE-IMS-PCY-001)

Appendix 3

ISO 14001 Certificate



NSAI

Certificate of Registration of Environmental Management System to I.S. EN ISO 14001:2015

Sorensen Civil Engineering Ltd.

Forge Hill
Kinsale Road
Co. Cork
Ireland

NSAI certifies that the aforementioned company has been assessed and deemed to comply with the provisions of the standard referred to above in respect of:-

The provider of civil engineering and construction projects, project management, civil marine works, tunneling works, water & wastewater treatment plants including the network pipelines

Approved by:
Stewart Hickey
Head - Business Excellence, NSAI



Registration Number: 14.0749
Original Registration: 19 June 2015
Last amended on: 1 April 2021
Valid from: 18 June 2021
Remains valid to: 18 June 2024

This certificate remains valid on condition that the Approved Environmental Management System is maintained in an adequate and efficacious manner. NSAI is a partner of IQNet – the international certification network (www.iqnet-certification.com)



All valid certifications are listed on NSAI's website – www.nsai.ie. The continued validity of this certificate may be verified under "Certified Company Search"



NSAI (National Standards Authority of Ireland), 1 Swift Square, Northwood, Santry, Dublin 9, Ireland T +353 1 807 3800 E: info@nsai.ie www.nsai.ie

CERT-161 WM: 14001 2015 INAB (3)

Appendix 4

Flow Management Strategy

Appendix 5

Site Rules

Appendix 6

Table of Toolbox Talks

MONTH	TBT
November 2023	Working in a Japanese Knotweed infested site
November 2023	Introduction of Permit to Pump/Discharge Water System
December 2023	Silt Mitigation & Watercourses
January 2024	Refresher – Permit to Pump System
February 2024	Spill Response Training
March 2024	Mitigating disturbance to nesting birds and otters
April 2024	Refresher – Silt Mitigation & Watercourses
May 2024	Refresher – Japanese Knotweed (hazards & controls)
June 2024	Refresher – Permit to Pump System
July 2024	Refresher – Spill Response training
August 2024	Refresher – Silt Mitigation & Watercourses
September 2024	Use of Silt Curtains & Fencing
October 2024	Refresher – Permit to Pump System

Appendix 7

IAPS Biosecurity Management Plan – Rev 02

Appendix 8

Schedule of Mitigation (EIAR, 2018, *Pg. 218 – 264*)

Schedule of Mitigation – “Assessment of Potential Effects and Mitigation Measures” (EIAR Main Text, May 2018, *Pg. 418 – 464*).

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
CONSTRUCTION PHASE		
Site Clearance and Preparation		
Setting up of site office, contractor facilities including toilets and construction containers	A Construction Environmental Management Plan (CEMP) has been prepared and is included in Appendix 4.2 which will be updated and finalised by the Contractor prior to construction commencing. The CEMP comprises all of the construction mitigation measures, which are set out in this EIA Report, and will be updated with any additional measures which are required by the conditions to the Minister for Public Expenditure’s statutory confirmation of the Scheme under the Arterial Drainage Acts.	Imperceptible No significant residual impact predicted.
Importation of construction equipment	Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum. The plan has regard to the guidance contained in the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, <i>Environmental Good Practice on Site Guide, 4th Edition</i> (CIRIA 2015). The plan also has regard to the TII Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.	
Excavation activities	The Employer’s Representative will have a construction management team on the project site for the duration of the construction phase. The team will supervise the construction of the scheme including monitoring the contractors’ performance to ensure that the proposed construction phase mitigation measures are implemented and that construction impacts and nuisance are minimised.	
Construction waste	The construction management team will liaise with residents and the general community during the construction phase to ensure that any disturbance is kept to a minimum and to ensure that all anticipated nuisances are minimised and that the construction activity will have the lowest possible impacts on the residents and other properties.	
Excavated material	It is also proposed that a Community Liaison Officer will be appointed who will coordinate communications and liaise with the local community during the construction phase. The appointed CLO may be part of the resident engineering team.	
Untidy site		

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	Soil, Surface Water and Groundwater • Training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures; • Careful consideration will be given to the location of any fuel storage facilities. These will be designed in accordance with guidelines produced by CIRIA, and will be fully bunded; • All vehicles and plant will be regularly inspected for fuel, oil and hydraulic fluid leaks. Suitable equipment to deal with spills will be maintained on site; • Where feasible, soil excavation will be completed during dry periods and undertaken with excavators and dump trucks. Topsoil and subsoil will not be mixed together; • Ensure that all areas where liquids are stored or cleaning is carried out are in a designated impermeable area that is isolated from the surrounding area, e.g. by a roll-over bund, raised kerb, ramps or stepped access; • Use collection systems to prevent any contaminated drainage entering surface water drains, watercourses or groundwater, or draining onto the land; • Wheel wash at site entrance to clean vehicles prior to exiting onto public road network; • Minimise the use of cleaning chemicals; • Use trigger-operated spray guns, with automatic water-supply cut-off; • Use settlement lagoons or suitable absorbent material such as flocculent to remove suspended solids such as mud and silt; • Use silt control methods for in-stream working e.g. silt curtains, silt pumps; and	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Ensure that all staff are trained and follow vehicle cleaning procedures. Post details of the procedures in the work area for easy reference. - Appropriate sediment control measures will be employed. - Where cast-in-place concrete is required, all work must be carried out in the dry and effectively isolated from any flowing water (or water that may enter streams and rivers) for a period sufficient to ensure no leachate from the concrete; - Waterproofing and other chemical treatment to structures in close proximity to watercourses shall be applied by hand; and - All pumps used for dewatering excavations shall be located in sump to minimise the sediment generation. Air Emissions Refer to Air Quality below. Site Tidiness - Daily site inspections will be undertaken to monitor site tidiness; - A regular programme of site tidying will be established to ensure a safe and orderly site; - Scaffolding will have debris netting attached to prevent materials and equipment being scattered by the wind; - Food waste will be strictly controlled on all parts of the site. - Mud spillages on roads and footpaths outside the site will be cleaned regularly and will not be allowed to accumulate; - Wheel-wash facilities will be provided for vehicles exiting the site; and - In the event of any fugitive solid waste escaping the site, it will be collected immediately and removed to storage on site, and subsequently disposed of in the normal manner.	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	Noise Emissions and Vibrations Refer to Noise and Vibration below. Invasive Species Treatment measures and prevention of spread are discussed in Appendix 4.1. Waste Management - Waste generated during the construction phase will be carefully managed according to the accepted waste hierarchy which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill. - This hierarchy will be implemented by identifying opportunities to firstly prevent waste from being produced, and secondly minimise the amount of waste produced. Where prevention and minimisation will not be feasible, ways to reuse or recycle waste will be sought, preferably on-site to avoid the impacts arising from transportation. If this is not feasible, opportunities to reuse or recycle the waste off-site will be investigated. If this is not feasible, then waste will be sent to an energy recovery facility, and only where there is no alternative, will waste be disposed of to landfill. To achieve this, existing waste management programmes and networks will be used such as the National Waste Prevention Programme, which is implemented by the Environmental Protection Agency. - All waste removed from the site will be collected only by contractors with valid waste collection permits, under the Waste Management (Collection Permit) Regulations. - All facilities to which waste will be taken will have appropriate waste licences or permits, under the Waste Management Act 1996, as amended, and the regulations thereunder, allowing them to accept the type of waste that is to be sent there. Hazardous waste generation will be minimised, and such waste will be recovered where feasible, and only disposed of if recovery is not feasible. Hazardous waste will be managed in accordance with the relevant legislation.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	The key principles underlying the plan will be to minimise waste generation and to segregate waste at source. The measures to achieve these aims include: - Ordering of appropriate quantities of materials, with a just-in-time philosophy; - Immediate and careful storage of materials delivered to the site; - Storing materials which are vulnerable to damage by rain under cover and raised above the ground; - Careful handling of materials, using appropriate equipment, to avoid undue damage; and - Designation of separate storage areas for different types of waste, in order to maximise the reuse and recycling potential of the waste. The Waste Management Plan will outline how residual waste will be handled as follows: - The identification of disposal sites; - The identification of quantities to be excavated and disposed of and classification of this material; - The identification of measures to prevent nuisance, etc.; - The identification of the amounts intended to be stored temporarily on site and the location of such storage; - The contractor's approach to waste management; and - The names, roles, responsibilities, and authority of the key personnel involved in the waste management. The following will also be considered as part of the Waste Management Plan: - The identification of the amount of materials intended to be stored temporarily on site and the location of such storage;	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Procedures for controlling sub contracts i.e. for checking waste procedures of subcontractors and ensuring sub-contractors fulfil design teams and contractor obligations in respect of waste management; - Designation of separate storage areas for different types of waste materials in order to maximise their re-use and recycling potential; - Procedure for record keeping for waste retained on site; - Procedure for record keeping for hazardous waste, for example, C1 forms and trans-frontier shipment documents; and - Details of authorised waste hauliers with appropriate and up-to-date Waste Collection Permits. Details of permitted or licensed recovery and/or disposal facilities where waste materials will be sent, including copies of permits and licenses. The main contractor will be required to minimise waste and to segregate waste at source. The possible measures used to achieve these aims will include: - Ordering of appropriate quantities of materials, with a just-in-time philosophy. - Immediate and careful storage of materials delivered to the site. - Storing under cover and raised above ground materials, which are vulnerable to damage by rain. - Careful handling of materials, using appropriate equipment, to avoid undue damage. - Designating separate storage areas for different types of waste in order to maximise the re-use and recycling potential of the waste. Anticipated wastes arising can be summarised as follows: - Sanitary waste from toilet and washing facilities. These will be tankered offsite; and	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	Construction Waste – e.g. packaging, pallets, and metal waste will be disposed off-site at suitably permitted waste facilities.	
Landscape and Visual Impact		
Removal of trees and vegetation and the construction of new flood defence walls Visual impacts on the historical character of the built environment and immediate settings of protected structures; Visual impact from construction of new embankments; and Impact on public realm and residential amenity from the localised noise, dust, vibration, access restrictions and visual disturbance associated	General - Design of Glashaboy River (Glanmire/Sallybrook) Drainage Scheme shall be sympathetic to the riparian character of the woodland river corridor and historical built environment. - Retain existing trees where possible in the interest of residential amenity, public realm and visual character of the river landscape. Trees to be retained will be protected during the construction period in accordance with BS5837:2012, Trees in relation to design, demolition and construction. Recommendations. - River banks will be left intact and vegetated wherever possible. All disturbed areas will be re-landscaped and seeded, as soon as possible post works. On the 'wetside' of the flood wall, soil areas will be seeded with a native wildflower mix suitable for riparian environments. - Where retention of existing trees is not an option, these shall be replaced with new native species as close as possible to the original location, on the dry side of the wall, in the interest of residential and public amenity and visual character of the river landscape. Species to include Alder (<i>Alnus glutinosa</i>), Birch (<i>Betula pubescens</i>), Hawthorn (<i>Crateagus monogyna</i>), Blackthorn (<i>Prunus spinosa</i>), Pine (<i>Pinus sylvestris</i>), Hazel (<i>Corylus avellana</i>), Spindle (<i>Euonymus europaeus</i>) and Holly (<i>Ilex aquifolium</i>). There is also native hedge (<i>Corylus avellana</i> and <i>Euonymus europaeus</i>) carefully provided for around the artificial Otter holts provided for along the river. - Galvanised powder coated finish to be applied to new railings and barriers.	Imperceptible No significant residual impact predicted.
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
with the construction works.	- Proposed flood defence walls have typically been aligned to be constructed along existing walls where possible, in the interest of minimising intrusion on the existing landscape character (with the exception of Meadowbrook where wall will be set back in order to retain trees). Specific - Installation of 1.8m high fence and hedging along eastern river bank adjacent to Multi Use Games Area in Riverstown in replacement of removed trees (as per Figure 7.1.2.2 in Appendix 7.1) - Sandstone cladding on exposed sections of new walls is of particular importance for the following areas: - The approach road and entrance to Glanmire town (dry and wet side of new wall); - Any new sections approaching Riverstown Bridge. Contemporary capping and railing is deemed appropriate to define boundary with protected structure and avoid a pastiche approach. The finalised detailed design and colour of the railings and finishes at this location will be agreed with Cork County Council's heritage officer, prior to works commencing; - On entrance to (including wall near Multi Use Games Area) and within the Hazelwood Centre (on sections of exposed walls in public areas, mainly dry side). (as per Figure 7.1.1.2); - On exposed side of any reinstated/alterted sections of the existing wall opposite Copper Valley Vue (as per Figure 7.1.6.2); - At The Grove: on dry side of new wall along R639 north of Glanmire Bridge (C01_L08 – Works Chainage 0-101); and - Native hedge planting, consisting of hawthorn (<i>Crateagus monogyna</i>), blackthorn (<i>Prunus spinosa</i>), holly (<i>Ilex aquifolium</i>), spindle (<i>Euonymus europaeus</i>) and dog rose (<i>Rosa canina</i>) will be planted at 0.45m centres along the dry side of the textured concrete wall running through Meadowbrook (as per Figure 7.1.4.2 in Appendix 7.1). - The quantity and extent of replacement tree planting is curtailed by the need to minimise tree planting within the flood defence measures cause blockage of the channel and/or damage the flood walls; and the amount of available space left for tree planting. However, there has been allowance for some replacement tree planting at;	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	◦ 'Circus Field' north of Hazelbrook, where riparian Alder tree planting has been provided along the river bank, ◦ John O'Callaghan, where new corpses of Oak, Birch and Alder have been provided within the park. ◦ Copper Valley Vue, where new trees have been provided for within the landscape space between the road and the river. Construction • Existing trees to be retained where possible in the interest of public realm and visual character of the river amenity. River banks will be left intact and vegetated wherever possible. Coppicing and/or selective removal of trees may be considered where required in preference to total vegetation removal. Trees to be retained will be protected during the construction period in accordance with BS5837:2012, Trees in relation to design, demolition and construction. Recommendations. • Disturbance to private boundaries, gardens, etc. shall be avoided wherever possible and where impacted shall be reinstated prior to completion of the works. • Machinery shall not enter the river unnecessarily. • All landscape, footpath, roads etc., disturbed during the course of the works shall be fully reinstated prior to the completion of the construction works. • Japanese Knotweed is particularly common along stretches of the river (e.g. on main entrance road to Hazelwood centre towards sports pitch). Works on river banks should seek to control/eradicate such invasive weeds. Such weeds shall not spread or relocated in the course of the works.	
Traffic		

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Increase in traffic due to construction activities in the form of HGVs, and workforce and general site traffic. Temporary traffic diversions and road closures Phasing	• All construction works will be subject to industry-standard traffic management measures, including the preparation of a Construction Traffic Management Plan which will be undertaken in consultation with Cork County Council and An Garda Síochána, and which will be prepared and agreed in advance of any works commencing, and will include the sourcing of construction materials, agreement of appropriate haul routes, etc. • These traffic management measures will be designed in accordance with the 'Guidance for the Control and Management of Traffic at Roadworks – Second Edition'. • Consequently, construction-related traffic flows will also be subject to any such traffic management plans, which may include restricted construction working hours, maintaining single-lane or two-way traffic flows and/or suitable diversion routes. • As outlined above, construction working hours will be 08:00-19:00 on weekdays, and 09:00-16:00 on Saturdays. Therefore, construction workforce traffic will arrive and depart at the working areas before the morning peak on the local road network, and after the evening peak. • In addition, it may be necessary to work outside these hours, including at weekends and at night, at certain stages. Working outside normal hours may be necessitated through consideration of safety or weather and sub-contractor availability. Heavy or noisy construction activities will be avoided outside normal hours and the amount of work outside normal hours will be strictly controlled. Approval from Cork County Council will be obtained for works outside normal hours. Specific work activities may also be programmed to coincide with the summer months to avail of the lower local traffic flows during school holiday periods, etc. • The construction of the replacement bridges will be carried out by a suitably qualified and experienced contractor who will be supervised to ensure that the works are carried out correctly. This will ensure that the bridge will be constructed safely and ensure the structural integrity of the structure.	Imperceptible No significant residual impact predicted.

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Excavation and reinstatement of the culvert trenches will be carried out in consultation with the Local Authority, and will also follow the Department of Transport, Tourism and Sport published document entitled 'Guidelines for Managing Openings in Public Roads'. These works will be designed and supervised by a suitably qualified and experienced professional to ensure they are carried out correctly. - As with construction-related traffic, the localised traffic disruptions as a result of other proposed works throughout the scheme will be mitigated through the use of industry-standard traffic management measures. These traffic management measures should be designed in accordance with the 'Guidance for the Control and Management of Traffic at Roadworks – Second Edition'. Where necessary, diversion routes will be developed for affected traffic due to road restrictions or closures. Mitigation Measures for the Local Road Network during Construction - The construction programme of the scheme will be phased in order to ensure that certain works are not underway simultaneously in proximity to each other where one works element impacts on the mitigation measures associated with an adjacent scheme. - In so far as possible, the Contractor is expected to primarily gain access from the river banks to carry out specific elements of the works. - For example, as outlined in Chapter 4 the replacement of the internal Hazelwood Shopping Centre bridge will not occur at the same time as the construction of the adjacent culvert outside the shopping centre on Hazelwood Avenue, as this will be a diversion route for traffic displaced by the closure for replacement of the internal bridge (and vice versa). - The adjacent culvert works at Hazelwood Avenue are expected to be constructed in two phases, which will retain vehicular, pedestrian and cyclist access to a limited extent. Due to the generous road width at this location, it may be possible to retain two-way traffic. - Similarly, the culverting works on the R639 and R615 at the Springhill Stream will be phased so as to occur independently of each other in order to enable diversion routes to be incorporated on the local road network.	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- The timings of potential road closures or restrictions will, where possible, be arranged so as to carry out the most intensive works elements at off-peak. - Where possible, and subject to local considerations (including impacts on residents and businesses), 24-hour or night-time working will be included in construction phasing. Consultation will occur with local businesses and residents in advance of any works commencing. - Local access will be maintained throughout the works, by provision of new temporary accesses or by retention of existing accesses where possible. - The majority of the proposed works will be undertaken in phases so that partial traffic flow can be maintained at a minimum at all times and at all locations, wherever possible. Many works elements will be undertaken in multiple phases so as to allow for partial road closures so as to minimise the extent of any full road closures. Depending on the commencement date of the works, it may be possible to schedule the more disruptive elements during the summer months to coincide with school holidays. - Although the impact of temporary construction works are likely to be significant in localised areas, there are numerous diversion routes available within the study area due to the extensive local road network. The R615 and R639 can serve as temporary diversion routes for many of the substantial works elements, while East Cliff Road also offers a localised diversion route via Glanmire Bridge. The L3010, Brooklodge Grove and Hazelwood Avenue also offer numerous potential diversion routes. The works in question will not alter the function or operational capabilities of the road network once completed. Access will be immediately restored upon completion of any works that involve a partial or full road closure. - The road network will continue to function as it does at present once the works are completed, and there will be no permanent loss of access or loss of any elements of the existing road network.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Noise and Vibration		
Principal sources of noise: Earthworks plant and equipment. Construction plant and equipment. Construction traffic.	- In accordance with best practice, noise aspects during the construction phase will be managed in accordance with BS 5228: Code of practice for noise and vibration control on construction and open sites (Part 1: Noise) (BSI, 2009). - Selection of plant machinery with low inherent potential for generation of noise and/or vibration. All construction plant and equipment to be used at the site will be modern equipment and will comply with the relevant legislation and regulations - Regular maintenance of plant will be carried out in order to minimise noise produced by on-site operations. In particular, attention will be paid to the lubrication of bearings and the integrity of silencers. Silencers and engine covers will be maintained in good and effective working order. - All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the Contract. - Any compressors used on-site will be of the 'sound reduced' models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers. - Machines, which are used intermittently, will be shut down or throttled back to a minimum during those periods when they are not in use. - Any plant, such as generators or pumps, which are required to work outside of normal working hours, will be surrounded by an acoustic enclosure. - Training of drivers to ensure smooth machinery operation/driving, and to minimise unnecessary noise generation.	Imperceptible Residual impacts are not envisaged following the implementation of the mitigation measures outlined.
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- A maximum speed limit of 30 km/hr will be imposed for HGVs and drivers will be instructed to maintain as far as possible the distances between vehicles. - Prior to the commencement of construction works, baseline noise monitoring will be carried out by the Contractor to determine the existing noise environment. During the works, noise monitoring will take place at the nearest sensitive receptors to the works. A minimum of ten number noise monitoring locations are to be set up to monitor construction noise levels at sensitive locations throughout the scheme. The following areas have been provisionally identified for noise monitoring during the construction phase: Meadowbrook, Riverstown, Hazelwood, Brooklodge Grove, Copper Valley Vue and The Grove. - Monitoring will be carried out at worst-case receptors at these locations, at a minimum. Measured levels will be compared to the limits outlined in Table 9.1 of Chapter 9. - In terms of minimising vibration levels, the Contractor will be required to select and utilise methods of working and items of plant so that the maximum measured ground vibrations do not exceed a peak particle velocity (PPV) of 8.5mm per second at any occupied property, with a lower PPV limit of 5mm per second applying to properties in poor condition or other sensitive receptors, such as the Eurofins facility. Works in proximity to sensitive receptors, such as the Eurofins facility will be carried out at an optimum time to minimise disturbance and potential impacts. Prior to the commencement of construction works in proximity to the Eurofins facility, discussions will be held with management of the facility to confirm the optimum time to carry out the works. - The Contractor will be required to monitor ground vibrations at selected locations to the approval of the Employer's Representative during the progress of the works. Each vibrograph shall be certified as being in proper working order and shall unless otherwise approved, record vibrations in three directions simultaneously with print-out showing the amplitude and frequency of the vibrations. - Vibration measurements shall be taken at the base of buildings, on the side facing the source of vibration. Where feasible, the measurement should be taken on a hard surface on the ground outside the building.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	A pre-condition survey will also be undertaken of all properties potentially affected by the works (likely within a 10m radius of works areas). Crack monitoring will be installed on such affected properties and monitored throughout the works.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Air Quality		
Dust from excavation and site clearance activities Emissions from exhausts of construction plant and vehicles. Dust from movements on site in dry windy weather. Dust from dry surfaces and stockpiles.	The following dust mitigation measures will be implemented by the contractor as part of the CEMP: - Limiting vehicle speeds on the construction site; - During very dry periods, spraying surfaces with water will control dust emissions from heavily trafficked locations; - All vehicles exiting the site will make use of wheel wash facilities prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary. Wheel-washing facilities will be located away from sensitive receptors; - Topsoil and other dusty material being moved onsite will be transported in covered trucks, where the likelihood of emitting dust is high, and during dry weather conditions the area of removal will be sprayed with water from a mobile tanker on a regular basis to control dust emissions; - Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be minimised through regular servicing, and	Imperceptible No significant residual impact predicted.

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Dust monitoring will be carried out at the site boundary adjacent to the works throughout the construction phase. Dust deposition monitoring will be conducted at the nearest sensitive receptors in the vicinity of the proposed development. Monitoring will be carried out using the Bergerhoff method, i.e. analysis of dust collecting jars left on-site (German Standard VDI 2119, 1972). Results will be compared to the TA Luft limit of 350 mg/m²/day. Should an exceedance of the TA Luft limit occur during the construction phase, additional mitigation measures, for example more regular spraying of water, will be implemented. - A dust minimisation plan will be formulated for the construction phase of the project so as to minimise dust emissions. The dust minimisation plan shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures and compliance with the TA Luft limit.	
Climate		
Construction vehicles, generators etc., may give rise to CO ₂ and NO _x emissions.	There will be minor emissions to the atmosphere during the construction phase. No mitigation measures required.	Imperceptible No significant residual impact predicted.
Soils, Geology and Hydrogeology		
Potential impact on soil from leaks or spills from fuel, etc. Excavation of soil for wall foundations,	The construction management of the site 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. Measures, as recommended in the guidance above, that will be implemented to minimise the risk of spills and contamination of soils and waters, include: Training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures;	Imperceptible No significant residual impact predicted.

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
embankments, culverts and sediment trap	- Careful consideration will be given to the location of any fuel storage facilities. These will be designed in accordance with guidelines produced by CIRIA, and will be fully bunded; - All vehicles and plant will be regularly inspected for fuel, oil and hydraulic fluid leaks. Suitable equipment to deal with spills will be maintained on site; - Where feasible, soil excavation will be completed during dry periods and undertaken with excavators and dump trucks. Topsoil and subsoil will not be mixed together; - Ensure that all areas where liquids are stored or cleaning is carried out are in a designated impermeable area that is isolated from the surrounding area, e.g. by a roll-over bund, raised kerb, ramps or stepped access; - Use collection systems to prevent any contaminated drainage entering surface water drains, watercourses or groundwater, or draining onto the land; - Wheel wash at site entrance to clean vehicles prior to exiting onto public road network; - Minimise the use of cleaning chemicals; - Use trigger-operated spray guns, with automatic water-supply cut-off; - Use settlement lagoons or suitable absorbent material such as flocculent to remove suspended solids such as mud and silt; and - Ensure that all staff are trained and follow vehicle cleaning procedures. Post details of the procedures in the work area for easy reference.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Hydrology		
Potential impact on surface water during heavy precipitation from stormwater runoff which could contain silt, or oils from plant and vehicles. Potential impact due to the risk of flooding.	A CEMP has been prepared and implemented for the duration of the construction phase of the project. Prepare an Emergency Response Plan detailing the procedures to be undertaken in the event of flooding, a spill of chemical, fuel or other hazardous wastes, a fire, or non-compliance incident. This plan will contain the following information: - Containment measures; - List of appropriate equipment and clean-up materials; - Maintenance schedule for equipment; - Details of trained staff, location and provision of 24- hour cover; - Details of staff responsibilities; - Notification procedures to inform the relevant environmental authorities: Cork County Council, the EPA and Inland Fisheries Ireland; - Audit and review schedule; - Telephone numbers of Cork County Council and Cork City Council Drainage Services; - List of specialised pollution clean-up companies and their telephone numbers; - Ensure all site staff are trained in the implementation of Emergency Response Plan and the use of any spill control equipment as necessary; - Prepare method statements for the control, treatment and disposal of potentially contaminated surface water;	Imperceptible No significant residual impact predicted.

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Prepare a site plan showing the location of all surface water drainage lines and proposed infiltration areas / discharge to combined sewers. This shall include the location of all existing and proposed surface water protection measures, including monitoring points and treatment facilities; - Ensure that all appropriate licenses required for construction are obtained from the relevant authorities; The Contractor will comply with the following guidance documents: - CIRIA – Guideline Document C532 Control of Water Pollution from Construction Sites (CIRIA, 2001); - CIRIA – Guideline Document C649 Control of Water Pollution from Linear Construction Projects Site Guide (CIRIA, 2006); - CIRIA – Guideline Document C624 Development and Flood Risk – guidance for the construction industry (CIRIA, 2004); and - Guidelines on Protection of Fisheries During Construction Works in and adjacent to Waters (Inland Fisheries Ireland, 2016). The following construction mitigation measures will be utilised to minimise the risk of contamination during in channel works: - Where cast-in-place concrete is required, all work must be carried out in the dry and effectively isolated from any flowing water (or water that may enter streams and rivers) for a period sufficient to ensure no leachate from the concrete; - Waterproofing and other chemical treatment to structures in close proximity to watercourses shall be applied by hand; and - All pumps used for dewatering excavations shall be located in sump to minimise the sediment generation. The following construction mitigation measures will be utilised to control the interaction of wash down water from concrete and cementitious material, vehicle wash down areas and run-off from fuelling areas with surface water: - All batching and mixing activities will be located in areas away from watercourses and drains;	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Surface water drainage around the batching plant will be controlled; - There will be no hosing into surface water drains of spills of concrete, cement, grout or similar materials; and - Washout from mixing plant or concrete lorries will be carried out in a designated, contained impermeable area. - All oils and fuels shall be stored in secure bunded areas and care and attention taken during refuelling and maintenance operations. Particular attention shall be paid to the gradient and ground conditions which could increase the risk of discharge to waters. - Vehicle wash down areas shall be bunded and run-off channelled to a treatment area, such as a settlement pond, prior to discharge. As per the above listed guidelines, protection measures will be put in place to ensure that all materials used during the construction phase are appropriately handled, stored and disposed of in accordance with recognised standards and manufacturer's guidance. Ensure that any discharges to waterbodies will comply with the appropriate legislative requirements as addressed in Section 12.2.2 of Chapter 12. To mitigate the increased risk of fluvial flooding during the construction of the Scheme, the Contractor will be required to ensure all temporary watercourse diversions have adequate hydraulic capacity and do not increase the risk of flooding during high fluvial flows or tidal water levels. Adequate overflow arrangements will be required to ensure high flows can be conveyed downstream without increasing the risk of fluvial flooding. The Contractor will be required to carry out risk assessments prior to undertaking any works (including in-stream works), which will include assessing the risk of flooding. To mitigate the risk of pluvial flooding during the construction stage the Contractor will be required to ensure all surface water drainage networks in the vicinity of the works remain clear and free flowing. The Contractor will also be required to ensure that all surface water drainage outfalls to existing watercourses are maintained or alternative outfalls are constructed.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Biodiversity		
Temporary physical damage to habitats within the construction footprint or access routes Potential changes to the physical regime e.g. estuarine, fluvial and geomorphological processes, salinity levels, tidal regimes, erosion, deposition, sediment transport and accumulation). Changes in the hydrological regime Changes in water quality and pollution Disturbances to sensitive species such as birds, badgers, bats and otters Disturbance to fisheries Invasive plant species in works areas	Designated Conservation Sites In order to mitigate identified construction and operational impacts on the Cork Harbour SPA, and also the pNHAs, the following mitigation measures will be implemented: - No works shall take place downstream of Glanmire Bridge. - Localised temporary piling during the construction phase of the proposed scheme shall not take place downstream of Glanmire Bridge, which carries road L2999. - Temporary piling shall not take place during the hours of darkness. - Vibratory piling methods shall be used as a low noise alternative to impact piling. - Piling methods shall use a 'soft-start' approach to piling. - The permanent works (i.e. the flood defence walls) will not encroach into Cork Harbour SPA and Glanmire Wood pNHA. Wherever possible works on the flood defence walls will be conducted from the dry side to limit damage to riverine/estuarine and intertidal habitats along the toe of the walls and works. - Follow pollution prevention measures as detailed in Section 6.8.9. Habitats and Flora - In-channel working will be minimised, wherever possible;	Neutral No significant residual impact predicted.
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Channel maintenance activities	- Sympathetic and suitably extensive erosion control measures will be installed at key changes in flow regime, such as at culvert entrances and exits, so that local erosion does not precipitate a disruption or acceleration of the sediment regime. A transition from hard to soft erosion control measures will be included at all culverts and hard defences. - Upon completion of the works, in-stream (aquatic) vegetation will be allowed to re-colonise naturally, however, this will be monitored and if deemed necessary additional planting of suitable aquatic plant species will be undertaken; - Upon completion of in-channel works, in-channel sediment features will be reinstated. This may be in the form of placing boulders at intervals along sections of channel where the natural river bank is being altered by hard structures; - A silt fence shall be installed at the base of the new embankment at Sallybrook. This silt fence shall be installed prior to the exposure of unvegetated overburden. Sections of embankment will be appropriately covered at the end of each work day to ensure unvegetated overburden is left exposed; - It is anticipated that any alteration of the sediment transport processes will be local to the main in channel works, such as bridges and culverts. It is important that a review of the construction works to capture immediate local channel geomorphological response is undertaken by a qualified geomorphologist. Erosion control measures may be extended further downstream as a result but this assessment has taken that possibility into account. - Follow pollution prevention measures as detailed in Section 6.8.9 of Chapter 6. - Upon completion of the works the new embankment, and in any other grassland areas disturbed during the construction works, will be re-sown with an appropriate species-rich grass and/or native wildflower seed mix option. - Hedgerow/tree planting will be undertaken to address the loss of hedgerow/treeline to accommodate the new drainage scheme. Hedgerows will be replanted as close to the existing alignment and location as possible and will use native, locally sourced species appropriate to the locality.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	Birds - All vegetation clearance works and site preparatory works will be conducted outside of the bird nesting season (March to August inclusive). - If this is not possible, a breeding bird survey will be undertaken by a suitably qualified ecologist in advance of the works to ensure that there will be no impacts on nesting birds. If nests are found, they will be safeguarded, with an appropriate buffer, until the chicks have successfully fledged. - Impacts on Kingfisher have been mitigated through the scheme design, by moving the flood wall to avoid the Kingfisher embankment and placing the flood defence wall behind the existing wall and within Meadowbrook housing estate in order further minimise impacts to Kingfisher. - With respect to Kingfisher at Meadowbrook, no temporary piling or construction of the RC wall shall take place during the breeding bird season (March – August inclusive). Nesting activity shall be monitored by a suitably qualified ecologist. If nesting activity is not observed, ensuring the allowance for a late clutch and/or double clutch, works may proceed during the later months of the breeding bird season. - The Kingfisher nesting area at Meadowbrook will be physically screened off from proposed works in the vicinity of the Kingfisher embankment. - Hedgerow/tree planting will be undertaken to address the loss of hedgerow/treeline to accommodate the new drainage scheme. Hedgerows will be replanted as close to the existing alignment and location as possible and will use native, locally sourced species appropriate to the locality. The planting of unstable banks shall be carried out to assist the re-establishment of habitat cover to the river corridor.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Works to existing walls and bridge structures shall require a breeding bird survey prior to the commencement of works to ensure there will be no impacts on Dipper and Grey wagtail. If nests are found, they will be safeguarded, with an appropriate buffer, until the chicks have successfully fledged. - If nesting areas of Dipper and Grey wagtail, as identified in the breeding bird survey, will be damaged or lost through the proposed scheme, enhancement measures to wall and bridge structures shall involve the installation of nest boxes for Dipper and Grey wagtail in these areas. - This will require consultation with the UCC research department who currently run a Dipper project on the Glashaboy and who have provided information to JBA's ecologists throughout this project. Consultation will be required by the Contractor prior to the installation for the nest boxes. Otters - A derogation licence for the Scheme was obtained from NPWS with respect to otter for the proposed Scheme (See Appendix 6.3). The derogation licence application that was submitted to NPWS detailed the temporary closure of a number of holts and proposed the locations and design for two artificial holts. A course of monitoring in advance of the commencement of work will be required to establish the relative occupancy of the identified holt structures, including interim reporting and method statements for the temporary closure of the holts in consultation with NPWS. All conditions and mitigation measures required by this licence shall be implemented. Refer to Figure 1 in Appendix 6.3 of the EIAR for the location of the proposed artificial otter holts. - Prior to commencement of works, a further survey to identify the presence of any new Otter resting places/holts within 200m of the works areas will be undertaken. If found and likely to be damaged/disturbed by the works, a revised derogation licence shall be applied for from NPWS. This licence will include new otter resting places and holts identified during the pre-construction survey. Any further mitigation measures required by the derogation licence shall be implemented.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- A 20m buffer shall be provided for any holt in the vicinity of the proposed construction compound at Circus Field. Physical delineation of the 20m shall be provided with solid screening. This compound area shall be used for the storage of materials and machinery only and will not contain welfare facilities. - The provision of lighting for the compound shall be designed in such a way that it is directional and thus preventing unnecessary light spillage and light pollution. Lighting shall be controlled by a timesclock/ sensors. - Night-time working shall be avoided within 20m of the known otter holts and resting places, or those that may be identified as part of the pre-works Otter survey. If night-time work is required within 20m of an otter holt, this shall be detailed in the revised derogation licence, the appropriate mitigation measure strategy devised and any additional requirements of the derogation licence implemented. - The design of new structures shall include the provision of ledges for the movement and passage of otters in accordance with 'Guidelines for the treatment of otters prior to the construction period of national road schemes' (NRA, 2008) and 'Guidelines for the crossing of watercourses during the construction of national road schemes' (NRA, 2008). Ledges shall tie into the adjoining riverbanks, or river bed where practicable, and should be screened with landscape planting. A 500mm wide ledge will be constructed from concrete with its top at 150mm above the 1 in 5-year event. It will be on one side of the bridge/culvert structure only. These ledges will be provided at the following culverts: - Shopping centre bridge at Hazelwood - All three new structures on the Glenmore Stream - To minimise the potential for otters becoming trapped, all excavations will be left open for the minimum possible time, and not over-night. If excavations have to be left open over-night, they will be fitted with an escape ramp (no more than 45°) to allow accidentally trapped animals to escape. Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site.	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- All materials stored on site will be stacked securely so as to prevent accidental collapse if investigated by an Otter, or any other large mammals. Badger - To minimise the potential for Badgers becoming trapped, all excavations will be left open for the minimum possible time, and not over-night. If excavations have to be left open over-night, they will be fitted with an escape ramp (no more than 45°) to allow accidentally trapped animals to escape. Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site. - All materials stored on site will be stacked securely so as to prevent accidental collapse if investigated by Badger, or any other large mammals. - Prior to commencement, all works areas, site compounds and access routes will be re-surveyed to ensure that new Badger setts have not been established. If found, appropriate mitigation strategies will need to be devised and implemented. Bats In order to mitigate identified construction and operational impacts on bats the mitigation measures listed below will be implemented. A derogation licence for the scheme has been obtained from NPWS with respect to bats for the proposed scheme (See Appendix 6.4 of the EIAR). All conditions of the derogation licence shall be implemented. In survey areas where habitats present and currently provide good commuting and some foraging potential for bats, it is best practice to avoid damaging activities. It is proposed that the following measures be put in place to avoid or lessen the degree of construction and operational impacts on bats.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	<i>Mitigation by avoidance</i> - Do not remove trees and shrubs along waterway banks adjacent to the bridge structures, where feasible. Protect this habitat from any potential damage as a result of the proposed development works. - Treelines and shrubs should remain in-situ, where possible, and remain protected from potential management work. - Minimise damage to the woodland habitat adjacent to the bridges/walls/ culverts and along the rivers. - Ensure that all equipment, construction materials are stored on the roadway and not in adjacent habitats to the bridges. - Open areas required to facilitate works should be limited, where feasible, to areas where tree and hedgerows are not present. Lighting of such work spaces can also disrupt traditional foraging grounds for bats and therefore should be limited and should not occur during foraging period (30 minutes prior to sunset to 30 minutes after sunrise). <i>Priority Mitigation Measures for Bats – Riverstown Bridge</i> Riverstown bridge is the only bridge within the Scheme that has bat potential to which works will be carried out. A derogation licence has been obtained from NPWS for the works on Riverstown bridge (See Appendix 6.4 of the EIAR). The mitigation measures outlined below are those contained in the derogation licence application. - A bat specialist examines the arch prior to proposed works. If crevices are not used by bats, they are filled temporarily with bubble wrap. This will prevent the bats using the crevice during works. Once works are finished, the bubble wrap is removed allowing the bats to use the crevices post works. However, at the section where the pedestrian foot bridge meets the stone bridge, there are gaps suitable for roosting bats. There is also evidence of nesting birds. This, where possible, should remain open. - It is preferable that works are undertaken outside the main maternity season (May-July/August) and the main hibernation season (Dec/Jan – this is weather dependent). Works should be avoided during freezing conditions, where possible.	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Crevices that remain open will have to be daily checked prior to filling in unless the canvas sheeting procedure as recommended below is undertaken. - Due to the number of open crevices found in Riverstown Bridge, a bat inspection of any bridge is required the night before works are due to be undertaken. In preparation for this survey, two sheets of canvas that will close the arches (post bat survey), are required to be in place (i.e. canvas sheeting to be erected from the top of the bridge and held in place. When the sheeting is unfurled, the length of it should reach the water level. The width of the sheeting should also ensure that entire opening to the 1/2 arches of the bridges (upstream and downstream) are covered to prevent bats accessing the bridge for the duration of the works. Once the bat inspection and survey determines that there are no bats within the bridge, the canvas sheets are to be released. While the canvas sheeting can be opened during the daytime to allow works to be undertaken, it is of paramount importance that each evening, the canvas sheets are released to close the arches during the night for the duration of the works under the arches. Once the works are finalised and a bat inspection is completed, the crevices blocked to be retained are unblocked and the canvas sheets removed. <i>Removal of Trees</i> - Minimise the removal of mature trees with bat roost potential, i.e. PBR trees, where possible. - If the trees are to be removed, felling should be undertaken during the months of September and October (potentially November – weather dependent), and February and March during mild weather conditions. Note: the breeding bird season is March to August inclusive. Thus, tree removal during March may only be conducted if a breeding bird survey is undertaken by a suitably qualified ecologist in advance of the works. - Tree felling of PBR trees may be permitted in December and January in mild conditions (i.e. >8°C day time temperature). This will be undertaken in consultation with the bat specialist. Planting will be required to mitigate for tree removal. Consideration should be given towards hawthorn, blackthorn mix with individual ash, alder and birch to form a native tree hedge and deciduous trees (native tree species include ash, oak, alder, birch) should be planted in public areas.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	An assessment of trees according to their PBR value determines the methodology of felling. Trees with B-value PBR have a medium suitability for roosting bats and require more intensive procedures prior to felling, for example: - Any trees showing crevices, hollows, etc., should be removed while a bat specialist is present to deal with any bats found (i.e. PBR Value A or B). Such animals should be retained in a box until dusk and released on-site. Large mature trees will be felled carefully, essentially by gradual dismantling by tree surgeons, under supervision of a bat specialist. Care will be taken when removing branches as removal of loads may cause cracks or crevices to close, crushing any animals within. These cracks should be wedged open prior to load removal. The dead branches should be lowered to the ground using ropes to avoid impacts which may injure or kill bats within. This measure refers to B-value trees. These trees should be marked with spray paint prior to felling in order for them to be felled correctly in relation to method described above. - A bat expert will survey all trees due for removal prior to construction works commencing once there is a consensus on what trees are to be removed and there is a clear access to all of the trees on-site. - Any ivy covered trees which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape (i.e. PBR Value C). <i>Alternative roosting sites - Bat Boxes</i> If trees are proposed to be felled then, a bat box scheme is required to mitigate for this. The number of bat boxes is calculated according to the number of trees to be felled and their PBR value. Bat box locations (exact trees for erection of bat boxes) should be undertaken by bat specialist prior to construction works are undertaken. - For every A-value tree to be felled – one bat box is required. - For every three B-value trees to be felled – one bat box is required. - For every five C-value trees to be felled – one bat box is required.	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	As there are 1 A-value; 5 B-value and 28 C-value trees proposed to be felled, a minimum of 9 bat boxes are required to be erected to mitigate for tree felling. To mitigate for habitat loss a further 15 bat boxes are required to be erected. Therefore, a total of 24 bat boxes are required. These should be erected in John O'Callaghan Park and adjacent public land with wooded (siting should be on mature trees adjacent to the river). This type of bat box is suitable for brown long-eared bats, pipistrelles and Leisler's bat. The bat box design recommended for use is: 'Schwegler' woodcrete bat box designs are recommended – 1FF design (flat box, self-cleaning). However, 24 bat boxes is a large number of bat boxes in public areas. Therefore, alternatively, 12 bat tubes can be inserted/attached on to flood defence walls/culverts/ structures along the river within the survey area constructed to replace 16 of the bat boxes. There are two types of bat tubes recommended and the type used will be dependent on how the tube can be inserted/attached to structures. This is a preferred option as bat tubes have proven to be good alternative roosting sites for Myotis species of bats, those typically found in wooded area and along the rivers. Therefore, a combination of bat boxes and bat tubes will cater for the entire suite of bat species recorded utilising the river system surveyed. The bat tube designs recommended for use are: 'Schwegler' 1FR bat tubes and 'Schwegler' 1WI Summer and Winter Bat Box, which is designed for year-round occupation. The 1FR bat tube, for best results, should be used where it is inserted into the fabric of structures. The 1WI is an insulated version which is more suitable for attaching to external surfaces of structures such as flood defence walls. Therefore, this type of bat tube is recommended where it is not possible to build the standard bat tube into the fabric of a structure. There will then only be a need for 8 bats boxes which can be erected within the John O'Callaghan Park on mature trees, while the bat tubes can be inserted into walls, or attached to bridges and other suitable structures. Any wall approximately 2m or higher are suitable for the tubes.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	They are approximately the size of a concrete block with an opening to allow bats to enter into the internal space of the tube. They are built into walls with the opening at the bottom and facing out onto the waterway to allow bats to enter and exit freely over water. The exit point needs to be 1.5m above the water level to ensure that they are not flooded. Bat boxes should be erected prior to works (e.g. tree felling) while bat tubes should be inserted in walls during construction. Discussions with the bat specialist are recommended in relation to siting of bat boxes and bat tubes. The main function of bat boxes and bat tubes are to provide alternative safe roosting sites for groups of bats where natural sites become unavailable. The internal diameter of a bat box is required to be sufficient to allow bats to cluster together in numbers to retain body heat. It is important to understand the life cycle of bats and their tendency to use an array of roosting sites through the year. In summary, bats require different roost conditions for hibernation, during the sensitive time of rearing their young (maternity roost), night roosts for resting stops during night feeding and satellite roosts in between the main hibernation and maternity season. Roosting conditions also vary with each species. In general, hibernation boxes require greater insulation (wall thickness of 100 mm timber) to provide a constant temperature for bats throughout the winter to prevent bats from freezing. All other boxes, typically called summer boxes, are designed to provide secure and dry sheltered conditions. These boxes have relatively thin walls (about 20-30 mm timber) and are used by bats outside the hibernation period. These requirements mean that any Bat Box Schemes should provide suitable bat boxes to cover the general requirements of different bat species all year around. 'Woodcrete' boxes are made of a mixture of concrete, sawdust and clay moulded into to shape. They have the advantage of allowing natural respiration, stable temperature and durability. 'Woodcrete' boxes last, on average, for 25 years. To ensure that bats use the bat boxes, it is very important to site them carefully and this should be undertaken by a bat specialist. Some general points to follow include: - Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 3 metres above and below position of bat box. - Diameter of tree should be wide and strong enough to hold the required number of boxes.	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations should be sheltered from prevailing winds. - Bat boxes should be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of resident bats. - It is recommended to erect a number of bat boxes on one tree at an array of aspects. South facing boxes will receive the warmth of the sun, which is necessary for maternity colonies. In large bat box schemes, it is generally recommended to have three bat boxes arranged at the same height facing North, South-East and South-West. This ensures a range of temperatures are available all day. If the South facing boxes become warm, bats can safely remove to the cooler North facing box. Acceptance of boxes by bats is less predictable than those for birds. Therefore, it is essential to monitor their use over a period of time. Those boxes that remain unused within two years of date of erection should be re-located. Bat boxes should also be checked in wintertime for general wear and tear and to remove droppings from the previous summer use. Bat boxes should be inspected, by bat licence holder (bat specialist), at least once within 12 months of erection at appropriate season in order to monitor bat use and the species using boxes. This should be followed up with another inspection within 24 months of setting up. At this point, any bat boxes not used should be re-located to a new site. Any bats found should be counted and identified to species level. All data collected should be submitted to Bat Conservation Ireland. Bat box scheme should be registered with Bat Conservation Ireland and monitoring should be undertaken annually for 2 years. <i>Enhancement Work – Tree Planting</i> - A large array of trees is proposed to be felled as part of the flood relief works. It is therefore recommended to plant tree species in adjacent public lands to mitigate for such habitat loss. Bats utilise trees as they develop tree holes, splits etc. in reaction to the aging process or weather damage. Different tree species develop different features at different ages. Tree species such as alder and birch grow quickly and also develop suitable roosting sites for bats quickly, while slow growing tree species develop suitable roosting sites for bats at a slower rate.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	Therefore, it is recommended to plant a mix of Irish native trees species such as alder, birch, oak with undershrub layer of hawthorn, blackthorn and holly. Fisheries In order to mitigate identified construction and operational impacts on fisheries the following mitigation measures will be implemented: • IFI Guidance on the Protection of Fisheries During Construction Works in and adjacent to Water (IFI, 2016) should be followed and consultation with IFI will be carried out prior to works. • In-channel working will be minimised, wherever possible. Where in-channel working is unavoidable, works should be preferentially done in the dry wherever possible, through the use of temporary coffer dams and dewatering, following a fish rescue from any wetted channel area within the coffer dam. Fish rescues should be undertaken by an appropriately experienced fisheries contractor in possession of the relevant permits and consents from the regulator. • In-channel works will only occur during the in-stream working window, i.e. July – September inclusive. Extension of the July – September working window shall be in consultation with IFI. • During the construction phase it will be ensured that fish can migrate past areas of in-channel working. • Where piling is required, a presumption against the use of percussive piling should be made. Where possible, a press-in piling technique should be used, with a presumption to use vibration piling, using a variable moment vibrator, where press-in techniques are not appropriate due to ground conditions. • Any pumps used for over-pumping/de-watering must be fitted with appropriate screens. • Method statement to be drafted and approved with IFI for in-channel works relating to fitting of all non-return drainage outlets to new flood defence walls.	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	• Hard engineering of the river bed will be avoided. • Any riverbed materials removed or disrupted as part of the works will be replaced and any areas where new bed materials will be installed (i.e. wall footings, bed armour to prevent scour), will be designed to replicate natural bed conditions. Existing bed material will be used to cover new bed materials, wherever possible. Bed material removed from the river will be stored on the bankside. The storage facility will be such that there will be no loss of sediments from the material stored and no external contamination (e.g. a bunded plastic sheet or sealed plastic container). Once excavations are complete, and any new material has been introduced, the stored material will be replaced over the bed. Once normal flows are restored after demobilisation, the replaced material will be redistributed by the currents. These measures will ensure no net loss of material and no significant changes to bed sediment morphology or composition. • Follow pollution prevention measures as detailed in section 6.8.9 of Chapter 6. • Ensure that all culverts and trash screens are designed and installed in line with published best practice on fish passage (e.g. CIRIA 2010; Armstrong et al 2010; Tumpenny & O'Keefe 2005). • Inclusion of cost effective fish passage measures at the wooden weir on the bottom end of the Springmount Stream to enable upstream migration and exploitation of habitat (albeit limited). Non-native Invasive Species In order to mitigate the possible spread of non-native invasive species, the mitigation measures will be implemented: • Where feasible, avoid working in areas where Japanese Knotweed is present; all areas within 7m of visible above-ground growth will be avoided and clearly demarcated. • If work is required in areas infested with Japanese Knotweed (including any area within 7m of visible above-ground growth) an appropriate Japanese Knotweed Mitigation Strategy will need to be devised and implanted to prevent spread. Refer to Appendix 4.1 of the EIAR for further details.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Prior to commencement, all works areas, site compounds and access routes will be re-surveyed to ensure that stands of non-native invasive species have not become established. If found, appropriate mitigation strategies will need to be devised and implemented. - An overall site specific Invasive Species Management Plan will be developed to address any areas that may affect the proposed scheme prior to the commencement of works. - All contractors and staff shall adhere to Biosecurity Protocols for invasive species. Construction and Environment Management Plan Chapter 4 of this ELAR details the main constraints required to be contained in the Construction and Environmental Management Plan (CEMP) during the construction phase and will be included in the tender documents for the construction of the proposed scheme. - A detailed and site-specific CEMP will be prepared (Appendix 4.2) and it will be provided to the competent authority by the contractor prior to works commencing. This has been completed in consultation with a suitably qualified ecologist. - All works will be monitored by a suitably qualified ecologist who will report to the Heritage Officer of Cork County Council. Reporting format and programme to be agreed with Cork County Council. Pollution Prevention Measures Appropriate mitigation measures will be implemented prior to the construction phase to ensure that water quality of the Glashaboy River is not adversely affected through pollution incidents and silt mobilisation. This mitigation will include: - Appropriate sediment control measures will be employed.	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Any chemical, fuel and oil stores will be located on an impervious base within a secured bund with a storage capacity 110% of the stored volume. - Biodegradable oils and fuels will be used where possible. - Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage (at least 10m). - Emergency spill kits will be available on site and staff trained in their use. - Operators will check their vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages will be reported immediately. - Daily checks will be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded. - Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed. All items of plant will be checked prior to use before each shift for signs of wear/damage. - All washing out of grout pumps will be carried out in designated areas away from the river, such as in the lined compound area. At no point will grout pumps be washed out at the worksite. Tree Removal Hedgerow/tree planting will be undertaken to address the loss of hedgerow/treeline to accommodate the new drainage scheme. Hedgerows and trees will be replanted as close to the existing alignment and location where feasible and will use native, locally sourced species appropriate to the locality.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	A number of trees require removal at Sallybrook to facilitate the construction of the new embankment. The root systems of trees within a minimum of a 2m buffer from the channel edge shall be left in-situ and shall not be removed. This area is also covered in Japanese knotweed and therefore, measures and controls must be in place to ensure that the works do not cause the spread of Japanese knotweed. See also bat mitigation above regarding tree removal.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Archaeological Architectural and Cultural Heritage		
Ground disturbance at numerous locations Potential disturbance to potentially surviving subsurface archaeological deposits. Removal of features of cultural significance	Following a comprehensive archaeological assessment carried out as part of the Glashaboy River (Glannure/Sallybrook) Drainage Scheme, twenty-three cultural heritage Sites (CHS) were identified. Fourteen of these sites (CHS Nos. 01, 03, 05, 06, 07, 08, 09, 10, 11, 12, 15, 21, 22 and 23) will be directly impacted by the proposed works, specific mitigation measures for these CHS are: - CHS 01(CO 01): Ex-situ mass of bonded brick. Mitigation: Record (descriptive and photographic) of this feature. Further consultation with NMS. - CHS 03 (CO 01): Section of revetment wall along the eastern bank of the river and part of the curtilage of Sallybrook House (NIAH 20903332) and Sallybrook Mill (CO063-069 and RPS 00390). Mitigation: Archaeological record (descriptive and photographic) of the sections of wall to be impacted. Licenced archaeological monitoring by an experienced underwater archaeologist. - CHS 05 (CO 01): Tailrace associated with Sallybrook Mill (CO063-069 and RPS 00390).	Imperceptible to slight effects Slight effects where features are to be removed.

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	Mitigation: Archaeological record (descriptive and photographic) of any features identified. Licenced archaeological monitoring by an experienced underwater archaeologist - CHS 06 (CO 01): Weir and sluice associated with Glansillagh Mill (CO063-094 and RPS 00389). Mitigation: Avoidance of impact to the training wall into the sluice, if possible. If avoidance is not possible, archaeological record (descriptive and photographic) of the sections of wall in advance of any impact. The proposed flood defence works will be sympathetically faced with materials similar to those existing to minimise potential negative aesthetic visual impacts. Licenced archaeological monitoring of any works in this area. - CHS 07 (CO 08): Headrace associated with Glansillagh Mill (CO063-094) and RPS 00389). Mitigation: Archaeological testing in the area of the pumping station followed by licenced archaeological monitoring by an experienced underwater archaeologist of any works in this area. - CHS 08 (CO 01): Revetment wall on the eastern bank of the river. Mitigation: Archaeological record (descriptive and photographic) of the revetment wall in advance of impact and licensed archaeological monitoring by an experienced underwater archaeologist - CHS 09 (CO 01): Revetment wall along the western bank of the river. Mitigation: Archaeological record (descriptive and photographic) of the revetment wall in advance of impact and licensed archaeological monitoring by an experienced underwater archaeologist - CHS 10 (CO 06): Tailrace from the flour/corn mill at Spring Hill. Mitigation: Archaeological record (descriptive and photographic) of any elements of the tailrace and licensed archaeological monitoring by an experienced underwater archaeologist.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	CHS 11 (CO 01): Intra-riverine feature immediately south of the headrace of Riverstown Mill. Mitigation: Avoidance if possible, if avoidance is not possible, archaeological record (descriptive and photographic) of the revetment wall in advance of any impact. The proposed flood defence works will be sympathetically faced with materials similar to those existing to minimise potential negative aesthetic visual impacts. Licensed archaeological monitoring by an experienced underwater archaeologist CHS 12 (CO 01): Riverstown Bridge (CO064-111, RPS 00394, NIAH 20906415) a four-arch hump back road bridge. Mitigation: Licensed archaeological testing in green areas in advance of construction for all works within the ZON of Riverstown Bridge. A full archaeological survey of the bridge to be undertaken prior to any construction works. Licensed archaeological monitoring by an experienced underwater archaeologist during construction including construction of flood defence walls along the eastern and western river banks upstream of the bridge. Archaeological assessment of the proposed works on the bridge and its vicinity outlining likely impacts and proposing appropriate mitigation. This assessment will be carried out by a professional underwater archaeologist and submitted to the NMS at the DCHG for consideration. CHS 15 (CO 01): Revetment wall. Mitigation: Archaeological record (descriptive and photographic) of the revetment wall in advance of impact and licensed archaeological monitoring by an experienced underwater archaeologist. CHS 21 (CO 01): A rectangular well structure in Cois na Gleann stream Mitigation: Full archaeological record (descriptive and photographic) in advance of any impact and further consultation with the NMS at the DCHG prior to any works taking place.	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	CHS 22 (CO 05): A weir and random rubble culvert in the Glenmore stream. Mitigation: Archaeological record (drawn, descriptive, photographic and GIS survey) of the weir and culvert prior to any works. Licenced archaeological monitoring of any works in this area thereafter. CHS 23 (CO 01): A roofless, ruinous structure a short distance upstream of the Glanmire Bridge in the townland of Poulacurry South. Mitigation: Archaeological record (descriptive and photographic survey) of the structure prior to any works. Licenced archaeological monitoring of any works in this area thereafter. Construction work on the drainage scheme will require extensive ground disturbance in multiple locations. Some of these areas have been previously disturbed, however, <i>in situ</i> localised subsurface deposits may survive in places. - In areas where <i>in situ</i> subsurface deposits may be present licensed archaeological monitoring of ground works will be carried out. - In areas where intra-riverine archaeological deposits may survive licensed archaeological monitoring will be carried out by an experienced underwater archaeologist. All construction works, i.e. construction of flood defence walls along the river banks, construction and replacement of culverts; removal and replacement of bridges; construction of embankments and pumping stations; conveyance improvements (river channel widening and deepening), and localised regrading of ground levels will be subject to archaeological monitoring. A monitoring methodology will be agreed for all works carried out during construction to include licenced archaeological monitoring and metal detection of an agreed portion of materials recovered.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	The monitoring program will be reviewed and modified depending on the quantity of archaeological material recovered and will be scaled back if quantities are small. The monitoring works will be carried out under the supervision of a professional underwater archaeologist. This includes preparatory or temporary works in advance of full works, and includes the clearance of topsoil and subsoil stripping of riverbanks, green field areas, areas for works compounds, etc. Similarly, the excavation for all culverts that will impact subsurface levels beneath the existing culvert will be subject to archaeological monitoring. Any archaeological features identified during archaeological monitoring will be fully resolved to professional standards of archaeological practice. Such material will be preserved <i>in situ</i> or preserved by record, as appropriate, as outlined in Policy and Guidelines on Archaeological Excavation – Department of Arts, Heritage, Gaeltacht and the Islands.	
Population and Human Health		
Traffic disturbances Noise and vibration effects Dust generation Potential loss of cultural heritage	• See Roads and Traffic • See Noise and Vibration • See Air Quality and Climate • See Archaeological Architectural and Cultural Heritage	Imperceptible No significant negative residual impact predicted. Positive residual impact due to lower risk of flooding to residential, commercial properties, amenities etc.
Material Assets		
Construction phase will require potable water,	• Standard industry practice or construction works will ensure the safety of the workers and maintain the integrity and operational functions of any service, above or underground.	Imperceptible
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
power, fuel, materials such as steel and concrete. Generation of waste and excavated material. Potential temporary impact on services.	• Prior to construction, drainage networks, electrical cabling, gas pipelines and telecommunications infrastructure will be reported in detail and incorporated into the construction design as to be avoided where possible. • Planned diversions will be implemented after discussion with the relevant bodies and all affected persons including businesses and residents will be notified in advance of any disruptions. Contractors will be provided with all the locations of any services, including liaison with service providers and for the execution of the work so as to avoid the risk of injury to the construction personnel as well as the risk of damage to services. • Mitigation measures for impacts on roads and transport networks are discussed in Chapter 14 Roads and Traffic and further details of mitigation measures of construction waste can be found in Chapter 4 Construction Activities and Chapter 11 Soils, Geology and Hydrogeology.	No significant residual impact but there will be a residual positive impact on properties.
OPERATIONAL PHASE		
Landscape and Visual		
	The following mitigation measures are included for the post construction stage of the scheme: • Where retention of existing trees is not an option, these shall be replaced with new native species as close as possible to the original location, on the dry side of the wall. • Where shrubs and vegetation are removed, new plants of appropriate species shall be planted in replacement. • Where space permits, native hedge planting shall be planted at 0.45m centres along the dry-side of the wall where feasible. Areas where this is deemed necessary are as follows: Hazelwood, Meadowbrook and Copper Vue.	Slight Negative Overall the impacts on residential and public amenity are considered to be slight negative once new planting matures and screening begins to establish. Considering the scale of the project, on adhering to mitigation measures outlined, the proposed Glashaboy River Drainage Scheme will not have an appreciable impact on the

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	All trees retained in proximity of the construction works, i.e. within root protection area (RPA), shall be subject of to a post-construction tree survey in accordance with BS 5837. This survey is to be carried by the works contractor and competent Arboricultural professional. The post construction survey shall be made available to the OPW for approval and any tree works recommended shall be undertaken by the Contractor.	integrity or landscape planning aspects of the Glashaboy River corridor, with impacts reducing as existing and new planting matures. Positive impacts arise due to the reduced risk of flooding in the area
Traffic		
Potential impact during channel maintenance works	Impacts due to channel maintenance works cannot be foreseen. A traffic management plan will be put in place where works are foreseen to cause disruption.	Not significant
Noise and Vibration		
Use of surface water pumps and foul pump.	Pumps will be used during flood events.	Imperceptible effect and temporary effect.
Air Quality		
	No mitigation measures are deemed necessary.	Not significant
Climate		
	No mitigation measures are deemed necessary.	Not significant
Soils, Geology, Surface Water and Groundwater		
	- The OPW may have to carry out channel maintenance activities on the river. These maintenance activities may disturb the river bank however they will only be carried out where they are deemed necessary for the integrity of the flood defences. No mitigation measures are deemed necessary other than good standard construction methods. - All OPW maintenance work is undertaken in accordance with Environmental Management Protocols and Standard Operating Procedures (OPW, 2011) along with additional measures where the SOPs show deficiencies, to ensure adverse impacts on the environment are considered and minimised. OPW drainage maintenance activities will also be subject to a separate Ecological and Appropriate Assessment process to ensure no adverse impacts arise. - Consultation will be required with the relevant stakeholders as necessary during the planning of these maintenance works including landowners, IFI, the National Monuments Service (NMS), Cork County Council (CCC) and National Parks and Wildlife Service (NPWS) to ensure that the works are carried out with minimal environmental impact	Positive effect
Biodiversity		
Bat Monitoring Channel Maintenance	<i>Monitoring</i> Monitoring is recommended post-construction works. This monitoring should involve the following aspects: Inspection of bat boxes/bat tubes within one year of erection of bat box scheme and inspection of current bat box scheme. Register bat box scheme with Bat Conservation Ireland. This should be undertaken for a minimum of 2 years.	Not significant

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Monitoring of any bridge works. All mitigation measures should be checked by a suitably qualified ecologist to determine that they were successful. <i>Channel Maintenance</i> The following mitigation measures shall be implemented in order to inform the required and suitable assessment in order to conduct maintenance activities. The following (but not limited to) measures shall be implemented, as determined by the EcIA; - Ecological surveys, including an invasive species survey, shall be conducted in the appropriate seasons by a suitably qualified ecologist to inform the EcIA as required. - The mitigation measures resulting from the EcIA shall be implemented when carrying out channel maintenance activities. - Channel maintenance activities shall be avoided where possible downstream of Glanmire bridge. - If a derogation licence is required, e.g. otter and bats, this shall be acquired prior to the decision to progress with the channel maintenance activities. Any further mitigation measures required by the derogation licence shall also be implemented during the channel maintenance activities. - Channel maintenance shall be carried out as much as possible from the river bank without in-stream tracking. - In-stream works shall be avoided where possible. If in-stream works are unavoidable, these shall be conducted during July-September inclusive. Extension of this in-stream working window shall be in consultation with IFI. - Tree removal shall be limited to the removal of fallen trees or overhanging branches, unless identified as dead or diseased trees that are a risk of blockage. Tree roots shall not be removed from the river bank. - Channel maintenance activities shall be carried out in accordance with, but not limited to, the following guidance where appropriate and applicable;	
Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	- Environmental Management Protocols and Standard Operating Procedures (OPW, 2011) - CIRIA Guidance C741: Environmental good practice on site guide (Charles & Edwards, 2015), - NetRegs Guidance for Pollution Prevention for works and maintenance in or near water (NetRegs, 2017), - Inland Fisheries Ireland Guidance on Protection of Fisheries During Construction Works In and Adjacent to Waters (IFI, 2016), - Inland Fisheries Ireland biosecurity protocols (IFI, 2010). - If maintenance activities are required, which fall outside the scope and nature of maintenance activities described in Chapter 4, those maintenance activities will be subject to a separate Appropriate Assessment process to ensure no adverse impacts arise to Natura 2000 sites.	
Archaeological, Architectural and Cultural Heritage		
Disturbance due to channel maintenance activities	Under Section 37 of the Arterial Drainage Act 1945, the Office of Public Works (OPW) is statutorily obliged to maintain all rivers, embankments and urban flood defences on which it has executed works since the 1945 Act in "<i>proper repair and effective condition</i>". Channel and embankment maintenance operations can encompass a variety of activities, including silt and vegetation management, aquatic vegetation cutting, bank protection, bush cutting/branch trimming, tree cutting, mulching, mowing and structure maintenance (Ryan Hanley, 2014). All riverine maintenance work and riverbank works will be carried out in consultation with the NMS. Where required, a monitoring methodology will be agreed for channel maintenance works to include, as appropriate licenced archaeological monitoring and or metal detection of an agreed portion of materials recovered.	Not significant and temporary

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Population and Human Health		
Improved resilience of the local area to flood events	Reduced flooding of residential areas, businesses.	Positive effect
Material Assets		
	No mitigation measures are necessary.	Imperceptible effect