



River Bride (Blackpool) **Certified Drainage** Scheme

Environmental Impact Assessment Report Addendum

Appendices

November 2020



RYAN HANLEY

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Appendix 3C – Maintenance Plan

Office of Public Works River Bride (Blackpool)Certified Drainage Scheme

Preliminary Maintenance Plan

4-03-03

Final | 30 October 2020

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Ove Arup & Partners Ireland Ltd

Arup One Albert Quay Cork T12 X8N6 Ireland www.arup.com



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		Name	Amanda Ryan	Emer Kennedy	Ken Leahy							
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1 Introduction

Under Section 37 of the Arterial Drainage Act 1945 as amended, the Office of Public Works (OPW) is statutorily obliged to maintain all drainage (or flood relief) scheme works elements (including watercourses, embankments, flood defences, pumping stations), which have been completed as part of schemes confirmed under the Arterial Drainage Act 1945 as amended, in proper repair and effective condition. This maintenance work is crucial to the function of the flood defence scheme; not carried out there would be a consequent erosion in the standard of defence provided by the scheme, as well as an increase in the risk of flooding of people's homes, businesses and infrastructure, and negative impacts on human interests and livelihoods.

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.

Maintenance is a responsibility of the OPW. All OPW maintenance work is undertaken in accordance with Environmental Procedures and the OPW Environmental Guidance: Drainage Maintenance (2019) along with additional measures where the Environmental Protocols 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.

Future channel maintenance will apply to the River Bride (Blackpool) Certified Drainage Scheme. The location of channel maintenance is shown as general interferences on the drawings from RB_201 to RB_212 of the Confirmation Drawings. Specific maintenance activities are described in detail in this report.

2 Details of Proposed Maintenance Activities

Further detail of the proposed maintenance activities and requirements is described in the following section and is separated into channel maintenance and flood scheme/structure maintenance. The extents of maintenance within the scheme is as outlined on the previously issued Confirmation drawings (RB_201 to RB_212) and has not changed since Confirmation issue.

Consultation will be required with the relevant stakeholders as necessary during the planning of these maintenance works including landowners, Inland Fisheries Ireland (IFI), the National Monuments Service (NMS), Cork City Council (CCC), and National Parks and Wildlife Service (NPWS) to ensure that the works are carried out with minimal environmental impact.

2.1 Channel Maintenance

A channel maintenance programme will be required throughout the reach of the watercourses impacted by the proposed works. The channel maintenance programme will pay particular attention to locations where silt, gravel and debris are likely to accumulate, such as at structures, sharp bends, culvert inlets, blockages from trees etc. At this stage, the exact nature and scale of channel and embankment maintenance work likely to be required for the River Bride (Blackpool) Certified Drainage Scheme is unknown.

The design of the scheme is such that all significant maintenance works within the riverbed have been focused into areas where pre-defined interventions are planned. The strategic removal of course sediment at the downstream end of the catchment, within a heavily engineered section of the watercourse concentrates the maintenance works to the sediment trap and the immediate channel downstream. This has number of bed check devices, and a further control with the installation of a debris screen.

Limited geomorphic impacts from the planned works upstream are predicted, and it is expected that only at the winter channel overflow will occasional erosion control and sediment removal in this reach be required.

The river restoration planned through the Dulux works will be subject to adjustments and redistribution of the rock armour forming the low flow channel in the early part of the scheme. Limited access by a machine will be required, it is expected that the channel form will settle down after a couple of flood seasons.

The purpose of any channel maintenance is to ensure that the scheme elements are kept in "proper repair and effective condition". Channel maintenance to that end will include the removal of silt/gravel build-ups and vegetation to maintain the asdesigned channel cross section but this will not require removal of material below the existing bed. This removal of silts to maintain the designed cross section is not considered dredging. The following measures will also be incorporated into the channel maintenance methodology:

a) This work is carried out as much as possible from the riverbank without in stream tracking,

- b) Any unavoidable in stream work is carried out between May and September,
- c) Tree removal is limited to fallen trees, overhanging branches or newly established trees in-channel/ bank (where their presence impacts on the channel hydraulic capacity),
- d) Tree roots are not pulled from the riverbank.

Other measures will include regular scheduled maintenance of the river channel and pruning of trees (including removal of trees where necessary), planning and control measure. In general, channel maintenance will typically consist of the following activities:

- The channels will be monitored by means of a walkover survey from the banks on a regular basis (likely quarterly for the first couple of years and annually thereafter, and also following a significant flood event). The walkover surveys will aim to identify issues with implications for flood risk (e.g. fallen trees, excessive vegetation build-up, overgrown trees, illegal dumping, accumulation of granular deposits, etc.). In-channel debris will typically be removed by a long reach excavator working from the banks. Excessive overhanging vegetation will typically be pruned back or removed by hand using a cherry picker, depending on access.
- Removal of build-up of foreign or natural material that impedes the flow of • water within the watercourse or river channel in order to maintain the hydraulic conveyance to pass the design flood. This will include periodic removal of material within the channel by means of suitably rigged excavators or similar equipment. Where access is required to the watercourse, this will be carried out as close as practical to the area of channel subject to maintenance to minimise the length of tracking along the channel. Maintenance works are to be carried out from the bank/dry side where possible depending on flow conditions and other constraints. For example, maintenance activities to remove bed material build up will be ideally carried out during low flow periods to minimise the risk of siltation and material transport downstream. This will be carried out by a long reach excavator but due to space constraints within the scheme, this may not be possible within certain areas and in stream access will be required. Typically, this material would be deposited on the riverbanks subject to space constraints or may be disposed offsite to an appropriately licenced waste facility.
- This would be carried out on average every 4-6 years but shall be assessed on an annual basis by means of a site walkover survey. This applies to all extents of the scheme watercourses as indicated on the previously issued Confirmation Drawings RB_201 to RB_212. No change in extent of watercourses subject to channel maintenance is proposed as a result of finalising detailed design of the scheme.
- Critical areas where this will be carried out include upstream and downstream of bridges, culverts, the scheme sedimentat trap and areas where local widening of the channel is proposed.

- The volume of future material to be removed from the scheme extents is impossible to predict and is dependent on future flow regime within the river, climate change and land use management upstream. As a worst-case scenario, it is envisaged that 180 m³ material will be removed on an annual basis at the sediment trap. The sediment trap does not have to fully emptied each time, and some material in the low flow channel will be retained. Once the river has adjusted to the works upstream an annual removal of sediment is considered sufficient. A set of marker posts will be installed along the sediment trap to trigger removal. Based on sequential filling of the sediment trap and with each bay filling to different depths, ie 1st bay is likely to be filled first and to a higher depth, then a worst-case scenario would be to remove 180m³. This shall be based on a trigger of 0.4m fill depth in the first bay, and 0.3m in the second and third.
- Cutting back and removal of overgrowth and fallen trees. This prevents snagging of debris upstream or at hydraulic structures such as bridges and culverts which reduces the risk of blockages. Furthermore, removal of vegetation reduces the risk of material build up at these locations. This can be typically carried out by less invasive mechanical means such as using weed cutting boats or similar less intrusive equipment. During low flow events, manual intervention into the river may be possible subject to health and safety assessment and methods of working. Emergency removal of fallen trees may be required at intermittent periods or as required following regular inspection of the channel extent such as pre and post flood events. This is to be carried out during the appropriate environmental period (i.e. outside the breeding bird season) or if required as emergency works shall be carried out in consultation with a suitably qualified ecologist.
- Inspection of watercourse for evidence of scour or riverbank erosion. This includes ongoing inspection of placed rock armour, erosion protection membranes, stone slabs in culverts (proposed as part of the scheme), existing riverbanks and other in-stream features.
- Invasive species survey and treatment management plan: This includes annual survey and treatment (where required) of invasive species along the channel extent. Treatment of invasive species commenced in 2016 and is currently ongoing. This treatment will continue through construction and an Invasive Species Management Plan shall be implemented as part of the maintenance regime of the scheme.

2.2 Maintenance of Structures and Equipment

The inspection regime will ensure that there is no deterioration in the structural integrity of the defences which may occur as a result of a vehicular collision for example. It is expected that the flood defences will otherwise be relatively maintenance free.

The embankment and flood wall structures will be monitored by means of a walkover survey from the banks on an annual basis (See Table 1 below). The walkover surveys will aim to identify issues with implications for flood risk (e.g. damage to structures, settlement of embankments, etc.).

Culverts will be inspected on an annual basis and following a significant flood event. Any debris present in the culvert will be cleared by hand. A full CCTV survey and clearing of silt/sediment from the culvert is expected to take place approximately every ten years. Removal of debris will be carried out as required.

Pumping stations and flap valves will be inspected bi-annually or after a severe flood event.

Regular maintenance of the scheme elements is required and the requirements for each element is outlined in further detail in Table 1 summarises the maintenance requirements of the scheme, including seasonal constraints, frequency and duration. below, including typical frequency required for maintenance tasks.

While the more routine and predictable types of maintenance works are described in the following table and the previous text in this document, it should also be noted that any issue that may occur, which has the potential to threaten the effectiveness or adequacy of any element of the Drainage Scheme, will be addressed as required.

3 Maintenance Schedule

Table 1 summarises the maintenance requirements of the scheme, including seasonal constraints, frequency and duration.

Table 1: Ongoing routine maintenance

Element	Instream?	length/ number / extent	Maintenance Task	Predicted Average Frequency	Season	Routine Maintenance Activities / Defect Resolution
			Mowing	6 months	Spring & Autumn	Ride-on mower, strimmer required.
Embankment	Some	406m	Visual inspection & repair	Annually / as required	After mowing / as required	Should localised consolidation occur, topping up of the embankment may be required. This will include topping up with topsoil and re-seeding. In the unlikely event that high flows may cause localised erosion of the embankment, repair will be requirement immediately. This will include excavating locally around the area of erosion as required and reinstating with impermeable material and replacement of seeded topsoil and erosion protection membrane on top.
Floodwalls	Yes, majority	2210m	Structural inspection and vegetation control	Annually / after major storm events or vehicle impact	Fisheries window / summer low river flow Post-storm permitted by exception.	Visual inspection from opposite bank; where closer inspection is required access by wading. Min two persons at all times. Vegetation control as required; infrequent. Two- person min crew. Manual with truck for vegetation removal.

Element	Instream?	length/ number /	Maintenance Task	Predicted Average	Season	Routine Maintenance Activities / Defect Resolution					
		extent	Sealant replacement	20 years	Fisheries window / summer low river flow	Repair/replacement of polyurethane joint sealant and close cell joint filler board every 20 years (typical). This will include removal of the old joint from the top of the wall (including coping) to the top of the wall base. This will require a small/narrow excavation at the location of each wall joint only to expose the base on both wet and dry side of the wall. Works in river using a small excavator is likely. The existing joint will be removed, replaced with a new joint and the local area reinstated as existing. Manual labour required, estimate 2 workmen.					
			Repointing mortar joints in cladding or existing masonry walls (say 25% of area)	20 years	Fisheries window / summer low river flow	Repointing mortar joints: Cleaning of wall to remove vegetation and loose mortar, raking out of joints, and pointing of mortar in affected areas. For walls close to the river, this will involve instream works (by hand) to remove the existing mortar to a specified depth and reinstatement with new mortar. Scaffolding within the river may be constructed or alternatively a cherry picker may be used. Appropriate flow diversion methods may be required, and appropriate environmental mitigation measures put in place to ensure that mortar does not enter the river channel. Manual labour required, estimate 2 workmen.					
Flap Valves, Penstocks, Other movable/wearable	Yes	Not	Visual Inspection & vegetation control	Bi-annually	Any	Inspection to check for broken components or blockages. Inspection of seals. Vegetation control.					
elements		quantified	Replacement	25 years	Any						
Pumping Stations	No	8 no.	Inspections & regular running of pumping station	Bi-annual testing / after major storm events	Any	As per manufacturer's recommendations which will include regular running of pumping stations, removal of blockages, replacement of parts, condition assessment and repairs					
			Testing of telemetry system and equipment	Dry run at least bi- annually	Any	As per manufacturer's recommendations. This is to include inspection of ultrasonic gauges					

Element	Instream?	length/ number / extent	Maintenance Task	Predicted Average Frequency	Season	Routine Maintenance Activities / Defect Resolution							
			Inspection of riser pipework - Check for broken seals and blockages.	Quarterly and before and after heavy rainfall events	All	Localised repair of discrete components. Two-man crew, van required. Remote lifting equipment for heavier pump components. Lifting davits provided in the permanent design.							
			Sump manholes - Inspection and removal of blockages	Bi-annual testing / after major storm events		Two-man work crew. Maintenance truck with water tanker.							
			Electrical Works Replacement	20 years	Any	Electrician; two-man crew. Van.							
			Running costs (electricity)	Annual	Any								
	Yes, all		Visual inspection	Annual / after major storm event	Any	Inspection from access points to identify and if necessary, remove debris and reinstate stone slabs (as necessary). Structural inspection to be also carried out. (Note: Confined space and other H&S procedures required)							
Culverts		981m	Clearing of silt	10 years	Fisheries window / summer low river flow	Some replacement gravel may be required to ensure min embedment depths are maintained.							
			Full CCTV survey	10 years	Fisheries window / summer low river flow	Two-man crew, van, traffic management.							
Whole of the scheme	Yes	~7km	Full visual inspection	1 year/ inspection 10 years remediate	Any	Two-man crew, traffic management.							

Element	Instream?	length/ number / extent	Maintenance Task	Predicted Average Frequency	Season	Routine Maintenance Activities / Defect Resolution
			Vegetation clearance,	Annual / after major storm events	Location dependant. In-channel maintenance is permitted in fisheries window Out of channel vegetation clearance must be outside of bird nesting season	Season for vegetation clearance to be agreed with NPWS and IFI based on extent of works required. Potential conflict between fisheries window and bird nesting season.
Trash screens / Roughing screen	Yes	2 of each	Cleaning of Debris	Every 2 months & after storm events	All	Small excavator
Winter channel	Yes	78m	Visual inspection	Annual / after major storm event	Any	Inspection from formal access point to identify and if necessary, remove debris and sediment build up.
Sedimentation trap	Yes	180m ³ maximum	Visual inspection Clearing of Debris and sediment removal if required	Annual / after major storm event	Any	Small excavator
River channel maintenance	Yes	~7km	Visual inspection Removal of in-channel debris and foreign material Pruning of overhanging vegetation	Every 3 months & after flood events. Annual	Any time of year, disruption of riverbed by exception and subject to IFI approval.	Small excavator & cherry-picker

		length/		Predicted		
Element	Instream?	number / extent	Maintenance Task	Average Frequency	Season	Routine Maintenance Activities / Defect Resolution
Bridge	Yes	4 no.	Visual inspection	Annual / after major storm event	Fisheries window / summer low river flow Post-storm permitted by exception.	Inspection from access points to identify and if necessary, remove debris and reinstate stone slabs (as necessary). Structural inspection to be also carried out. (Note: Confined space and other H&S procedures required)
Access stairs	No	3 no.	Visual inspection, local repairs or replacement	10 years	Any	Two-man work crew.
Access tracks and ramps	No	Not quantified	Visual inspection, weeding, local repairs or replacement	10 years	Any	Two-man work crew.
Fencing and gates	No	Not quantified	Visual inspection, local repairs or replacement	5 years	Any	Two-man work crew.
Foul and combined manholes	No	Not quantified	Inspection to check the seals in surface, foul and combined manholes which form part of the flood relief scheme. Inspection to check that sealed manholes operate correctly including inspection of locking mechanisms where required.	Annually	Any	Foul water drainage including combined sewers to be maintained by Irish Water.
Surface water drainage including valves	No	Not quantified	Inspection of pipes/drains and removal of any blockages. CCTV survey to be undertaken at long term periods	Annually. Full CCTV (10 year period)	Any	Two-man work crew. CCTV survey equipment. Surface water drainage system to be maintained by Local Authority.
	No	Not	Visual Inspection	5 years	Any	Site walkover. Culvert inspection.
Filter drains		quantified	CCTV survey	10 years	Any	Two-man work crew. CCTV survey equipment
			Granular Fill Replacement	20 years	Any	Excavator. Occasional removal (every 20-25 years) of the gravel infill will be required to remove sediment more efficiently. The gravel can either be cleaned and

Element	Instream?	length/ number / extent	Maintenance Task	Predicted Average Frequency	Season	Routine Maintenance Activities / Defect Resolution
		extent		Frequency		reused, or new material used as a replacement. Cleaning and replacing gravel is the preferred option as it is more sustainable than disposing of the gravel. The geotextile surrounds to the trench and to the pipes may also require replacement at this time. Similarly, the layer of topsoil and grass will need to be replaced following removal and replacement of gravel infill and also to remove sediment build-up in the grass. Small lengths will probably be cleaned using a small excavator to remove and replace the material. There are specialist companies that can clean long lengths of linear filter drain (e.g. alongside roads) using specialist machinery. The machinery can easily deal with single size material of 40mm and Type B filter material (partial infiltration). The machinery lifts the filter material from the trench, segregates and cleans it and then returns it to the trench. Typically, the machines will clean the gravel to depths of 300mm or exceptionally 600mm. Disposal of silt and debris that is removed is achieved via a belt which can discharge to a truck running alongside, or it can be deposited well back on the
						the order of 5-10 tonnes for every 100m of drain cleaned to 300mm depth.

Appendix 3D – Indicative Site Compound Layout



Appendix 3E – Construction Programme

	2021							2022						2023															
		Fisheries Window						Fisheries Window														Fishe	ries W	/indow	1				
	Jun	lut	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	lut	Aug	Sep	Oct
Contractor Start	Х		10							-	I.	- 1			10								L. L.				- 0	1 1-	
Collins/ O'Shea (RB_201 &202)																													
Kilnap/ Woodpark (RB_203)																													
Rose Cottage (RB_204)																													
Northpoint (RB_204)																													
Common's Inn (RB_205)																													
Fitzs Boreen to Retail Park (RB_206 & 207)																													
Blackpool Retail Park (RB_207 & 208)																				-									
Orchard Court (RB_208 & 209)										_																			
Blackpool Church (RB_209 & 211)																													
Spring Lane (RB_210)																													
Maddens Junction to Church (RB_211)																													
Maddens to end (RB_212)																													

Notes:

1. Programme and sequencing are indicative only and are subject to contract appointment, licencing, hydrological constraints, and other seasonal constraints.

2. Detailed construction programme to be developed by Contractor.

Appendix 3F – CEMP



River Bride (Blackpool) Certified Drainage Scheme

Construction and Environmental Management Plan

November 2020



RYAN HANLEY

Client	OPW
Project No.	2317
Project Title	River Bride (Blackpool) Certified Drainage Scheme
Report Title	Construction and Environmental Management Plan

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1 INTRODUCTION

The Construction and Environmental Management Plan (CEMP) has been prepared by Ryan Hanley in association with McCarthy Keville O'Sullivan Ltd. on behalf of the Office of Public Works (OPW) who intend to implement the River Bride (Blackpool) Certified Drainage Scheme.

The CEMP has been prepared in conjunction with the Environmental Impact Assessment Report (EIAR) which has been prepared to provide information to allow the competent authority to conduct the Environmental Impact Assessment (EIA) of the proposed project. The EIA will be undertaken by the Department of Public Expenditure and Reform (DPER), as the competent authority.

This Construction and Environmental Management Plan (CEMP) defines the project specific environmental measures that are to be put in place and procedures to be followed for the scope of construction works, both permanent and temporary, for the proposed River Bride (Blackpool) Certified Drainage Scheme.

This CEMP is produced as part of the Environmental Impact Assessment. The CEMP will be updated after consent is granted to include more site-specific information once the Construction Management Team is appointed.

The CEMP is an integral part of the site health, safety, environmental and quality management system and constitutes a component of the Construction Health and Safety Plan documentation. The CEMP is also subject to the requirements of the project quality management system with respect to documentation control, records control and other relevant measures.

1.1 OBJECTIVES

The objective of this document is to communicate key environmental obligations that apply to all contractors, sub-contractors and employees while carrying out any construction activity for the proposed works.

The objectives of the CEMP are made up of:

- The Mitigation Measures put forward within the EIAR and NIS,
- Conditions imposed by DPER
- The development of a suite of Construction Phase Management Plans which will be prepared by the Contractor.

The CEMP will be updated by OPW in advance of the final Contract being signed. The CEMP will be overseen by personnel such as the Site Manager, Environmental Manager and Environmental Clerk of Works, as outlined in Section 4.

1.2 LIVE DOCUMENT

The CEMP is considered a 'live' document and as such will be reviewed on a regular basis. Updates to the CEMP may be necessary due to any changes in environmental management practices and/or contractors. As explained in more detail in the later sections, the procedures agreed in this CEMP will be audited regularly throughout the construction phase to ensure compliance.

Triggers for amendments to the CEMP will include:

- When there is a perceived need to improve performance in an area of environmental impact;
- As a result of changes in environmental legislation applicable and relevant to the project;

- Where the outcomes from auditing establish a need for change;
- Outcomes of third-party consultations;
- Where Work Method Statements identify changes to a construction methodology to address high environmental risk; and
- As a result of an incident or complaint occurring that necessitates an amendments.

The Contractor will ensure that the CEMP remains up to date for the duration of the construction period.

2 SITE AND PROJECT DETAILS

2.1 SITE LOCATION

The site of the proposed drainage works is located almost completely within the environs of Cork City, with a small part of it located within the townlands of Killeens, Rathpeacon and Kilbarry County Cork. The overall study area, which covers the full catchment area for the River Bride (north) extends into both Cork City and County.

The population density is generally high within the study area due to the location within and adjacent to Cork City, and the main urban centres include Blackpool and Ballyvolane, Cork. The land within the Study Area falls generally towards the river Bride and its tributaries, the Glenamought and Glen Rivers. The Rivers have a relatively flat gradient within the Cork City area, where the proposed works will take place.

The Proposed Scheme encompasses over approximately 2.5 km of the River Bride, stretches of its tributaries including 1 km of the Glenamought and 0.7 km of the Glen River and, works to the lower reaches which extend over 1 km and are mainly culverted.

The proposed development site is accessed via several routes along the length of the works. Various local roads provide most of the direct site access, while the N20 national road runs in a northwest-southeast direction near the site.

2.2 **PROJECT DESCRIPTION**

The Proposed Scheme for the River Bride (Blackpool) Certified Drainage Scheme comprises of a combination of flood walls, culverting a section of open channel, bridge replacement, embankment construction and other minor works. The Scheme will be designed to cater for the 1% Annual Exceedance Probability (AEP) flood event (also known as the 100-year flood event). The design of the proposed works is adaptable for future climate change in accordance with Office of Public Works (OPW) guidance in relation to climate change and also includes an allowance for freeboard.

The proposed works for the River Bride (Blackpool) Certified Drainage Scheme will comprise the following:

- Site investigation;
- Construction of new culverts;
- Replacement of existing bridges/ culverts;
- Construction of new flood walls/ earthen embankments;
- Constructing bridge parapets;
- Local channel widening of the River Bride;
- Construction of a sedimentation trap on the left bank of the River Bride;
- Removal of approximately 70m of existing culvert and restoration of open channel (River Bride) at this location;
- Construction of a new trash screen and roughing screens, and removal of existing trash screens on the River Bride, and the Glen and Glenamought Rivers;
- Modifications to the existing foul and surface water collection networks in the vicinity of the proposed works, including construction of pumping stations, in order to prevent flooding;
- Removal of an existing sluice structure in the channel of the River Bride to the rear of the Dulux factory;

- Localised regrading of ground levels, erection of fencing and access gates, to facilitate pedestrian/ vehicular access to and around flood defences, or to redirect overland surface water flow paths;
- Filling in a part of an existing open watercourse;
- Introduction of a flow control structure on the entrance to the Brewery culvert on the River Bride and the Spring Lane culverted branch of the River Glen;
- Regular maintenance of the river channel and pumping stations;
- Local stonework repairs within an existing masonry arch culvert (Brewery Branch culvert);
- Utility diversions.

2.3 TARGETS AND OBJECTIVES

In so far as they have been completed to date, or are to be further completed in future, the construction phase works are designed to approved standards, which include specified materials, standards, specifications and codes of practice. The design of the project has considered all environmental issues, and this is enhanced by the works proposals.

The key site targets are as follows;

- Ensure construction works and activities are completed in accordance with mitigation and best practice approach presented in the Environmental Impact Assessment Report (EIAR) and associated documentation;
- Ensure construction works and activities are completed in accordance with all documents prepared as part of the assessment of the proposed development;
- Ensure construction works and activities have minimal impact/disturbance to the local landowners and the local community;
- Ensure construction works and activities have minimal impact on the natural environment;
- Adopt a sustainable approach to construction, and,
- Provide adequate environmental training and awareness for all project personnel.

The key site objectives are as follows;

- Using recycled materials if possible, e.g. excavated stone and overburden material;
- Ensure sustainable sources for materials supply where possible;
- Avoidance of any pollution incident or near miss as a result of working around or close to existing watercourses and having emergency measures in place;
- Avoidance of vandalism;
- Keeping all watercourses free from obstruction and debris;
- Keep impact of construction to a minimum on the local environments, watercourses, and wildlife;
- Correct fuel storage and refuelling procedures to be followed;
- Good waste management and house-keeping to be implemented;
- Air and noise pollution prevention to be implemented;
- Monitoring of the works and any adverse effects that it may have on the environment. Construction Methods and designs will be altered where it is found there is an adverse effect on the environment;
- Comply with all relevant water quality legislation listed throughout this document; and,
- Ensure a properly designed, constructed and maintained drainage system appropriate to the requirements of the site is kept in place at all times.

2.4 CONSTRUCTION METHODOLOGIES OVERVIEW

Experienced contractor(s) will be appointed for the civil works for the construction phase(s) of the Proposed Scheme. The appointed contractor for the works will be required to further develop and comply with this CEMP and any revisions made to this document in the preparation of method statements for the various elements of the construction phase. An overview of the anticipated Construction Methodologies is provided below.

2.4.1 TEMPORARY CONSTRUCTION FACILITIES

Provision has been made within the temporary working area for location of temporary site compounds. The site compounds will be bound by the mitigation measures identified within this CEMP. Three preliminary site compound layouts are shown in Appendix 3D, the locations of which are outside of the floodplain.

The site compounds will be surfaced with a hard standing to prevent generation of mud. A silt fence will be erected on all sides of the compounds to prevent any run off from the perimeter of the compounds. The compounds will be adequately buffered to prevent any surface water run off or will incorporate a surface water collection and treatment system if required. The compound areas will be monitored and observed daily to ensure that they are not impacting on any local watercourses.

The compounds will comprise the following elements:

- temporary site offices, portaloo toilets, facilities for staff and car-parking areas.
- storage areas for construction materials.
- bunded containment areas for plant refuelling, maintenance, washing and for the storage of fuels and site generators. The bunded area shall have sufficient volume to contain any spills and all mitigation measures for these activities are outlined below in their various sections.
- a dedicated waste storage area for any construction waste generated. Skips or bays will be provided for recyclable material.
- wheel wash area for construction and delivery vehicles and a designated wash out tank for wash out of concrete trucks following concrete pours.

2.4.2 NEW CULVERTS

Construction of new culverts will form the most significant aspect of the new scheme. Approximately 480m of new culvert will be constructed in Blackpool, some of which will be constructed along the route of the River Bride. Construction of the new culvert will take place as follows:

- The works area will be isolated and traffic management set up as required. Temporary road closures will be required for the culvert replacement in the vicinity of Blackpool Church and Madden's Buildings. Alternative access routes may be required for Orchard Court during construction works if it does not prove possible to maintain one lane of the existing bridge open at all times/ maintain access in the vicinity of the existing bridge.
- Temporary works will be put in place, including silt barrages, and/or flow diversions/ over pumping where in stream works are required at Blackpool Church and between the Old Commons Road and the N20 culvert (upstream of Orchard Court). Service diversions will also be required in advance of culvert construction, particularly at Blackpool Church and Madden's Buildings.

- The foundations will be excavated down to formation level. Utilities and drainage pipes will be diverted as required. Excavated material will be transported off site to a licenced facility or stored for reuse on site. Blinding will be poured.
- Reinforced concrete culverts will be placed in position. Utilities and drainage pipes will be diverted into permanent positions as required.
- The excavation will be backfilled, the area reinstated, and the works area reopened. In the case of culverts constructed under the public road, permanent reinstatement may be required approximately six months following reopening of the road.
- An otter ledge will be integrated into the existing and proposed culvert network. Light wells will be provided within the culvert periodically to provide natural light for otters and aquatic organisms using the structure.

2.4.3 BRIDGE REPLACEMENT

The replacement of existing bridges is likely to comprise the following proposed works:

- The works area will be isolated and traffic management set up as required. Temporary road closures may be required if it does not prove possible to maintain one lane of the existing bridge open at all times/ maintain access in the vicinity of the existing bridge, or if an alternative convenient access route is available.
- Temporary works will be put in place, including silt barrages, and/or flow diversions/ over pumping. Service diversions may also be required in advance of bridge construction.
- The existing bridge/ culvert structure will be dismantled/ demolished and removed off site.
- The foundations will be excavated down to formation level. Excavated material will be transported off site to a licenced facility or stored for reuse on site. Blinding will be poured.
- The new bridge/culvert will be constructed using either precast units or reinforced concrete placed in situ. Utilities and drainage pipes will be diverted into permanent positions as required during/ following construction. Construction of an in-situ reinforced concrete bridge would involve
 - Fixing of reinforcement for abutments and piers,
 - Placing of formwork for abutments and piers,
 - Placing of cast in-situ concrete for abutments and piers,
 - Stripping of formwork,
 - The placing and fixing of a precast concrete and insitu bridge decks, and
 - Construction of bridge parapets.
- The excavation will be backfilled, the area reinstated, and the works area reopened. Permanent reinstatement of road surfaces may be required approximately six months following reopening of the road.

2.4.4 BRIDGE PARAPETS

New/ upgraded bridge parapets will be constructed as follows:

- Isolation of works area, including traffic management.
- One lane of the bridge will be closed at a time where possible. Where sufficient space is not available to accommodate a working area and live traffic, a road closure will be acquired and alternative access put in place.

• The existing bridge parapet/ railings will be removed where these exist.

- The underlying concrete will be scabbled and starter bars dowelled into the concrete.
- Formwork will be set up from the bridge deck for the construction of the reinforced concrete bridge parapet.
- Scaffolding will be set up as required and won't have any in-stream elements. The parapet will be poured following steel fixing. Once the concrete has cured, the formwork will be stripped and the scaffolding removed.
- The lane will be opened, the second lane closed and the plant and equipment will be relocated to the location of the second parapet.

2.4.5 FLOOD DEFENCE WALLS

The construction of the reinforced concrete flood defence walls is likely to be carried out by traditional methods comprising the following activities:

- isolation of works area, including traffic management where the work area will overlap with a public road/ pedestrianised area,
- temporary works including silt barrages where in stream works are required,
- excavation for foundations,
- blinding of formation,
- fixing of reinforcement,
- placing of formwork,
- placing of concrete,
- stripping of formwork, and
- reinstatement of works area.

In certain locations, where there is a possibility of flood water passing underneath the flood defence wall foundations, either sheet piles or grouting techniques will be required to provide a cut-off. The sheet piles may be metal or plastic and will be driven to the required depth using a piling hammer or similar.

2.4.6 EARTHEN EMBANKMENTS

The construction of the earthen flood defence embankments is likely to comprise the following activities:

- Temporary works,
- Excavation for formation,
- Placing and compaction of suitable clay material, and
- Reinstatement of area, including grass seeding.

2.4.7 DRAINAGE WORKS

The drains/ surface water sewers will be constructed by one of two methods as follows:

• Where the trench does not overlap with the footprint of the excavation for the flood wall, the trench of the drainage pipe will be set out. Where the trench is located in a road, the road will be saw cut. Where the trench is located in a grassed area, the topsoil will be removed and stored in close proximity to the trench. The trench will then be excavated to the required depth. Excavated material unsuitable for use as backfill material will be disposed of to an approved waste management facility. Pipe bedding will be placed, followed by the pipe and granular pipe surround. Trenches in roads will be backfilled with granular material or lean mix
concrete, depending on its location in accordance with DDTS (2017) Guidelines for Opening, Backfilling and Reinstatment of Openings in Public Roads and Cork City Council (2010) Directions for Management and Control of Roadworks in Cork City. Trenches in grassed areas will be backfilled with suitable excavated material, following which the original topsoil will be replaced. The trench will be left to consolidate for approximately six months, following which the surface layer will be removed is necessary, the backfill material will be supplemented and the trench reinstated.

• Where the trench overlaps with the footprint of the excavation for the flood wall, the steps outlined above will be taken. The order of excavation, pipelaying, backfilling and reinstatement will depend on the sequence of construction of the retaining wall and the proximity of the proposed retaining wall to the pipe trench. The pipe may be laid and partially backfilling prior to pouring of concrete for the wall. Pipelaying may alternatively take place following pouring of the base of the wall or following construction of the wall.

2.4.8 PUMPING STATIONS

The footprint of the pumping station will be set out. Where the proposed excavation is located in a paved area, the pavement will be saw cut. Where the proposed excavation is located in a grassed area, the topsoil will be removed and stored in close proximity to the excavation. The excavation will take place to the required depth. Sheet piling will likely be required in order to facilitate construction of deep excavations in an urban area. Excavated material unsuitable for use as backfill material will be disposed of to an approved waste management facility. Lean mix concrete blinding will be placed, followed by formwork and steel fixing. Once concrete has been poured and has cured, the formwork will be stripped and the area outside the pumping station will be backfilled. Excavations in grassed areas will be backfilled with suitable excavated material, following which the original topsoil will be replaced. Excavations in paved areas will be backfilled with granular material and reinstated to their original condition. Mechanical and electrical fit out of pumping stations will take place following backfilling.

2.4.9 OTHER INSTREAM WORKS

Other proposed works which will be carried out partially or wholly instream include:

- Local channel widening of the River Bride (referred to as a 'Winter Channel' on the scheme drawings in Appendix 3A);
- Construction of a sedimentation trap on the left bank of the River Bride;
- Construction of roughing screens and a new trash screen;
- Removal of existing trash screens on the River Bride (North) and Glen River;
- Removal of an existing sluice structure in the channel of the River Bride to the rear of the Dulux factory; and
- Fisheries enhancement measures will be provided at interference number C06 C02, downstream of McDonalds to the area adjacent to Blackpool Shopping Centre and will include 4 channel meanders with a low flow wetted area and stone deflectors and the provision of riparian zones including window boxes.

In general, these works will involve:

- Isolation of works area, and temporary works including silt barrages, flow diversions or overpumping;
- Dismantling/ demolition and removal of the existing structure (in the case of sluice structure at Dulux and the screens on the River Glen and Bride North) and removal off site;

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- Excavations;
- Blinding of formation (as required);
- Construction of sedimentation trap/ screen; following which
- The excavation will be backfilled, the area reinstated, flow redirected, and the works area reopened.

2.4.10 MAINTENANCE REGIME

When the scheme is completed, there will be a statutory duty under the provisions of the Arterial Drainage Acts to maintain the scheme works in proper repair and effective condition. As such a rigorous and organised channel maintenance programme will be required throughout the reach of the channel impacted by the proposed works. The channel maintenance programme will include the following stretches of river/ stream channel:

- The Glenamought River from the new roughing screen upstream of the Viaduct to its confluence with the River Bride (517m),
- The River Bride from the new roughing screen upstream of Rose Cottage to Blackpool Church (2,623m),
- The River Bride (Kiln culvert branch) from Blackpool Church to the confluence of the Kiln Branch and the Kiln Brewery Branch (946m, running under Watercourse Road and the N20 Blackpool Bypass),
- The River Bride (Kiln Brewery culvert branch) between its bifurcation with the Kiln culvert branch at its upstream end to its confluence with the Kiln culvert branch at its downstream end (740m, running under Watercourse Road and the Heineken Brewery),
- The Glen River (Spring Lane culvert branch) from its confluence with the new culvert on the River Bride to the proposed sluice structure at the head of this channel section (333m),
- The Glen River (mainly open channel) from the proposed sluice structure referred to above to the existing culvert under the North Ring Road (230m),
- The Glen River (Back Watercourse culvert branch) from the proposed sluice structure referred to above to its confluence with the (Kiln Watercourse culvert branch) outside Madden's Buildings (542m, running mainly under the N20 Blackpool Bypass),
- The Rathpeacon Stream from its confluence with the River Bride for a distance of 193m upstream, and
- The Fairhill Stream from its confluence with the River Bride for a distance of 108m upstream,

The channel maintenance programme will pay particular attention to locations where silt, gravel and debris are likely to accumulate, such as at structures, sharp bends, culvert inlets, etc.

The new trash screen and roughing screens will require regular maintenance, as will the proposed surface water pumping stations. The surface water pumping stations will require regular maintenance and it will be necessary to jet the surface water sewers to maintain hydraulic capacity to drain flood waters.

Other measures will include regular inspections of flood walls and embankments, regular scheduled maintenance of the river channel and pruning of trees (including removal of tress where necessary), planning and control measures. The inspection regime will ensure than there is no deterioration in the structural integrity of the defences which may occur as a result of a collision for example nor the hydraulic (conveyance) adequacy of the channels or flood plain between the channel or defences. It is expected that the flood defences will be relatively maintenance free otherwise. The extents of channels/culverts to be maintained will be shown on the drawings contained in Appendix 3A. In general, maintenance activities will consist of the following:

- The channels and structures will be monitored by means of a walkover survey from the banks on a regular basis (likely annually, and also following a flood event). The walkover surveys would aim to identify issues with implications for flood risk (e.g. fallen trees, excessive vegetation buildup, overgrown trees, illegal dumping, accumulation of granular deposits, etc.). In-channel debris will typically be removed by JCB. Excessive overhanging vegetation will typically be pruned back or removed by hand using a cherrypicker, depending on access.
- Culverts will be inspected by means of man-entry on an annual basis, or following a significant flood event. Any debris present in the culvert will be cleared by hand. A full CCTV survey and clearing of silt/sediment from the culvert is expected to take place approximately every five years. Removal of debris will be carried out as required.
- The optimum frequency of cleaning of the sediment trap and trash screen will evolve over time based on experience. However, initially it is proposed to carry out cleaning generally on a quarterly basis, and also following a significant flood event. Water level monitoring and alarms will also be installed at the trash screen to alert maintenance staff of a screen blockage.
- Excessive growth or shrubbery or trees on the banks of the channels, in channels, and in the flood plain, will be removed so that the hydraulic adequacy of the channels will not be compromised.
- Pumping stations will be maintained in accordance with the instructions of manufacturers of the installed equipment.
- Walls and embankments will be subject to routine level surveys to monitor for settlement which might impact on defence levels of these structures. If settlement occurs and there is a need to restore the height of the defences, this will be done.
- Non return valves and other such operational items will be subject to routine inspection and if the needs arise, they will be replaced or repaired.
- Any drainage infrastructure installed as part of the scheme will be maintained as necessary by the owner of the infrastructure (local Authority or Irish Water) with suitably frequent inspections of the infrastructure using CCTV and visual inspection. Any issues observed that need attention will be addressed by the responsible body.
- In general, any issues that arises that threatens the structural integrity of any defence structure or element, or that threatens the effectiveness, including hydraulic adequacy, of any element of the scheme will be addressed as necessary to maintain the scheme in proper repair and effective condition.

3 ENVIRONMENTAL MANAGEMENT

3.1 INTRODUCTION

The following sections give an overview of the construction management, waste management and invasive species control plans for the proposed works.

3.2 CONSTRUCTION MANAGEMENT PLANS

A suite of Construction Management Plans will be prepared in association with the appointed contractors. These Management Plans will reflect the requirements of the Consent applications, this document and any conditions by the Consenting Authority in advance of the final contract signing. The Construction Management Plans will comply with all requirements identified and include the following topics:

3.2.1 DUST CONTROL

The Dust Minimisation Plan is based on the industry guidelines in the Building Research Establishment document "Control of Dust from Construction and Demolition Activities".

Construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including dry weather conditions, levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the air and wind conditions can carry or disperse generated dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within two hundred metres of the construction area. Businesses and private dwellings lie <200m along the proposed works location and may be affected by dust produced. Therefore, in order to ensure mitigation of the effects of dust nuisance, a series of measures will be implemented:

Site roads/ access paths shall be regularly cleaned and maintained as appropriate.

Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly dampened by water sprinklers, as appropriate, during dry and/or windy conditions.

Vehicles using site roads shall have their speeds restricted where there is a potential for dust generation. Vehicles delivering material with dust potential shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust.

Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site shall be regularly inspected for cleanliness and cleaned as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.

At all times, dust levels and extent as well as control the procedures put in place will be strictly monitored and assessed and reviewed as necessary. In the event of dust nuisance occurring outside the site boundary, satisfactory procedures will be implemented to rectify the problem, in consideration of all stakeholders including pedestrians and cyclists. 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.

3.2.2 NOISE CONTROL

Management of noise emissions will be in compliance with British Standard BS5228:2009 - Noise and vibration control on construction and open sites Part 1 - Noise.

There are no national limits for permissible noise levels on construction sites, however TII (NRA) Guidance documents (Guidelines for the Treatment of Noise and Vibration in National Roads Schemes) specifies noise levels that it typically deems acceptable in terms of construction noise as identified in **Table 1**.

Days and Times	LAeq (1hr)dB	LAmax dB(A)
Monday to Friday	70	80
07:00 to 1900hrs	, 0	
Monday to Friday	60*	65*
19:00 to 22:00hrs	80	85
Saturday	65	75
08:00 to 16:30hrs	05	/3
Sundays and Bank Holidays	60*	65*
08:00 to 16:30hrs	80	65

Table 1 Maximum permissible noise levels at the façade of nearby dwellings during construction

*Construction activity at these times, other than required for emergency works, will normally require the explicit permission of the OPW and Cork City Council

The contract documents will clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendation of BS 5228: Part 1 and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001. These measures will ensure that:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise;
- All vehicles and mechanical plant will be 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; and
- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 8.1 using methods outlined in BS 5228 "Noise and Vibration Control on Construction and open sites".

The operation of plant and machinery, including construction vehicles, is a source of potential impact that will require mitigation at all locations within the site. Proposed measures to control noise include:

- Diesel generators will be enclosed in sound proofed containers to minimise the potential for noise impacts;
- Plant and machinery with low inherent potential for generation of noise and/or vibration will be selected. All construction plant and equipment to be used on-site will be modern equipment and will comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations;

- Compressors will be attenuated 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;
- Machinery which are used intermittently, will be shut down or throttled back during those periods when they are not in use.

3.2.3 TRAFFIC MANAGEMENT

The construction phase of the River Bride (Blackpool) Certified Drainage Scheme will have a temporary impact on traffic volumes in Blackpool and its environs. The Contractor will provide an Indicative Traffic Management Plan (TMP) that will include the provision for routing, vehicle checking and cleaning and covering loads. The TMP will be subject to further development and the contractors TMP will be subject to approval and agreement by Cork City Council.

Appropriate parking facilities for site operatives and visitors will be maintained within the site and all parking areas will be clearly signed and monitored. The following headings will be detailed under the Traffic Management Plan:

- Site access and egress;
- Traffic management signage (as necessary);
- Routing of construction traffic/road closures;
- Timing of material delivered to site;
- Traffic management speed limits;
- Road cleaning;
- Road conditions;
- Implementation of traffic management plan;
- Details of working hours and days;
- Details of emergency plan; and
- Training at site induction.

3.2.4 LANDSCAPING

A landscaping management plan will be developed in discussion with Cork City Council and shall be inkeeping with the relevant Development Plans.

Any loss of trees or tree cover will be mitigated in so far as is possible through replacement planting within the scheme boundary, as close as possible to the area where trees may have to be removed to accommodate the proposed works

3.2.5 BIODIVERSITY

The contractor will have regard for local biodiversity, flora and fauna in the area.

The following measures will be implemented on site for the protection of flora and fauna:

Vegetation (e.g. hedgerows, woodland, tree, scrub and grassland) will not be removed between
1st March and 31st August inclusive, to avoid impacts on nesting birds, except as noted below.
Although the Wildlife Acts provide an exemption from this seasonal restriction for road
construction, there is no exemption provided for intentional nest destruction. Where the
construction programme does not allow this seasonal restriction to be observed, vegetated areas
will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to

in association with

clearance. Where nests are found, the appointed ecologist will recommend whether a licence is required for vegetation removal from the NPWS. Areas where there are no nests present must be cleared within three days of the survey, or further surveys will be required to be undertaken;

• The surrounding immediate construction area will be fenced off, or otherwise demarcated, to prevent inadvertent intrusion from construction plant.

3.2.6 WATER QUALITY, SOIL AND GROUNDWATER

A Pollution Control Management Plan will be put in place. The Plan will include the requirement for the best practice and adherence to Irish guidelines or international guidelines where relevant.

Material storage and handling measures will be implemented to contain potential sources of soil/groundwater pollution. Contractors will ensure that spill kits will be accessible to construction personnel at all times and all spills will be reported to the site environmental manager.

All contractors shall be responsible for ensuring the following measures are implemented:

- All liquids, solids and powder containers will be clearly labelled and stored in sealable containers;
- All liquid and hazardous materials will be stored in a designated and temporarily bunded area with appropriate signage. This area should be within the construction compound or at an alternative location agreed with the Site Environmental Manager/ Environmental Clerk of Works (ECoW);
- Bunding must have a minimum capacity of 110% of the volume of the largest tank or 25% of the total storage capacity, whichever is the greater. Bunding shall be impermeable to the substance that is being stored in the tank;
- Where a contractor is responsible for materials stored in a bunded area, that contractor shall implement measures for the regular inspection of bunds and emptying of rainwater (when uncontaminated);
- Material storage areas will be at a safe distance from live construction activities;
- Spill kits will be provided in areas where liquids are stored and refuelling areas;
- Chemicals/fuels/materials brought on-site must be accompanied by a Safety Data Sheet (SDS). A copy of the SDS should be provided to the Site Manager;
- Materials will be stored in accordance with any specific requirements of the SDS;
- A complete register of all SDSs in use on-site will be maintained and retain copies of all SDS onsite;
- Careful ordering of materials to minimise quantities present on-site;
- Excess materials will not be stored on-site for extended periods;
- Contractors will be responsible for ensuring the regular maintenance of construction plant and equipment, to prevent leaks.
- Where soil/made ground and subsoil stripping occurs, the resulting excavated soil fracture will be segregated into inert, non-hazardous and / or hazardous fractions (in accordance with Council Decision 2003/33/EC, of the EPA water classification criteria at certain licensed landfills in Ireland)
- The excavation and handling of inert material will be carefully managed in such a way as to prevent any potential negative impact on the receiving water environment.

3.2.7 REFUELLING, FUEL AND HAZARDOUS MATERIALS STORAGE

The following mitigation measures are proposed to avoid release of hydrocarbons at the site:

- Where contractors are required to refuel vehicles on-site, this will be carried out at designated refuelling locations.
- All refuelling will be on areas of hard standing at designated areas which are not within 30 metres of any watercourses and will be identified prior to commencement of the project.
- All machinery and plant used will be regularly maintained and serviced and will comply with appropriate standards to ensure that leakage of diesel, oil and lubricants is minimised.
- Fuels, oils, greases and hydraulic fluids will be fully bunded, works compounds used for the storage of materials and machinery will be located in a designated area.
- Refuelling of machinery will be carried out off site or in a contained bunded area on site.

3.2.8 CEMENT BASED PRODUCTS CONTROL MEASURES

The following mitigation measures are proposed to avoid release of cement at the site:

- Concrete pouring will be planned for dry days were possible by following weather forecasts;
- There will be no batching of wet-cement products on site. A ready-mixed supply of wet concrete will be imported to the site. Whenever possible, pre-cast concrete sections for culverts and walls will be used;
- Where concrete is delivered to the site, only chute cleaning will be permitted, using the smallest volume of water possible, and will be directed into a designated concrete washout area, which will be lined with an impermeable membrane.

3.3 WASTE MANAGEMENT

This section of the CEMP details a Waste Management Plan (WMP), which outlines the best practice procedures during the excavation and construction stages of the proposed scheme. Section 3.3.1 below, identifies the key legislation relevant to waste management requirements. All waste disposal will be recorded by the contractor through a Waste Disposal Register. Waste management and disposal will be considered as part of the construction process and in the operation of the development when completed.

3.3.1 LEGISLATION

The primary legislative requirement applicable to the project and that governs waste management in Ireland is the The Waste Management Act 1996 and its subsequent amendments. The Waste Management Act 1996 provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

3.3.2 WASTE MANAGEMENT HIERARCHY

Waste management actions that can be undertaken on site should follow the principles of the waste hierarchy (**Figure 1**). The primary aim of the WMP is to prevent and minimise to amount of waste generated. Reuse and recycling of waste generated on site, reduces the quantities of waste required for disposal which is considered as last resort.

Waste will be segregated and disposed of appropriately. Working methods will be reviewed to ensure waste minimisation and sustainability during construction.



Figure 1: Schematic of the Waste Hierarchy Model

3.3.3 CONSTRUCTION PHASE WASTE MANAGEMENT

3.3.3.1 DESCRIPTION OF THE WORKS

The construction stage of the Scheme will involve the construction of flood walls, culverting a section of open channel, bridge replacement, embankment construction and other minor works.

The precast culverts will be manufactured off site and delivered and installed on site as required.

Site roads and paved areas will be constructed with stone from local quarries.

The main non-hazardous waste types arising from the construction phase of the scheme are outlined in Table 2 below.

Waste Material	European Waste Code (EWC)
Sand, stones, plaster, rock, blocks	17 01 07
Copper, aluminium, lead, iron and steel	17 04 07
Cables (electrical wiring)	17 04 11
Plastic (PVC frames, electrical fittings)	17 02 03
Wooden packaging (boxes, pallets)	15 01 03
Cardboard packaging	15 01 01
Composite packaging	15 01 05

Table 2 Expected waste material arising during the Construction Stage

Hazardous material for example, oil, diesel fuel, chemicals, that may occur during the construction stage of the Scheme will be stored in bunded containers before being collected by an authorised waste contractor and brought to a facility holding the appropriate registration, permit or license.

3.3.3.2 WASTE ARISING FROM CONSTRUCTION ACTIVITIES AND PROPOSALS FOR MINIMISATION, REUSE AND RECYCLING OF CONSTRUCTION WASTE

Waste arising from the construction phase will be primarily from excavation required for channel widening of the River Bride, removal of existing culvert structures, replacement of existing bridges, in addition to unavoidable construction waste including material surpluses and packaging waste.

Topsoil and subsoil will require excavation to facilitate site preparation for flood defence foundations, culverts and pumping station foundations, regrading of localised ground levels and trenches for

underground utility services. Excavated material will be reused where possible, however it is anticipated that approximately 10,000m³ will have to be exported from the site.

During the construction phase there may be a surplus of building materials, for example off-cuts of timber, plastic ducts, concrete blocks, bricks and metal waste. There also maybe excess concrete during construction which will need to be disposed of. Plastic and carboard packaging waste will be generated.

There will be a dedicated Waste Storage Area (WSA) located near the construction compound for any construction waste generated. The WSA will provide skips/ bays for each recyclable material. This waste material will be transferred to a Materials Recovery Facility (MRF) by a fully licensed waste contractor where the waste will be processed for recycling, recovery or disposal. There are numerous waste contractors in the region that provide this service.

Construction workers on site will generate waste e.g. organic/ food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, aluminium cans and tins), mixed non-recyclables and potentially sewage sludge from temporary onsite welfare facilities. Waste electrical and electronic equipment (WEEE), waste batteries and waste printer/ toner cartridges may also be generated from site offices.

Examples of appropriate measures that should be taken to ensure construction waste generated is minimised, are as follows;

- Ordering of materials should be on an 'as needed' basis to prevent over supply to site. Coordination is required with suppliers enabling them to take/buy back surplus stock.
- Purchase of materials pre-cut to length to avoid excess scrap waste generated on site.
- Request that suppliers use least amount of packaging possible on materials delivered to the site.
- Ensuring correct storage and handling of goods to avoid unnecessary damage that would result in their disposal
- Ensuring correct sequencing of operations.
- Use reclaimed materials in the construction works.

The contractor will address the role of monitoring and inspections to ensure that waste produced on site is dealt with in a safe, efficient and legal manner. Waste streams will be monitored and KPI's maintained for all waste taken on site, recording quantity (tonnage) of individual waste streams. Records will be maintained.

3.3.4 WASTE ARISING FROM DECOMMISSIONING

Any materials which cannot be re-used or recycled will be disposed of by an appropriately licenced contractor.

The waste types arising from the decommissioning of the development are outlined in Table 3 below.

Waste Material	European Waste Code (EWC)
Sand, stones, plaster, rock, blocks	17 01 07
Copper, aluminium, lead, iron and steel	17 04 07
Cables (electrical wiring)	17 04 11

Table 3 Expected waste types arising during the decommissioning phase

3.3.4.1 REUSE

Many construction materials can be reused a number of times before they have to be disposed of:

Concrete from the replacement of existing culverts can be reused as aggregate backfilling material at locations of new flood walls/ earthen embankments. Plastic packaging etc. can be used to cover

materials on site or reused for the delivery of other materials. Excavated soil can be reused for reinstatement of the areas around culvert, flood walls/ embankments and localised areas of regrading.

3.3.4.2 RECYCLING

As outlined in Section 3.3.2 Waste Management Hierarchy, if a certain type of construction material cannot be reused onsite, then recycling is the most suitable option.

All waste that is produced during the construction phase including dry recyclables will be deposited in the on-site dedicated waste skips initially and sent for subsequent recycling at an offsite facility.

3.3.5 IMPLEMENTATION

3.3.5.1 ROLES AND RESPONSIBILITIES

A Construction Waste Manager will be appointed by the Contractor prior to the start of the proposed project. This Construction Waste Manager will have the responsibility of implementing the Waste Management plan and ensuring that all waste contractors have the necessary authorisations and that the waste management hierarchy is followed.

3.3.5.2 TRAINING

The Construction Waste Manager will communicate effectively with all employees on site in relation to the aims and objectives of the WMP. Basic awareness of the plan will be made known during general site induction. All employees working on site will be trained in materials management and should be able to:

- Distinguish reusable materials from those suitable for recycling;
- Ensure maximum segregation at source;
- Co-operate with site manager on the best locations for stockpiling reusable materials;
- Separate materials for recovery; and
- Identify and liaise with waste contractors and waste facility operators.

3.3.6 RECORD KEEPING

The WMP will provide a recording system to be put in place to record construction waste generated on site. The system will enable the contractor to maintain records for all waste material which leaves the site, either for reuse on another site, recycling or disposal.

The licensed waste contractor employed to remove waste from the site will be required to provide documented records for each movement of waste off-site. Each record will contain the following:

- Consignment Reference Number
- Material Type(s) and EWC Code(s)
- Company Name and Address of Site of Origin
- Trade Name and Collection Permit Ref. of Waste Carrier
- Trade Name and Licence Ref. of Destination Facility
- Date and Time of Waste Dispatch
- Registration no. of Waste Carrier vehicle
- Weight of Material
- Signature of Confirmation of Dispatch detail
- Date and Time of Waste Arrival at Destination
- Site Address of Destination Facility

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3.3.7 WASTE MANAGEMENT PLAN CONCLUSION

The WMP detailed above has been prepared to outline the main objectives that are to be adhered to for the preparation of a more detailed WMP to be completed after the consent phase of the proposed development. The appointed contractor will be required to produce the more detailed WMP prior to commencement of works.

3.4 INVASIVE SPECIES MANAGEMENT

Following an invasive species survey, an invasive species management plan was developed and sets out best practice control methods as summarised in the following sections. As species may have spread, or their distribution may have changed, between the survey completed in May 2020 and the commencement of the main construction works, the implementation of this Invasive Species Management Plan will require a pre-construction re-survey by a suitably qualified person within the proposed scheme boundary and any additional areas where construction works are required.

3.4.1 SITE MANAGEMENT

Careful preparation of the site and planning of the works is crucial to successful treatment of invasive species. The following list of guidelines, which is not exhaustive, shall be followed by all on-site personnel. Should any risk of contaminated material escaping be observed by the site manager, the management plan for the site must be amended by an appropriately qualified person to mitigate against the risk.

3.4.2 ESTABLISHING GOOD SITE HYGIENE

The following measures are proposed to establish good site hygiene to ensure the control of any potential spread of invasive species during construction works:

- In relation to Knotweed plant species, understand the possible extent of the rhizome (root) system underground up to 7m horizontally and 3 meters vertically.
- Fence off the infested areas prior to and during construction works where possible in order to avoid spreading seeds or plant fragments around or off the construction site. In relation to Knotweed plant species, allow for a 10m buffer around the area.
- Clearly identify and mark out infested areas. Erect signs to inform Contractors of the risk.
- Avoid, if possible, using machinery with tracks in infested areas.
- Clearly identify and mark out areas where contaminated soil is to be stockpiled on site and cannot be within 50m of any watercourse or within a flood zone.
- Create designated entry and exit points for operators on foot and for small mobile equipment.
- A delineated access track to be maintained free of non-native invasive species to be established through the site to avoid the spread of Japanese Knotweed by permitted vehicles accessing the site.
- Installation of a dedicated footwear and vehicular wheel wash down facility into a contained area within each works site.
- Vehicles leaving the site to be inspected for any plant material and washed down into a contained area.
- Vehicles used in the transport of contaminated material will need to 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.
- Transportation of contaminated material will need to be in covered trailers and haul routes should be prepared in advance using root barrier membrane and hardcore as required.
- Material gathered in dedicated wash down contained areas will need to be appropriately treated along with other contaminated soil on site. Refer to sections below in relation to treatment methods.
- If soil is imported to the site for landscaping, infilling or embankments, the Contractor shall gain documentation from suppliers that it is free from invasive species.

• Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan.

4 ENVIRONMENTAL MANAGEMENT IMPLEMENTATION

4.1 ROLES AND RESPONSIBILITIES

A Contractor will be appointed to undertake the works. The Contract will allocate responsibility for compliance with the terms of the CEMP during construction.

All staff and subcontractors have the responsibility to:

- Work to agreed methods and procedures to eliminate and minimise environmental impacts and note areas of sensitive receptors;
- Understand the importance of avoiding pollution on-site, including water, noise and dust and report all incidents to avoid or limit environmental impact; and
- Co-operate with site inspections and audits as required.

The Environmental Manager and/or Environmental Clerk of Works (ECoW) will be the project focal point relating to construction-related environmental issues.

In general, the ECoW will maintain responsibility for monitoring the Works and the Contractors/Subcontractors from an environmental perspective. The ECoW will act as the regulatory interface on environmental matters by reporting to and liaising with Cork County Council and other statutory bodies as required. The ECoW will report directly to the Environmental Manager.

4.1.1 ENVIRONMENTAL MANAGER

A suitably qualified person will be appointed to fulfil the environmental management role and will coordinate monitoring and reporting of the CEMP implementation, through liaisons with relevant site staff, management and others as appropriate. This role may be undertaken by the Site Manager and shall include:

- Review and comment on the CEMP;
- Participate in review meetings;
- Contribute to communication on environmental matters between the project team and any relevant statutory consultees;
- Set the focus of environmental policy, objectives and targets for site staff;
- Carry out site environmental inspections and audits as necessary generate reports of findings;
- Coordinate the environmental monitoring programme as required;
- Advise site management/contractor/sub-contractor on prevention of environmental pollution and improvement to existing working methods;
- Monitor implementation of corrective action and communicate issues to the Project Manager as necessary;
- Monitor management of environmental complaints;
- Ensure proper mitigation measures are initiated and adhered to during the construction phase;
- Ensure all relevant legal consents, licences and exemptions are in place and adhered to;
- Ensure implementation and monitoring of waste minimisation, segregation and safe disposal measures;
- Dissemination of waste reduction procedures to all relevant personnel on site;
- Ensure that details of environmental incidents are communicated in a timely manner to the relevant regulatory authorities;

4.1.2 SITE ENVIRONMENTAL CLERK OF WORKS

The main contractor will be required to engage a qualified Environmental Engineer, Environmental Scientist, or equivalent, to fulfil the role of Environmental Clerk of Works (ECoW), and to monitor all site works and to ensure that methodologies and mitigation are followed throughout construction to avoid negatively impacting on the receiving environment.

The ECoW will report to the Site Manager. The responsibilities and duties of the ECoW will include the following:

- Preparation and update of the CEMP as required, and supporting environmental documentation and review/approval of contractor method statements;
- Undertake inspections and reviews to ensure the works are carried out in compliance with the CEMP;
- Monitor the implementation of the CEMP, particularly all proposed/required Environmental Monitoring;
- Generate environmental reports as required to show environmental data trends and incidents and ensure environmental records are maintained throughout the construction period;
- Advise site management/contractor/sub-contractors on:
 - Prevention of environmental pollution and improvement to existing working methods;
 - Changes in legislation and legal requirements affecting the environment;
 - Suitability and use of plant, equipment and materials to prevent pollution;
 - \circ Environmentally sound methods of working and systems to identify environmental hazards
- Ensure the specified mitigation measures are initiated and adhered to during the construction phase;
- Liaise with Project Team and present the findings of site audits/inspections that are completed; Ensure adequate arrangements are in place for site personnel to identify potential environmental incidents;
- Ensure that details of environmental incidents are communicated in a timely manner to the relevant regulatory authorities, initially by phone and followed up as soon as it practicable by e-mail;
- Support the investigation of incidents of significant, potential or actual environmental damage, and ensure corrective actions are carried out, recommend means to prevent recurrence and communicate incident findings to relevant parties; and
- Identify environmental training requirements and arrange relevant training for all levels of site based staff/workers.

The level, detail and frequency of reporting expected from the ECoW for the Construction Manager, Project Manager, and any Authorities or other Agencies, will be specified in the works requirements prior to commencement of construction, and may be further adjusted as required during the course of the project.

4.2 ENVIRONMENTAL AWARENESS AND TRAINING

Environmental training and awareness are considered a crucial element in the appreciation and implementation of the CEMP. The CEMP will be distributed to members of the project team, including subcontractors as necessary to ensure that environmental and health and safety requirements are adequately communicated.

The Site Manager will be responsible for ensuring that all people on-site are provided with relevant information concerning environmental obligations. All staff and operatives will receive a site-specific safety and environmental induction prior to commencing any work on-site. Toolbox talks will be provided

to all staff for (but not limited to) working with concrete and biosecurity requirements on site. Training records for staff will be held on a central database. Training and awareness will be targeted at sensitive environmental elements including:

- Good Housekeeping practices, including storage of material etc
- Archaeology
- Traffic Management
- Waste Management
- Landscaping restrictions and requirements.
- Noise abatement
- Dust control
- Sensitive receptors (people, wildlife, water, soil etc)
- List of mitigation measures and how they will be implemented and by who doing or avoiding what and why
- Emergency responses eg to an oil or fuel spill
- Awareness, when to stop working or report a concern to the supervisor or manager (taking responsibility)

4.2.1 ENVIRONMENTAL INDUCTION

The Environmental Induction will be integrated into the general site induction on a case by case basis for each member of staff employed on-site depending on their assigned roles and responsibilities on site. Where necessary, the Environmental Induction will as a minimum include:

- An outline of the CEMP structure;
- A discussion of the applicable Works Method Statement;
- The roles and responsibilities of staff, including contractors, in relation to environmental management; and,
- An outline of the Environmental Incident Management Procedure.

4.2.2 TOOLBOX TALKS

Toolbox talks will be held by the ECoW or Site Manager at the commencement of works, or at the commencement of new activities. The aims of the toolbox talks are to identify the specific work activities that are scheduled for that day or phase of work. In addition, the necessary work method statements and sub plans would be identified and discussed prior to the commencement of the day's activities. The toolbox talks will include training and awareness on topics including:

- On-site Ecological Sensitivies
- Buffers to be upheld watercourses, archaeology, ecology
- Sediment and erosion control
- Good site practice
- On-site traffic routes and rules
- Keeping to tracks vehicle rules
- Strictly adhering to the development footprint
- Fuel storage
- Materials and waste procedures

Site meetings will be held on a regular basis involving all relevant site personnel. The objective of site meetings is to discuss the coming week's activities and identify the relevant work method statements and sub plans that will be relevant to that week's activities. Additionally, any non-compliance identified

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during the previous week would also be discussed with the aim to reduce the potential of the same noncompliance reoccurring.

During construction of the proposed development, all staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan.

4.3 ENVIRONMENTAL LEGISLATIVE AND REGULATORY REQUIREMENTS

A register of regulatory, legal and other requirements will be developed by the Environmental Manager. This will be a summary list of the major environmental legislation and other requirements with which the project must comply. A typical register of environmental legislation is divided into a number of categories, which include:

- General Environmental Legislation
- Flora & Fauna
- Emissions to Air
- Emissions to Water & Groundwater and water pollution
- Waste Management
- Noise & Vibration

For each piece of legislation, the following information will be provided:

- Index Number
- Title of Legislation
- Summary of Legislation
- Relevance

All legislation included in this Register can be readily accessed on <u>http://www.irishstatutebook.ie/</u> or will be available through the construction manager's office. The Register of Legislation will be reviewed and updated on a minimum six-monthly basis. This is a controlled document and as such will comply with all the requirements of the Contractor document control procedure as part of the Contractors quality management procedure.

4.4 STAKEHOLDER LIAISON

The Contractor will put in place a Communications Strategy which will provide a two-way mechanism for members of the public to communicate with a designated member of the Contractor's staff and for the Contractor to communicate important information on aspects of the works. The communications strategy will include:

- Procedures to inform stakeholders affected by the construction phase on schedules for any activity which is likely to affect them, and minimise any disruption
- Details of a contact name and number for any complaints that may arise during the works

A complaints register will form part of the communciations strategy and all complaints will be handled in an efficient manner. The register will have prescribed methodologies for documenting and actioning complaints received from the public and the relevant stakeholders.

5 EMERGENCY INCIDENT RESPONSE PLAN

5.1 OVERVIEW

It shall be the responsibility of the Contractor to develop an (Emergency) Incident Response Plan (IRP). The IRP is a working document and will be finalised by the appointed Contractor. The IRP will form part of the Contractor's CEMP, which will be submitted prior to the proposed site works commencing.

The primary objective of this IRP shall be to ensure the safety to all workers and visitors on the site.

The IRP will detail the emergency incident response procedures that will ensure that all countermeasures proceed in a controlled manner so that greater damages are avoided and the possible effects upon persons, the environment and property are avoided or minimised.

The Contractor will include within the plan, a pollution incident response procedure that is site/ activity specific and will include at a minimum; locations and operating procedures for emergency equipment, identification of possible pollution scenarios, staff training and responsibilities, and Material Safety Data Sheets of all chemicals on site.

The IRP will be regularly reviewed by the Contractor and amended to ensure it is applicable to the current construction activities, outlining the associated risks and recommended emergency responses procedures.

The IRP will provide a list of emergency contacts depending on the incident, a number of these is provided in section 5.3 below. The IRP shall also detail the contact details for the personal assigned responsibility of following up once an incident has occurred and the procedure to be adhered to in such an event.

5.2 INCIDENT REPORTING

The Contractor shall in the event of an incident occurring such as fire, explosions, accidents, leaks and spills, sabotage or emergencies, be required to outline in a report at the minimum the following points;

- A detailed description of the incident, including the location, time, weather conditions, affected parties;
- Potential contributing factors;
- Negative effects;
- Current mitigation control measures in place;
- Recommended improvements/ corrective actions to reduce risk of recurrence.

The Contractor shall submit to the Employer's Representative an initial incident report as detailed above, within a 24-hour period of the incident occurring.

5.3 EMERGENCY CONTACT DETAILS

The IRP shall include emergency contact details for key personal and emergency services, methods of notifying local authorities, statutory bodies and relevant stakeholders. These numbers will be posted at suitable noticeboards/welfare facilities. Emergency Contracts will include (but not limited to):

Table 4: Emergency Contacts

Contact	Telephone no.
Emergency Services – Ambulance, Fire, Gardaí	999/112
Hospital – Cork University Hospital	021 492 2000
ESB Emergency Services	1850 372 999

River Bride (Blackpool) Certified Drainage Scheme

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Gas Networks Ireland Emergency	1850 20 50 50
Gardaí –Watercourse Road Garda Station	021 455 8260
Health and Safety Co-ordinator - Health & Safety Services	ТВС
Health and Safety Authority	1890 289 389
Inland Fisheries Ireland (IFI)	1890 347 424
Project Supervisor Construction Stage (PSCS):	ТВС
Project Supervisor Design Stage (PSDS):	ТВС
Client: OPW	046 9426000

5.4 **RESOURCES AND TRAINING**

The Contractor shall ensure that the relevant staff will be trained in the implementation of the IRP. A list of all staff that received training on the topic shall be provided to the Employer's Site Representative outlining the person's name, contact number and the date the training was provided.

5.5 EMERGENCY ACCESS AND EQUIPMENT

The Contractor shall ensure that at each of the proposed work locations, there will be adequate space provided during construction to allow for emergency access routes. These emergency access routes shall be maintained for the duration of the construction stage.

Locations of pollution control plant/ spill kits shall be provided by the Contractor to the Employer's Site Representative. All pollution control equipment shall be checked regularly throughout the duration of the site works to ensure that it is in working order.

5.6 SITE EVACUATION/FIRE DRILL

A site evacuation/fire drill procedure will provide the basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. The following steps will be taken:

- Notification of the emergency situation. Provision of a siren or fog-horn to notify all personnel of an emergency situation.
- An assembly point will be designated in the construction compound area and will be marked with a sign. All site personnel will assemble at this point.
- A roll call will be carried out by the Site Security Officer to account for all personnel on site.
- The Site Security Officer will inform the Site Manager when all personnel have been accounted for. The Site Manager will decide the next course of action, which will be determined by the situation that exists at that time and will advise all personnel accordingly.

All personnel will be made aware of the evacuation procedure during the site induction. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specified intervals and the keeping records of such drills.

5.7 SPILL CONTROL MEASURES

Every effort will be made to prevent an environmental incident during the construction and operational phase of the project. Oil/fuel spillages are one of the main environmental risks that will exist on the site which will require an emergency response procedure. The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. The following steps provide the procedure to be followed in the event of such an incident:

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Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers;

- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill;
- If possible, clean up as much as possible using the spill control materials;
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited;
- Notify the ECoW immediately giving information on the location, type and extent of the spill so that they can take appropriate action;
- The ECoW will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring;
- The ECOW will notify the appropriate regulatory body such as Cork City Council, and the Environmental Protection Agency (EPA), if deemed necessary.

The importance of a swift and effective response in the event of such an incident occurring cannot be over emphasised. Any environmental incident must be investigated in accordance with the following steps:

- The ECoW must be immediately notified.
- If necessary, the ECoW will inform the appropriate regulatory authority. The appropriate regulatory authority will depend on the nature of the incident.
- The details of the incident will be recorded on an Environmental Incident Form which will provide information such as the cause, extent, actions and remedial measures used following the incident. The form will also include any recommendations made to avoid reoccurrence of the incident.
- If the incident has impacted on an ecologically sensitive receptor, such as a sensitive habitat, protected species or designated conservation site (SPA or SAC), the ECoW will liaise with the project ecologist.
- If the incident has impacted on a sensitive receptor such as an archaeological feature the ECoW will liaise with the project archaeologist.
- A record of all environmental incidents will be kept on file by the ECoW and the Main Contractor. These records will be made available to the relevant authorities such as Cork City Council, EPA, if required.

The ECoW will be responsible for any corrective actions required as a result of the incident e.g. an investigative report, formulation of alternative construction methods or environmental sampling, and will advise the Main Contractor as appropriate.

5.8 CORRECTIVE ACTION

Where an incident has occurred, or a site audit/ inspection has identified a non-conformance, it is imperative that a reoccurrence of a similar incident is avoided. Once the source of the incident has been identified, appropriate measures shall be implemented. Depending on the correction action required, these measures may in involve additional training to site personal, updating construction activity procedures, providing additional pollution protection equipment. Revised work methods, training requirements or any corrective action required to ensure an incident does not reoccur will be documented by the Contractor in an updated IRP and CEMP.

5.9 EMERGENCY INCIDENT RESPONSE PLAN - KEY POINTS

- The IRP is a live document and shall be updated regularly by the Contractor as necessary to include corrective actions implemented, revisions to regulations, and requests from Employer's Representative.
- Detail list of key personal to be contacted in the event of an emergency/ incident.
- Notification of incident and detailed incident investigation report provided to the Employer's Representative.
- Identify and implement corrective actions.
- Site specific pollution emergency response plan for risks associated with chemical/ fuel spills.
- Initial training to staff prior to construction work commencing and regular training (e.g. tool box talks) throughout the duration of the construction stage.

6 MITIGATION AND MONITORING PROPOSALS

All mitigation measures and monitoring proposals relating to the pre-commencement, construction and operational phases of the Proposed Development were set out in the various sections of the Environmental Impact Assessment Report (EIAR) prepared as part of the assessment.

This section of the CEMP groups together all of the mitigation measures and monitoring proposals presented in the EIAR. The Mitigation Measures are presented in the following pages.

Presenting the mitigation measures and monitoring proposals in tabular format provides an easy to audit list that can be reviewed and reported on during the project. This can be further expanded on, if necessary.

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required		
			Pre-Commencement Phase				
MM1	Traffic	EIAR Chapter 4	A traffic management plan (such as rolling traffic management) will be prepared and implemented for the duration of the works in order to ensure that any impacts on traffic mobility are minimised.				
MM2	Invasive species	EIAR Chapter 5	A pre-construction/pre-operational maintenance survey for invasive species will be conducted at the earliest stage possible to update and inform on the status of invasive plant species in or near the scheme/maintenance works area. These surveys should be undertaken during the appropriate botanical season (April to September).				
ммз	Dust	EIAR Chapter 8	A dust minimisation plan will be formulated for the construction phase of the project				
MM4	Archaeology	EIAR Chapter 10	Archaeological test trenching will be undertaken in dryland areas to be impacted by ground reduction works within the environs of Kilbarry Mill (HAN 1), Kilnap Glen House (HAN 3) and Sunbeam sites (HAN 4) during the pre-construction phase. In the event that any unrecorded features of archaeological significance are encountered the Archaeologist will consult with the OPW Project Archaeologist, the Cork City Council Archaeologist and the NMS in order to determine further mitigation measures. A report detailing the results of the archaeological site investigations will be submitted to the NMS and the completion of works as part of the process of monitoring potential impacts during the scheme.				
	Construction Phase						
Construe	Construction Management						
MM5	Existing underground services	EIAR Chapter 4, EIAR	Prior to excavation, the Contractor will assess record drawings and the results of the Site Investigation in order to determine the exact depth and location of the existing service networks within the works area.				

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
		Chapter 11			
мм6	Existing Watermains	EIAR Chapter 11	The Employer's Representative (Consulting Engineer) will assess the water distribution network drawing and detailed site investigation in order to determine the locations of watermains relative to the proposed works as part of the Design Phase. Any anticipated clashes between the water distribution network and the proposed works will be identified during the design phase and any diversions necessary to avoid accidental clashes during the construction phase will be designed, planned and agreed with Irish Water in advance of the construction phase of the Scheme.		
MM7	Existing Gas network	EIAR Chapter 11	The locations of the gas pipelines relative to the proposed works will be confirmed as part of the Design Phase. The Employer's Representative (Consultant Engineer) will assess the gas network drawings and result of the detailed site investigation in order to determine the exact depth and location of the existing gas pipelines within the works area. Should it be anticipated that the excavation for the proposed works will impact on this pipework, this will be taken into consideration at detailed design stage and any diversions necessary to avoid accidental clashes during construction phase will be designed, planned and agreed with Bord Gáis in advance of the construction phase. Prior to excavation the Contractor will carry out additional site investigation, including slit trenches, in order to determine the exact location of the gas pipelines in close proximity to the works area.		
MM8	Existing Electricity network	EIAR Chapter 11	The locations of the electricity network relative to the proposed works will be confirmed as part of the Design Phase. The Employer's Representative (Consulting Engineer) will assess the service drawings and results of the detailed site investigation in order to determine the exact depth and location of the existing electricity cables within the works area. Should it be anticipated that the excavation for the proposed works will impact on the electricity network, this will be taken into consideration at detailed design stage and any diversions necessary to avoid accidental clashes during construction phase will be designed, planned and agreed with the ESB in advance of the construction phase. Prior to excavation the Contractor will carry out additional site investigation, including slit trenches, in order to determine the exact location of the electricity network in close proximity to the works		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			area. This will ensure that the underground electricity network will not be damaged during the construction phase.		
мм9	Existing Broadband and telecommunications networks	EIAR Chapter 11	Prior to tendering Contract, the Employer's Representative (Consulting Engineer) will assess the broadband and telecommunications networks drawings and the detailed site investigation reports in order to determine the exact depth and location of the broadband and telecommunications networks within the works area. The locations of the drainage network pipework relative to the proposed works will be confirmed as part of the Design Phase. Should it be anticipated that the excavation for the proposed works will impact on this pipework, this will be taken into consideration at detailed design stage and any diversions necessary to avoid accidental clashes during construction phase will be designed, planned and agreed with the service provider in advance of the construction phase.		
MM10	Health and Safety	EIAR Chapter 4	During construction of the proposed development, all staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan.		
MM11	Health and Safety	EIAR Chapter 11	The Contractor must adhere to the ESB Code of Practice for Avoiding Danger from Overhead Electricity Lines, 2008 and the HSA Code of Practice for Avoiding Danger from Underground Services, 2010.		
MM12	Health and Safety	EIAR Chapter 4	Harris fencing will be erected around any excavations to prevent uncontrolled access to this area. Appropriate health and safety signage will also be erected on this fencing and at locations around the site.		
MM13	Potential Release of Hydrocarbons	EIAR Chapter 6, EIAR Chapter 7	 Fuels, chemicals, liquids and solid wastes will be stored on impermeable surfaces Plant refuelling shall be undertaken on impermeable surfaces within a suitably constructed bund in accordance with best practice guidelines. No refuelling will be permitted in or near soil or rock cuttings. 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			 All hydrocarbons and other potential contaminants will be stored within suitably constructed bunds in accordance with best practice guidelines. Spill kits will be provided at refuelling areas and at high risk/sensitive sites. There will be no refuelling of machinery within the river channel. Refuelling will take place at designated locations at distances of greater than 30 metres from the watercourse. No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times. Any fuel that is stored on the site will be in a double skinned, bunded container that will be located within a designated works compound at a location that is removed from the river. All other construction materials and plant will be stored in this compound. The compound will also house the site offices and portaloo toilets. This compound will either be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation. 		
MM14	Concrete Products	EIAR Chapter 7	 All concrete works will be carried out in dry conditions with no in-stream pouring of concrete. Ready mixed wet concrete will be used and where possible pre-cast sections will be used. There will be no batching of wet-concrete products on site. Chute cleaning will take place in designated, lined concrete washout areas. 		
MM15	Vegetation	EIAR Chapter 9	Trees and vegetation are to be retained where possible and replanting will occur where possible.		
MM16	Waste Management	EIAR Chapter 11	All current and applicable waste management legislation will be applied and adhered to. Contractors that are engaged in the transport of waste off-site will comply with the provisions of the Waste Management Act (1996) (as amended), associated Regulations and the Waste Management Plan prepared in accordance with 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects (2006)'. As such, the Contractor must handle, transport and dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities. A collection permit		

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Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			to transport waste must be held by the relevant contractor which has been issued by the Local Authority where the waste has been generated i.e Cork City Council and Cork County Council.		
MM17	Waste Management	EIAR Chapter 11	Waste receiving facilities must also be appropriately licensed or permitted for the waste being received		
MM18	Waste Management	EIAR Chapter 11	The construction compound for the proposed scheme should have a dedicated Waste Storage Area (WSA) for any construction waste generated. Receptacles/skips or bays will be provided for each recyclable material. Dedicated waste bins should also be provided on any water going vessel/platform to prevent litter from contaminating the River.		
MM19	Segregation of waste	EIAR Chapter 11	All waste generated on site will be segregated and placed in appropriate waste streams designated for recycling, reuse or disposal.		
MM20	Hazardous material	EIAR Chapter 11	If hazardous materials are used/encountered on site, i.e. timber with paint, asbestos concrete pipes, a specialist contractor will be employed to carry out an environmental clean-up to remove all traces of contaminated material from the site. The specialist contractor will be licensed under the 'Waste Management (Collection Permit) Regulations, 2007' (as amended). This will be disposed of at an appropriately licensed facility.		
			In order to avoid any hazardous materials infiltrating the ground water during construction and operation phase there will be a bunded area constructed within the site compound with sufficient volume to contain any spills. All plant refuelling, maintenance or washing will be carried out within the bunded area. Spill kits will also be available at this area to facilitate the quick and effective cleaning of any substances.		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
MM21	Waste Documentation	EIAR Chapter 11	Waste will be weighed, either by weighing mechanism on the truck or at the receiving facility, and these records will be kept by the contractor (both hard and soft copies).		
			A copy of all waste collection permits, for all waste contractors will be kept by the Waste Manager, working on behalf of the Contractor, on site.		
			If the waste is being transported to another site, a copy of the waste permit or EPA Waste License for that site must be provided and kept by the Waste Manager. If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) document must be obtained from Dublin City Council (as the relevant authority on behalf of all local authorities in Ireland) and kept on site along with details of the final destination (permits, licenses etc). A receipt from the final destination of the material will be kept as part of the on-site waste management records.		
			All information will be entered into the waste management system to be maintained on site.		
Flora and	d Fauna				
MM22	Biodiversity	EIAR Chapter 5	 A Project Ecologist will be appointed for the duration of the works. The appointed ecologist may carry out the role of ECoW (or may work alongside the ECoW) to ensure that all avoidance and mitigation and monitoring during construction are carried out according to the details specified in the final CEMP in the correct manner and to expected standards to ensure their effectiveness. The ECoW and Project Ecologist will report to the Environmental Manager. The footprint of works will be identified at the onset and will be demarcated to avoid unnecessary disturbance to habitats outside the works area. Method Statements detailing the construction footprint and access routes to the proposed works will be approved prior to construction. 		

 Upon completion of the works channel vegetation will be allowed to recolonise naturally.

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			 Introduce spawning gravels at morphologically/hydraulically appropriate locations i.e. where removal of culvert is proposed. This will involve ongoing maintenance outside of the spawning season when material accumulated in the sediment trap will be re-distributed in this channel to create clean gravel spawning substrate free of silt. 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 wildflower seed mix. Hedgerow/tree line planting will be undertaken to replace the length of hedgerow/treeline lost to accommodate the new flood embankment. Hedgerows will be replanted as close to the existing alignment and location as possible and will use native, locally sourced species. Works will only be undertaken during normal working hours (8:00 – 18:00) thus allowing the river to run clean for 14 hours per day. Night works will be required in limited circumstances for specialist activities (such as lifting of pre-cast bridge beams etc.). Where additional or alternative working hours are required, these will be agreed in advance via written agreement with Cork City Council. All works undertaken on the banks will be fully consolidated to prevent scour and run off of silt. Consolidation may include use of protective and biodegradable matting (coirmesh) on the banks and also the sowing of grass seed on bare soil. 		
MM23	Biodiversity	EIAR Chapter 5	 All material including oils, solvents and paints will be stored within temporary bunded areas or dedicated bunded containers; Where possible refuelling will take 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 will be transported in a mobile double skinned tank; All machinery and plant used will be regularly maintained and serviced and will comply with appropriate standards to ensure that leakage of diesel, oil and lubricants is prevented. 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			 Spill kits and hydrocarbon absorbent packs will be available and drip trays will be used during refuelling; All relevant personnel will be fully trained in the use of this equipment; Where soil/made ground and subsoil stripping occur, the resulting excavated soil fractions will be segregated into inert, non-hazardous and /or hazardous fractions (in accordance with Council Decision 2003/33/EC, the EPA water classification criteria at certain licensed landfills in Ireland); The excavation and handling of inert material will be carefully managed in such a way as to prevent any potential negative impact on the receiving water environment; Where possible the excavated spoil would not be stored beyond the working day, however in the event that this is not practical appropriate precautions in relation to the material will be taken. These precautions will include appropriate storage and covering; 		
MM24	Biodiversity	EIAR Chapter 5	 All associated hazardous construction waste will 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 will be adhered to. environment during the construction phase of the proposed development. During any working with cofferdams the following will be adhered to: The cofferdam will be inspected daily for any movement, leakage and general deterioration; any defects found will be remedied immediately. The working area will not be de-watered directly into the river; the removed water must receive treatment before discharge. Before removal of the cofferdam at completion of the works all materials, debris, tools, plant and equipment will be removed from the work area and any potential sources of pollution/contamination within the cofferdam will be cleaned up. 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			 The de-watered area will be re-watered before the cofferdam is removed to avoid the sudden ingress of water which may cause erosion of the replaced substrate. When re-watering is undertaken, the pump inlets will be screened appropriately to prevent the intake of fish or other aquatic animals. During all works the weather forecast will be monitored and a contingency plan developed to prevent damage or pollution during extreme weather and high flow events The sediment trap, as a pre-defined intervention of the scheme design, will limit the intrusiveness of maintenance operations by focusing works on a strategic removal of course sediment at one location and immediately downstream. Maintenance will be carried out once annually, or as necessitated by major storm event. Refer to Appendix 3c for more details. Channel maintenance work is carried out as much as possible from the riverbank without in stream tracking. In-channel debris will typically be removed by a long reach excavator working from the banks. Excessive overhanging vegetation will typically be pruned back or removed by hand using a cherry picker, depending on access. Where access is required to the watercourse, this will be carried out as close as practical to the area of channel subject to maintenance to minimise the length of tracking along the channel. Removal sediment material build up will be carried out during low flow periods to minimise the risk of siltation and material transport downstream. Typically, this will be carried out on average every 4-6 years but should be assessed on an annual basis by means of a site walkover survey. The sediment trap will not be fully emptied each time, and some material in the low flow channel will be retained, to retain continuity of natural bed materials. 		
MM25	Invasive species	EIAR Chapter 5, NIS	An Invasive Species Management Plan has been put in place by the OPW for the Rivers Bride and Glenamought in Blackpool which outlines the strategy that will be adopted during the construction and operation of the Scheme and taking into consideration the ongoing treatment of the site in order to prevent the spread of		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			invasive species. The schedule of treatment for invasive species within the proposed Scheme will be implemented for up to three years post construction. The following measures will be implemented to avoid the spread of invasive species:		
			 A pre-construction/pre-operational maintenance survey for invasive species will be conducted at the earliest stage possible to update and inform on the status of invasive plant species in or near the scheme/maintenance works area. These surveys should be undertaken during the appropriate botanical season (April to September). 		
			• Wash down all machinery and equipment using power washers to ensure the removal of all organic plant and soil mater before leaving the site. This material will be washed into a dedicated and contained area away from watercourses and will require appropriate treatment with other contaminated materials on site.		
			 Ensure all organic material removed from personal equipment and clothing including footwear 		
			 Use of machinery with tracks should, where possible, be avoided within infested areas. 		
			 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. 		
			 Areas infested with invasive species shall be fenced off prior to and during construction works where possible in order to avoid spreading plant fragments to areas free from infestation. For Japanese knotweed a buffer distance of 7m minimum is required. 		
			 Areas identified to be fenced off shall clearly be identified and marked out with signs to inform contractors of the risk. 		
			 Treatment and control of invasive alien species will follow Guidelines for the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA 2010) and Environmental Guidance: Drainage Maintenance & Construction (OPW 2019), and any other best practice guidance which may become available in the interim. 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			 Treatment will be carried out by a suitably qualified person and will involve the use of herbicides approved for working in proximity to an aquatic environment. All staff involved in the application of herbicides must have received appropriate training. All construction staff will receive training in the identification and management of invasive species, including identification of knotweed rhizomes, through "toolbox talks" and be made aware of the invasive species management plan before works begin on site. Areas where contaminated soil is to be stockpiled on site shall be clearly identified and cannot be within 50m of any watercourse or within a flood zone. For any material entering the site, including all fill material, the supplier must provide an assurance that it is free of non-native invasive species. Advanced treatment of the site has been undertaken using chemical treatment methods and given the physical site boundaries and flooding risk in the area the ISMP identified further chemical treatment as the most suitable method for future treatment at the site. The Invasive Species Management Plan is available in Appendix 5F. 		
MM26	Otter	EIAR Chapter 5	 Night-time working be restricted to emergency works only. 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 either be covered securely or 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. In order to compensate for loss of habitat it is proposed to provide artificial holts along the length of the scheme which will enhance suitable habitat available. The artificial holt construction will follow the wooden box type design as utilized by IRD Duhallow given the successful evidence of 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			 usage (IRD Duhallow, 2015). The holt design used was that described by the Sussex Otters & Rivers Project. Suitable locations for perspective holts have been identified on the north bank of the River Bride. Much of the south bank is readily accessible by dogs and people making it less suitable. The identified areas offer seclusion, have adjoining scrub, treelines and grassy embankment areas, are not readily accessible by the public and are above typical flood levels. Due to the sensitive nature of otter holts and their need for minimal disturbance the locations have not been identified within this report. In total 3 areas have been identified for the provision of artificial holts. The design of the holt areas will be overseen by an ecologist with significant experience of an Ecological Clerk of Works role and otter ecology. The tailoring of the holt construction will be conducive to maximizing the naturalness and attractiveness of the constructed holts to otter. Monitoring of the success of the holt construction in terms of otter utilization of the newly constructed habitat is essential to evaluate success of the compensatory habitat. This could be achieved by using remote trail cameras overtime. The detailed design of the otter holt constructions inclusive of their final positioning should be 		
			 Otter Ledges will be provided within all culvert designs. The otter ledge will traverse the entire length of the new proposed culverted areas and will follow the specifications of the National Roads Authority Guidance in relation to otters (NRA, 2008). The culverted area will also extend into the historically culverted zones of the River Bride as far as Leitrim Street. The ledge will tie into the adjoining riverbanks and will be screened with trees to provide seclusion for otter entering and exiting the culvert network. (See Appendix 5E). The detailed design of the tie in areas will be undertaken in conjunction with an ecologist with knowledge of otter usage of the area. Furthermore, the detailed design of the final ledge layouts should be agreed in conjunction with the NPWS. 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			• Light wells will be provided within the culvert at intervals to provide natural light within the culvert and to provide as natural a condition as possible		
MM27	Bats	EIAR Chapter 5	 Tree group 'T32' (see Appendix 5G) is likely to play a role in the success and viability of the roost and these trees will be removed as part of the scheme. However, the footprint of the proposed embankment (C08_E03) will be modified locally to allow for the retention of trees such that landscape connectivity offered by the Tree group T32 is not significantly impacted. This will ensure that bats continue to benefit from protective cover that lessens the threat of predation. In advance of commencement of construction in the above area the works area will be demarcated in consultation with an Ecologist and vegetation to be retained will be appropriately fenced off. This fencing and exclusion area will be maintained for the duration of the construction period. Measures in relation to the protection of trees are outlined below. Outside of emergency works, there will be no night working during the construction phase. Removal of existing trees and other vegetation to facilitate the proposed works will be minimized in all areas and particularly in the following areas: The river corridor between the Blackpool Bypass and Blackpool Church (Item C06_B04) Upstream of Kilnap Bridge (Item C08_T01) Rose Cottage (Item C06_C01; Tree group T36). Any loss of trees or tree cover will be mitigated in so far as possible through replacement planting within the Scheme boundary, as close as possible to the area where trees may have to be removed to accommodate the proposed works Any new lighting required as part of the project will be of as low a wattage as possible and will be directed away from the surface of the water. 		
			on trees identified as potential for bat roosts. If roosts are found or their		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			 potential cannon be ruled out, an appropriate mitigation strategy will need to be devised and a derogation licence will need applied from NPWS. Removal of trees with bat roost potential will be carried out in September/ October and under the supervision of a bat ecologist. A Bat box scheme will be put in place to mitigate for loss of trees and suitable foraging habitat for bats. Approximately 10 bat boxes will be provided for on stone walls faces or mature trees (as deemed appropriate). Bat boxes will be woodcrete bat boxes such as those manufactured by Schwelger and will be put in place as per the recommendations identified in NPWS Irish Wildlife Manual (2006) Bat Mitigation Guidelines for Ireland. Recommendations are made in the bat survey report (Appendix 5G). In advance of commencement of construction in the above areas the works areas will be demarcated in consultation with an Ecologist and vegetation to be retained will be appropriately fenced off. This fencing and exclusion area will be maintained for the duration of the construction period. Measures in relation to the protection of trees are outlined above. During construction works, generators or other machinery which create noise, vibration and air emissions, will not be located within 20m of sensitive habitats or any features with potential for bat roosting. Excessive noise and vibration will be avoided in as much as possible. 		
MM28	Fisheries	EIAR Chapter 5	 All works will be carried out in consultation with Inland Fisheries Ireland In channel working will be minimised, where possible, method statements will identify access routes and works areas prior to commencement in consultation with the Project Ecologist. In-channel working during the salmonid spawning season will not be permitted (November to March inclusive). During the construction phase, fish passage will be maintained in areas of in-channel working. Any pumps used for over-pumping must be 'fish-friendly' and fitted with appropriate screens. There will be high level attention to concrete formworks being carried out in isolated dry conditions when weather is stable and predictable. The ECoW 		
Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
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			and project ecologist will monitor the river downstream for any issues (such as turbidity from instream sediment and suspension) that indicates a failing of the mitigation and corrective will be taken or works suspended).		
MM29	Fisheries	EIAR Chapter 5	 The removal of the culvert near Sunbeam will include the regrading of the river to ensure removal of the existing weirs. Works will involve managing of spawning gravels upstream of Sunbeam Industrial Estate where culvert is to be removed. This will involve a redistribution of gravels removed during the maintenance of the sediment trap Leaving sufficient gravel of the appropriate qualities to retain spawning habitat within the open channel. Details for enhancement in Appendix 5E. The winter channel will be constructed as such that there is no risk of fish being retained in the channel as flood water subsides. This will be ensured out by appropriate grading of the channel. Ensure that the proposed trash screens have an appropriate mesh size to allow for movement of salmonid species and that culverts and trash screen are designed and installed in line with published best practice (e.g. Armstrong et al 2010; Turnpenny & O'Keefe 2005). Compensation measures for permanent loss of riverine habitat will be carried out in agreement with Inland Fisheries Ireland. Enhancement measures have been identified for the Bride and the recommendation of O'Grady (2016) Draft Fisheries Enhancement Proposals will be carried out as part of the scheme. The scheme will be accompanied by a programme of fish habitat and species monitoring, including the management of sediments and prior to removal of sediment during maintenance procedures. Relevant generic measures are set out in the OPW environmental guidelines (OPW Brew and Gilligan 2019). Lamprey and Eel will be monitored in relation to sediments of value for spawning. The river enhancement measures will include monitoring of spawning habitat improvements for salmonids, Brown Trout, to assess the condition of introduced gravel beds and determine the success of the measures and identify additional management ongoing. The various bydromorphological features required in the channel to mointal tontal to maintening. 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			conditions, including pools, runs and riffles will be monitored according to a 'Life Cycle Unit Score' assessment which will inform future management and enhancement requirements in accordance with the IFI and OPW approach to maintenance.		
Soils an	d Geology				
MM30	Bedrock	EIAR Chapter 6	Where it is necessary to remove bedrock to facilitate construction of the proposed scheme, suitable material will be reused elsewhere where possible. Material removed from site will be transported to the closest suitably licensed facility to be processed and used on other construction projects in the vicinity, where possible.		
MM31	Subsoils	EIAR Chapter 6	Excavated subsoils will be reused as fill, or for the construction of flood defence embankments where possible. Any remaining volumes of unsuitable materials will be transported to the closest suitably licensed facility to be processed and reused in other construction projects in the vicinity, where possible		
MM32	Soil Stripping	EIAR Chapter 6	 Vegetation and soil will be left in place for as long as possible prior to excavation and stockpiling of soil to be minimised during wet weather periods. Soil stockpiles will be shaped so as to shed water. Surface water run-off from exposed soil surface will be intercepted and channelled to sumps and to silt traps thereafter. Granular materials will be placed over bare soil, particularly in the vicinity of watercourses, to prevent erosion of fines and/or rutting by construction machinery. 		
Water		1			
MM33	Water Quality	EIAR Chapter 7	 Measures to minimise the suspension and transfer of sediment downstream will be implemented. These measures are likely to include the use of silt barriers downstream of the works areas and removal of any accumulated silt, construction of silt sumps downstream of the works areas, cofferdamming 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			and dewatering of works areas where concrete and other building works are proposed. Any stockpiling will also be greater than 10 metres from the river bank.		
MM34	Water Quality	EIAR Chapter 7	 All works undertaken on the banks will be fully consolidated to prevent scour and run off of silt. Consolidation may include use of protective and biodegradable matting (coirmesh) on the banks and also the sowing of grass seed on bare soil. Works will only be undertaken during normal working hours (8:00 – 6:00) thus allowing the river to run clean for 14 hours per day Night works will be required in limited circumstances for specialist activities (such as lifting of pre-cast bridge beams etc.). Where additional or alternative working hours are required, these will be agreed in advance via written agreement with Cork City Council. 		
MM35	Safe storage of contaminants	EIAR Chapter 7	A bunded area will be constructed within the site compound, which is shown in Appendix 3D in order to avoid any polluting substances infiltrating the ground water during the construction and operation phase of the Scheme. All plant refuelling, maintenance and washing will be carried out within the bunded area. Spill kits will be available at the bunded area in order to ensure the quick and effective cleaning of any substances.		
MM36	Turbidity monitoring	EIAR Chapter 7	 Runoff from works, stockpile and compound areas will be monitored and observed daily to ensure that it is not impacting on any local watercourses. Silt release results in discolouration to water and so is easy to visually monitor for its presence. Alarmed Sondes will be employed to measure turbidity in the River Bride upstream and downstream of the works area during construction of the drainage scheme. If an increase in turbidity of 20% or greater is identified downstream of the works, all works will cease immediately until the source of the increased turbidity is identified and rectified (if caused by the construction works). If necessary, water sampling and monitoring of the local 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			water courses will also be completed to test for Total Suspended Solids (TSS) and tested against the baseline water quality identified above in section 7.2.3.1.		
Air Qua	lity & Climate, Noise &	& Vibration			
MM37	Dust	EIAR Chapter 8	 Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface. Any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions. Speeds shall be restricted on hard surfaced roads as site management dictates. Vehicles delivering material with dust potential shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust. Public roads in the vicinity of the site shall be regularly inspected for cleanliness, and cleaned as necessary. In the event of dust nuisance occurring outside the site boundary, movement of materials will be immediately terminated and satisfactory procedures implemented to rectify the problem before the resumption of the operations. 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. All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise. Where a works activity is found to be a continuous or unmanageable source of dust during prolonged periods of dry weather, suspension of a particular activity during such weather conditions may be necessary. 		
MM38	Dust Monitoring	EIAR Chapter 8	 Bergerhoff dust gauges will be placed at various locations around the site to monitor the level of dust being generated during the construction phase. The monitoitng locations will be identified once the phasing of the works has 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			been established and will be subject to baseline analysis prior to works commencing in each particular area. These dust gauges will quantify the deposition of dust during the construction phase of the project enabling the comparison between the measured data and the max compliance level of 350mg/m2/day. Where it can be demonstrated that the level of dust generation is minimal and that the receptors at or adjacent to the locations are not being impacted by dust levels, a reduction or cessation of this monitoring may be proposed		
MM39	Noise & Vibration	EIAR Chapter 4	 Sensitive location of equipment, taking account of local topography, existing structures (i.e. walls, buildings, etc.) and natural screening. Working methods: construction noise will be controlled by prescribing that standard construction work will be restricted to the specified working hours. Any construction work carried out outside of these hours shall be restricted to activities that will not generate noise of a level that may cause a nuisance. The phasing of works has also been designed with regard to avoidance of noise impacts. Plant will be selected taking account of the characteristics of noise emissions from each item. All plant and machinery used on the site shall comply with E.U. and Irish legislation in relation to noise emissions. The timing of on- and off-site movements of plant near occupied properties will be controlled. 		
MM40	Noise & Vibration	EIAR Chapter 4	 Operation of plant: all construction operations shall comply with guidelines set out in British Standard documents 'BS 5338: Code of Practice for Noise Control on Construction and Demolition Sites' and 'BS5228: Part 1: 1997: Noise & Vibration Control on Construction and Open Sites'. The correct fitting and proper maintenance of silencers and/or enclosures, the avoidance of excessive and unnecessary revving of vehicle engines, and the parking of equipment in locations that avoid possible effects on noise-sensitive locations will be employed. Training and supervision of operatives in proper techniques to reduce site noise, and self-monitoring of noise levels, if appropriate. 		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
MM41	Hoarding	EIAR Chapter 8	With respect to 70 dB exceedances identified in section 8.4.2.3 in chapter 8 of this EIAR, consaw operations may be readily controlled by erecting a hoarding around the cutting area. In addition, the flood defence wall construction operation downstream of the Commons Inn, at the Killeens off-ramp dwelling, and at the Glennamought Bridge dwelling, may be similarly treated by erecting a hoarding along the boundary of the works zone. In each case, the hoarding should extend to a height of 2.4 m, and should consist of plywood boarding on both sides of timber framework, with waterproofed cavity to be filled with mineral wool or similar. Gaps at partition interfaces should be boarded. If such measures are installed, consaw and wall construction operations are expected to meet the 70 dB LAeq 1 h criterion.		
MM42	Noise & Vibration Standards	EIAR Chapter 8	 It is recommended that appointed contractor(s) be required to adopt practices set out in British Standard BS 5228:2009 Code of practice for noise and vibration control on construction and open sites Part 1: Noise and Part 2: Vibration (2009). Measures recommended in the standard include: Appointing a project representative responsible for noise and vibration issues, and for liaising with local representatives. A clear communication channel should be established between all parties prior to project commencement. Requiring that contractors ensure that site personnel are familiar with potential noise and vibration issues, and that personnel apply a common-sense approach to eliminating unnecessary noise emissions. Use of quieter plant and methods where possible. Installation of temporary barriers or enclosures around local sources such as compressors and generators. Limiting times of activities which may generate elevated noise or vibration emissions. 		
MM43	Noise Monitoring	EIAR Chapter 8	Noise monitoring will be undertaken during the groundworks stage of the construction works involving any excavation, rock breaking, demolition or piling, in parts of the works area where these activities are ongoing. Monitoring will be carried out in		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			accordance with British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (2014) and the National Roads Authority document Good practice guidance for the treatment of noise during the planning of national road schemes (2014) guidance. At each monitoring location, measured data will be used to assess compliance with limits recommended in Table 8.12 of this EIAR, During each survey, LAeq 1 h and LASmax limits will be measured by a competent person using calibrated equipment. Competency requirements are set out in EPA document NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities (2016). Where a survey shows that construction operations exceed Table 8.12 of this EIAR's limits, or any other limits imposed, all construction operations will be immediately halted. Works will not resume until appropriate mitigation measures have been designed and implemented. Such measures may include use of hoarding/enclosures, replacement with quieter plant, altered works timing so as to coincide with higher background levels/limits, and other measures set out in BS 5228. Measures will be specific to local conditions.		
MM44	Vibration Monitoring	EIAR Chapter 8	Where piling other than pressed-in piles are used, monitoring of groundborne vibration levels will be carried out at the nearest buildings in accordance with British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (2014). Data measured during such monitoring shall be used to assess compliance with PPV limits set out in Table 8.15 of this EIAR, or any other limits imposed. Monitoring will be undertaken by competent personnel using calibrated equipment.		
Landsca	pe				
MM45	Vegetation	EIAR Chapter 9	Vegetation is to be retained where possible. Following the excavation, the surface is to be covered with a biodegradable membrane to protect the exposed soil while vegetation is re-established in the months following completion of works. Where PPV levels due to piling exceed Table 8.15 of this EIAR, criteria or other applicable limits, all works will be immediately stopped. Appropriate mitigation measures will be		

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
			designed and implemented prior to proceeding. Such measures include alterations to the piling method, and installation of tell-tales on buildings of interest.		
Cultural					
MM46	Archaeological Monitoring	EIAR Chapter 10	Archaeological monitoring is required where direct impacts are to take place which includes the removal of HAN 14 (Kilnap House access bridge), Feature HAN 16 (Masonry Bridge, Fitz's Boreen), HAN 17 (River Walling), HAN 18 (Bridge Section), and HAN 19 (Masonry Culvert). The removal of these features should be undertaken in a systematic manner, under archaeological supervision, allowing the archaeologist to obtain additional information and undertake supplementary recording.		
MM47	Archaeological Monitoring	EIAR Chapter 10	Monitoring to be carried out at Han 4 (Kilnap Mill), HAN 31 (River walling) and HAN 32 (Masonry wall) under licence issued by NMS. A report on the supervision of works will be compiled and submitted to NMS and OPW Project Archaeologists.		
MM48	Archaeological Monitoring	EIAR Chapter 10	In the event that any previously unrecorded archaeological features are uncovered during monitoring of ground works then they will be recorded and securely cordoned off while the OPW Project Archaeologist, the Cork City Council Archaeologist and the NMS are consulted to determine appropriate further mitigation measures, which may entail preservation in situ (by avoidance) or preservation by record (archaeological excavation).		
Traffic					
MM49	Construction Traffic	EIAR Chapter 11	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'.		
MM50	Construction Traffic and Traffic	EIAR Chapter 11, EIAR	• Works in particular zones/areas are to be scheduled to avoid overlap with adjacent areas where the impacts of these in parallel would be significant;		

RYAN HANLEY in association with

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required					
	Management Measures	Appendix 11B	 Works at Maddens junction to be undertaken in June/July/August and to avoid the Cork City Marathon; Fitz's Boreen bridge replacement to be undertaken between September and November (inclusive); Works at Blackpool Shopping Centre are not to be undertaken during November or December; Night works to be undertaken for specific activities (such as lifting of precast bridge beams, etc.); Works in the area of the Dulux factory to be undertaken in the off-peak production period (timing to be coordinated with owners); and Further liaisons will take place with Cork City Council, An Garda Síochána and impacted landowners for all works areas in order to minimise the impact on traffic flows at critical junctions and locations. 							
MM51	Transport Infrastructure	EIAR Chapter 11	The construction of the reinforced concrete 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 bridges will be constructed safely and ensure the structural integrity of the structure. Excavation and reinstatement of the Watercourse Road and Blackpool Bypass 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 experience professional to ensure they are carried out correctly.							
MM52	Works in Vicinity of Roads Network	EIAR Chapter 11	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'.	lised traffic disruptions as a result of other proposed works throughout the vill be mitigated through the use of industry standard traffic management s. These traffic management measures should be designed in accordance 'Guidance for the Control and Management of Traffic at Roadworks – Edition'.						
			Operational Phase							

Ref No.	Reference Heading	Location	Mitigation Measure	Audit Result	Action Required
MM53	Sediment removal	EIAR Chapter 7	Any removal of material within the channel will be by means of suitably rigged excavators or similar equipment. Where access is required to the watercourse, this will be carried out as close as practical to the area of channel subject to maintenance to minimise the length of tracking along the channel. Maintenance works are to be carried out from the bank/dry side where possible depending on flow conditions and other constraints. For example, maintenance activities to remove bed material build up would be ideally carried out during low flow periods to minimise the risk of siltation and material transport downstream. This would typically be carried out by a long reach excavator but due to space constraints within the scheme, this may not be possible within certain areas and in stream access would be required. Typically, this material would be deposited on the riverbanks subject to space constraints or may be disposed offsite to an appropriately licenced waste facility. Typically, this would be carried out on average every 4-6 years but should be assessed on an annual basis by means of a site walkover survey.		
MM54	Bats		Monitoring will be carried out to evaluate the effectiveness of proposed mitigation or where possible to modify or improve the measures in the light of further assessment and thereby contribute to understanding of the impact of future development projects on bats in Ireland.		
MM55	Notifying Residents	EIAR Chapter 8	Given the size of plant associated with dredging and embankment construction, it is considered more suitable to notify residents in advance of operations.		
MM56	Debris Maintenance	EIAR Chapter 9	A trash screen is proposed within the River Bride in the open space in Blackpool Retail Park. The screen is to be maintained and debris removed on a frequent basis, once a month as a minimum, and more frequently if necessary.		
MM57	Debris Maintenance	EIAR Chapter 7	All OPW maintenance work is undertaken in accordance with Environmental Guidance: Drainage Maintenance & Construction (OPW, 2019) along with additional measures where the Environmental Procedures (EPs) show deficiencies, to ensure adverse impacts on the environment are considered and minimised. OPW drainage maintenance activities will also be subject to a separate Appropriate Assessment process to ensure no adverse impacts arise.		

Ref No.	Reference Heading	Location	Location Mitigation Measure											
MM58	Removal of material	EIAR Chapter 6, EIAR Chapter 7	Any removal of material within the channel will be by means of suitably rigged excavators or similar equipment. Where access is required to the watercourse, this will be carried out as close as practical to the area of channel subject to maintenance to minimise the length of tracking along the channel. Maintenance works are to be carried out from the bank/dry side where possible depending on flow conditions and other constraints. Typically, this material would be deposited on the riverbanks subject to space constraints or may be disposed offsite to an appropriately licenced waste facility. Typically, this would be carried out on average every 4-6 years but should be assessed on an annual basis by means of a site walkover survey.											

7.1 CONSTRUCTION SCHEDULE

As detailed in Section 3.3 of the EIAR, the construction works will last approximately eighteen months and will be subject to the following programme constraints:

- Instream works (include preparatory work) on all watercourses supporting salmonids shall be undertaken from April to October (inclusive) and in consultation with Inland Fisheries Ireland to avoid accidental damage or siltation of spawning beds;
- To avoid impacting on bird nesting sites, the vegetation removal within the defined working area will not be carried out during the peak bird nesting season of March to August (inclusive) prior to the onset of works;
- Christmas non-working time is from the beginning of the second week of December to the end of the second week of January.

See Appendix I for detailed programme of works.

7.2 WORKING HOURS

The normal working times are set out in the section below. Works other than safety requirements, security and emergency works will not be undertaken outside these working hours without the written permission from Cork City Council. This permission, if granted, can be withdrawn at any time should the working regulations be breached. Works other than the pumping out of excavations, security and emergency works will not be undertaken at night and on Sundays without the written permission of Cork City Council. Night is defined as 18:00 to 08:00hrs. When overtime and shift work is permitted, that hauling of spoil and delivery of materials outside normal working hours is prohibited and the noise limits outlined in Table 1 will apply.

It is proposed that the construction activities will operate between the following hours;

- Monday to Friday 08:00 to 18:00
- Saturday 08:00 to 13:00
- Sundays or Bank Holidays no works permitted

Where additional or alternative working hours are required, these will be agreed in advance via written agreement between Cork City Council. Approval to vary the prescribed hours may be sought based on the following considerations:

- Traffic management issues
- Location of the site in relation to 'sensitive' zones
- Safety requirements including risk to the public
- Sequential/timing measures
- Requirements of other authorities (e.g. ESB, Eircom)
- Public interest.

Emergency work may include the replacement of warning lights, signs and other safety items on public roads, the repair of damaged temporary works and all repairs.

8 COMPLIANCE AND REVIEW

8.1 SITE INSPECTIONS AND ENVIRONMENTAL AUDITS

Daily and weekly inspections of construction activities will be carried out by the Environmental Clerk of Works (ECoW) and the Site Construction Manager to ensure all controls to prevent environmental impact, relevant to the construction activities taking place at the time, are in place.

Environmental inspections will be undertaken by suitably trained staff to ensure the works are in compliance with this CEMP and all other planning application documentation.

8.2 AUDITING

It will be the responsibility of the Contractor to implement the mitigation and monitoring measures specified in the EIAR. The Contractor will also ensure that all construction staff understand the importance of implementing the mitigation measures. The implementation of the mitigation measures will be overseen by the Environmental Clerk of Works (ECoW).

Throughout the construction phase, environmental audits will be carried out. The purpose of the environmental audits is to identify any underlying causes of non-compliance and determine whether the CEMP is being properly implemented and maintained. Audits also allow for the identification of system and performance improvement opportunities. The Contractor may carry out the environmental audit themselves or appoint external personnel acting on their behalf. The results of environmental audits will be provided to the project management team.

An audit of compliance with the pre-commencement mitigation measures will be completed by the ECoW prior to the commencement of construction. Monthly audits of compliance with the construction phase mitigation measures will be completed as construction is ongoing. The findings of each audit will be documented by the ECoW, and made available to Cork City Council and other statutory bodies on request.

Once the scheme is operational and has been commissioned, a report of compliance with operational phase mitigation measures will be completed.

8.3 **ENVIRONMENTAL COMPLIANCE**

The following definitions shall apply in relation to the classification of Environmental Occurrences during construction:

Environmental Near Miss: An occurrence which if not controlled or due to its nature could lead to an Environmental Incident.

Environmental Occurrence: Any occurrence which has potential, due to its scale and nature, to migrate from source and have an environmental impact beyond the site boundary.

Environmental Exceedance Event: An environmental exceedance event occurs when monitoring results indicated that limits for a particular environmental parameter has been exceeded. An exceedance will immediately trigger an investigation into the reason for the exceedance occurring and the application of suitable mitigation where necessary.

Environmental Non-Compliance: A non-compliance occurs when there is non-fulfilment of a requirement, and includes any deviations from established procedures, programmes and other arrangements related to the EMP.

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8.4 CORRECTIVE ACTION PROCEDURE

A corrective action is implemented to rectify an environmental problem on-site. Corrective actions will be implemented by the Site Manager/Environmental Manager, as advised by the ECoW. Corrective actions may be required as a result of the following:

- Environmental audits;
- Environmental Inspections and Reviews;
- Environmental Monitoring;
- Environmental Incidents; and,
- Environmental Complaints

A Corrective Action Notice will be used to communicate the details of the action required to the main Contractor. A Corrective Action Notice is a form that describes the cause and effect of an environmental problem on site and the recommended corrective action that is required. The Corrective Action Notice, when completed, will include details of close out and follow up actions.

If an environmental problem occurs on site that requires immediate attention, direct communication between the Site Manager/Environmental Manager and the ECoW will be conducted. This will then be passed down to the site staff involved. A Corrective Action Notice will be completed at a later date.

8.5 CONSTRUCTION PHASE PLAN REVIEW

This CEMP will be updated and reviewed prior to commencement of construction, and also every six months thereafter during the construction phase of the project, as well as on foot of the triggers outlined in Section 1.

Appendix I

				2021					2022											2023									
		Fisheries Window									Fisheries Window											Fisheries Window							
	Jun	lut	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	lut	Aug	Sep	Oct
Contractor Start	Х		10							-	I.	- 1			10								L. L.				- 0	1 1-	
Collins/ O'Shea (RB_201 &202)																													
Kilnap/ Woodpark (RB_203)																													
Rose Cottage (RB_204)																													
Northpoint (RB_204)																													
Common's Inn (RB_205)																													
Fitzs Boreen to Retail Park (RB_206 & 207)																													
Blackpool Retail Park (RB_207 & 208)																				-									
Orchard Court (RB_208 & 209)										_																			
Blackpool Church (RB_209 & 211)				_																									
Spring Lane (RB_210)																													
Maddens Junction to Church (RB_211)																													
Maddens to end (RB_212)																													

Notes:

1. Programme and sequencing are indicative only and are subject to contract appointment, licencing, hydrological constraints, and other seasonal constraints.

2. Detailed construction programme to be developed by Contractor.

Appendix 5F – Invasive Species Management Plan

Office of Public Works River Bride (Blackpool) Certified Drainage Scheme

Invasive Species Management Plan

246842-06

Issue 01 | 16 October 2020

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 246842-00

Ove Arup & Partners Ireland Ltd

Arup 50 Ringsend Road Dublin 4 D04 T6X0 Ireland www.arup.com

ARUP

Document verification

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			Prepared by	Checked by	Approved by	
		Name	Amanda Ryan	/Nicholas Duff (Ryan Hanley)	Ken Leahy	
		Signature	Amarda kya	gement	to lab	
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			Prepared by	Checked by	Approved by	
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		Name				
		Signature				
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Appendices

Appendix A

All About Trees Mapping 2016

Appendix B

Japanese Knotweed Ireland Mapping 2019

Appendix C

Japanese Knotweed Ireland Treatment Report 2019

Appendix D

Japanese Knotweed Ireland Validation Report 2020

1 Introduction

1.1 Scope of document

Invasive plant species have been identified and documented within proposed works areas that are included in the River Bride (Blackpool) Certified Drainage Scheme, herein referred to as the flood relief scheme.

The purpose of this non-native invasive species management plan is to present the strategy that has been adopted from Stage 1 through Stage 3 and will continue during the construction (Stage 4), handover (Stage 5) and operation of the proposed scheme in order to manage and prevent the spread of the invasive plant species.

This outline plan is intended to be a working document and will be updated during both the construction and operational phases. During construction, it will be updated by the Contractor to form the detailed invasive species management plan which will form part of the detailed Construction Environmental Management Plan (CEMP). Following construction, the plan will be updated for the operational phase, taking into account the results of the detailed construction invasive species management plan and operational maintenance requirements etc.

Construction (and potentially operational maintenance works) could disturb stands of invasive plants and/or soils contaminated with invasive plant material. In addition to lands within the proposed works areas, there is an identified risk of invasive plant species being spread onto neighbouring lands and onto public roads and other locations.

Invasive plant species which have been identified in the proposed works areas include Gunnera (Giant Rhubarb) and Japanese Knotweed species. While Gunnera has been identified in the area, Japanese Knotweed is of primary concern for the structural integrity of these proposed flood works and for the designated sites downstream. Therefore, the focus of this report is on the prevention of the spread of Knotweed, however, the same principles are applicable to other invasive species. This report outlines the strategy that will be adopted during the construction and operation of the flood relief scheme in order to prevent the spread of invasive plant species.

The main objective of the invasive species management strategy for the scheme will be to:

- Prevent the spread of invasive plant species during the construction phase;
- Manage the growth of invasive plant species adjacent to flood defences so as to protect the integrity of the structures from the impacts of these species;
- Prevent the spread of invasive plant species during channel maintenance works in the future.

1.2 Description of the proposed development

The Office of Public of Works (OPW) has commissioned Arup in conjunction with JBA Consulting to develop a flood relief scheme for Blackpool in Cork City.

The proposed scheme is largely centred on the channels of the Rivers Bride and Glenamought and will comprise a combination of flood walls, embankments, culverting a section of open channel, bridge replacements and other works. The flood relief works area extends from the vicinity of North Point Business Park to Blackpool Village. The sites along the river are in a built-up urban area adjacent to a number of industrial, retail, and residential centres, as well as roads and parks.

An indicative timeline for the stages of the development is provided in Table 1, these dates may be subject to change.

Timeline	Current programme	
Stage 1	October 2015 – December 2015	
Stage 2 Planning	October 2015 – January 2020	
Stage 3 Finalisation of detailed design and tender – provisional datesPhase 1		October 2020 – July 2021
Stage 4 Construction	July 2021 – June 2023	
Stage 5 Handover	June 2023 – November 2023	

Table 1: Indicative timeline for development

1.3 Description of relevant invasive species

1.3.1 Japanese Knotweed

Japanese Knotweed is an herbaceous perennial plant that can grow to heights of 2-3 m, see Figure 1. In summer it produces dense bushes of purplish bamboo-like stems with large, triangular leaves, and hanging strings of white flowers. In winter the herbaceous material dies back, leaving only its dead canes. Plants expand via rhizomes (underground creeping stems), and as plants mature, they can create a dense network of rhizomes in the surrounding soil. Most are within 1m depth and 2m radius of the above-ground stems, but in extreme circumstances the rhizomes can extend 3m underground and 7m horizontally from the parent plant. As plants mature, the bases of dead stems combine to form a robust, woody 'crown' at the surface.

Japanese Knotweed is spread exclusively by fragmentation of its rhizomes, crowns and stems. The rhizomes and stems are relatively fragile and can easily be broken apart, and new plants can grow from root fragments weighing less than one gram. Although the plant produces large numbers of flowers in the late summer period, its seeds are not viable, because only female Japanese Knotweed plants have been introduced to Ireland.



Figure 1: Japanese Knotweed (photo taken from All About Trees Initial Invasive Species Survey Report, 2016)

As a result of its highly invasive characteristics and vigorous growth, Japanese Knotweed is recognised as a significant constraint on construction sites. It can easily be spread by the movement of earth, gravel or rocks, or by snagging on construction vehicles. Its rhizomes extend underground away from the main stem of the plant, so even works several metres from the plants can fragment and spread the rhizomes. New seedlings are very vigorous, and can break through some built surfaces (e.g. tarmac, permeable paving) or exploit gaps between concrete surfaces.

The standard approach to kill Japanese Knotweed is to treat it with a systemic herbicide, applied either as a spray to the foliage, or injected into the stem. Although leaves and stems can easily be killed by any herbicide, the key to successful eradication is to kill the rhizomes. Systemic herbicides are the most effective option in this regard, because they are carried through the vascular system of the plant and can infiltrate significant proportions of the rhizome. However, it is rarely possible to kill the entire rhizome network of mature plants with a single treatment, so it is usually necessary to carry out multiple years of treatment in order to successfully kill all of the rhizomes. Herbicide treatment typically takes 1-2 years for immature plants, 2-3 years for semi-mature plants, and 3-5 years for mature plants.

1.3.2 Gunnera (Giant Rhubarb)

Gunnera is an herbaceous perennial plant with very large leaves of up to 1.5 m diameter. It has a robust central core (referred to as a crown), from which large rhizomes spread into the surrounding soil. The leaves grow from the crown, and are deciduous, growing in spring each year, and dying back in the winter.

Spikes of flowers grow from the crown in summer months, and when fertilised, produce up to 250,000 seeds per plant, which are dispersed by birds and small mammals.

Figure 2: Small Gunnera (photo taken from the Japanese Knotweed Ireland monitoring photos, 2019)



Gunnera is spread primarily by fragmentation of crowns and rhizomes. As with Japanese Knotweed, it can easily be spread by the movement of earth, gravel or rocks, or by snagging on construction vehicles. Gunnera rhizomes are not as extensive as those of Japanese Knotweed, but can still spread several metres from the plants.

In some parts of Ireland, Gunnera plants can spread by seed, and these are the locations in which the plant is most problematic. Although it has been planted throughout Ireland, it is only invasive in a narrow band along the western coast of Ireland, notably in Galway, Mayo, Kerry and Donegal. This is because its seedlings are intolerant of frost, which is very rare along the western coastline due to the oceanic influence, but occurs regularly in winter and spring months further inland, including within Cork City. The crowns and rhizomes of mature plants can survive such conditions, and plants can survive for many decades but the seedlings of these plants will not survive, so they are not invasive in these locations.

The typical approach to kill Gunnera is to treat it with systemic herbicide, usually applied as a spray to the foliage. Systemic herbicides will usually penetrate the crown and rhizomes, but it may not be possible to kill all of the rhizomes with a single treatment, particularly for very mature plants. Infiltration can be improved by drilling small holes in the rhizome and filling them with herbicide.

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Nonetheless, multiple years of treatment are usually required in order to kill all rhizomes. As an alternative, Gunnera plants can be removed manually and destroyed (by burning, mulching, deep burial, etc), thus eradicating them within a single year. However, Gunnera fragments are restricted materials and cannot be disposed of as standard green waste: it may be sent off-site for incineration or deep-burial at a licensed facility (either within Ireland or overseas), or can be chipped or mulched and buried in-situ.

2 Methodology

This report applies the most relevant and current guidance in relation to the treatment and management of non-native invasive plant species in construction projects. The following literature was referred to in preparation of this report.

- NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2010)
- Managing Japanese Knotweed on development sites The Knotweed Code of Practice produced by the Environmental Agency (2013)1
- Managing Invasive Non-native Plants in or near Freshwater, Environment Agency (2010)
- Best Practice Management Guidelines Japanese Knotweed *Fallopia japonica*, Invasive Species Ireland (2015)

¹This document was officially withdrawn by the UK Environment Agency as a guidance document in July 2016 but contains relevant, practical advice and is included here for that reason.

3 Legislation

The control of invasive species in Ireland comes under the Wildlife (Amendment) Act 2000 where it states that:

'Any person who— [...] plants or otherwise causes to grow in a wild state in any place in the State any species of flora, or the flowers, roots, seeds or spores of flora, ['refers only to exotic species thereof'][...] otherwise than under and in accordance with a licence granted in that behalf by the Minister shall be guilty of an offence.'

Under the European legislation, the Birds and Natural Habitats Regulations 2011 (SI 477 of 2011), Section 49(2) prohibit the introduction and dispersal of species listed in the Third Schedule (including Japanese Knotweed) whereby "any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow [....] shall be guilty of an offence."

In addition, under Regulation 50 a person shall be guilty of an offence "*if he or she* […] *offers or exposes for sale, transportation, distribution, introduction or release* [any restricted non-native plant species], *anything from which* [the plants] *can be reproduced or propagated, or a vector material listed in the Third Schedule,* [which includes] *soil or spoil taken from places infested with Japanese Knotweed*". Soil that is contaminated with Japanese Knotweed is also considered a restricted material under the *Waste Management Act 1996* (as amended) and associated regulations.

The implementation of the management measures set out in this plan have been informed by the above legislation.

4 Non-native invasive species in the study area

Non-native invasive species have been identified in a number of areas of the proposed construction works. Invasive plant species which have been identified include Japanese Knotweed and Gunnera. Although these non-native invasive species are present throughout the study area, for the purposes of this scheme, a non-native invasive species management plan will only be put in place within the footprint of the construction works.

Several surveys have been carried out in the study area in the last five years. There was a previous invasive species survey completed in May 2015. Subsequently, All About Trees (AAT) carried out a complete survey in July 2016 covering a number of locations adjoining the River Bride and Glenamought River and up to 3m from the top of the bank in the Blackpool area, North of Cork City. The results of the survey indicated much more Japanese Knotweed than was initially noted in the area. The report recommended that all stands identified in the re-survey and all previously unrecorded Knotweed stands in the zone of influence be treated. Herbicide application was completed in August and September 2016.

AAT completed a follow up survey in August 2017. The herbicide treatment in 2016 was very effective and reduced the extent and density of Japanese Knotweed by almost 50%. The small amount of Gunnera found was noted not to be a priority for treatment and may be left in place until the commencement of construction works. They could be removed prior to site clearance works if required, and do not need to be treated beforehand.

In June 2018, Japanese Knotweed Ireland (JKI) completed another survey of the area to determine the extent of regrowth. Additionally, new locations were identified to be included in the next treatment programme. The treatment was completed from July through September 2018. There was evidence of cutting from an unknown party in some areas, signage in those areas warn against disturbing the Japanese Knotweed.

JKI completed another monitoring survey and report in June 2019 and by August 2019, herbicide treatment was again completed on recommended locations. It was noted at the time that there were areas with limited or no regrowth.

In May 2020, JKI identified two new areas of Japanese Knotweed. Another treatment of the study area took place in September 2020, results of this treatment are pending.

Table 2 provides an overview of annual works completed and general notes on the treatment progression.

Year	Works completed by Works completed		Notes
2015		Survey	N/A
2016	All About Trees	Survey and herbicide treatment	Area treated: 2,637 m ²

Table 2: Summary of works completed in the study area

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^{\\}GLOBAL\EUROPE\CORK\JOBS\264000\264842-004. INTERNAL\4-04 REPORTS\4-04-03 INFRASTRUCTURE\01_BLACKPOOL FRS\10_INVASIVE SPECIES MANAGEMENT PLANISSUE 01\264842-00 BLACKPOOL ISMP_ISSUE01.DOCX

Year	Works completed by	Works completed	Notes	
2017	All About Trees	Survey and herbicide treatment	Extent and density reduced by 50%	
			Regrowth treated: 1,327 m ²	
2018	Japanese Knotweed Ireland	Survey and herbicide treatment	Evidence of cutting, regrowth treated	
2019	Japanese Knotweed Ireland	Survey and herbicide treatment	Areas noted with limited or no regrowth	
2020	Japanese Knotweed Ireland	Survey, treatment completed in September 2020	New areas of growth added to treatment programme. Treatment report pending.	

A summary is given in Table 3 that indicates the required treatment for each specific site ID in the study area. Appendix A provides the 2016 mapping indicating the location of the Site ID numbers within the study area.

Site ID	2016 AAT Glyphosate	2017 AAT Glyphosate	2018 JKI Foliar Spray RoundUp Biactive	2019 JKI Foliar Spray RoundUp Biactive	2020 JKI Pending
G01	-	New area			
J1					
J2			Not required	Not required	
J3		Not required	Not required	Not required	
J4			Not required	Not required	
J5			001, 002, 003, 004, 005, 006,	001, 002, 003, 004, 005, 006, 101, 102	201, 202 New areas
J6 ABCDEF	ABCDEF	ABCDE	ABCDE	ABCDE	
J7					
J8			Not required	Not required	
J9					
J10		Not required	Not required	Not required	
J11		Not required	Not required	Not required	
J12			Not required	Not required	
J13					
J14					
J15			Not required	Not required	
J16		Not required	Not required	Not required	
J17					
J18					
J19					

Table 3: Summary of treated areas (hatched box indicates treatment occurred)

Site ID	2016 AAT Glyphosate	2017 AAT Glyphosate	2018 JKI Foliar Spray RoundUp Biactive	2019 JKI Foliar Spray RoundUp Biactive	2020 JKI Pending
J20			Not required	Not required	
J21					
J22					
J23					
J24					
J25			Not required	Not required	
J26					
J27					
J28			Not required	Not required	
J29					
J30			Not required	Not required	
J31 ABCDE	ABCDE	ABCDE	AC	AC	
J32	-	New area	Not required	Not required	
J33	-	New area	Not required	Not required	
J34	-	New area	Not required	Not required	

The latest mapping of the study area and treatment report from 2019 are provided in Appendix B and Appendix C for reference.

5 Management options

5.1 General measures to avoid spreading invasive species during construction or soil movement

The species noted above are highly invasive, can easily spread to new areas, and are particularly effective at colonising disturbed ground (e.g. construction sites). Japanese Knotweed spreads by the re-growth of cut fragments or root material, so if broken up during site clearance or other earthworks they can readily re-grow in new areas to which soil is moved.

The unintentional spread of invasive species during construction works is a significant issue, and if not managed in the correct manner, species like Japanese Knotweed could be spread to uninfested areas, which would increase the future cost and effort required to control the species, and could pose further public health and safety risks (Knotweed species can cause damage to buildings and infrastructure).

The most common ways that these species can be spread are:

- Site and vegetation clearance, mowing, hedge-cutting or other landscaping activities
- Spread of seeds or plant fragments during the movement or transport of soil
- Spread of seeds or plant fragments through the local surface water and drainage network
- Contamination of vehicles or equipment with seeds or plant fragments which are then transported to other areas
- Importation of soil from off-site sources contaminated with invasive species plant material

As mowing, cutting, and hand pulling easily spread Japanese Knotweed, these are not viable management options and should not be carried out as part of this management plan.

Depending on the timescale for the construction of the proposed scheme it may be possible to eradicate some species prior to the onset of construction on the site via an advance treatment contract (refer to Section 5.2 below); this would be preferable. In addition, hygiene measures will need to be put in place to ensure that the further spread of invasive species is avoided. Refer to the Section 5.4 below on-site hygiene below for further details on same.

5.2 Advance treatment

As mentioned previously, advance chemical treatment works on the Knotweed species have commenced. At least two rounds of treatment have been carried out so far and the survey completed in May 2020 showed that the advance treatment has been effective in substantially reducing the extent of the Japanese Knotweed infestation. The specific treatment method is decided on a site by site basis.

Details on the advance treatment (such as treatment locations, treatment methodologies etc) will be made available to the main Contractor before the construction works commence.

5.3 Pre-construction survey

As species may have spread, or their distribution may have changed, between the survey completed in May 2020 and the commencement of the main construction works, the implementation of this Invasive Species Management Plan will require a pre-construction re-survey by a suitably qualified person within the proposed scheme boundary and any additional areas where construction works are required (e.g. temporary construction compounds, haul routes etc.). In accordance with the TII guidance this survey will produce accurate 1:5,000 scale mapping for the precise location of invasive species.

The pre-construction surveys will be undertaken by suitable experts with competence in identifying the species concerned having regard to any seasonal constraint.

5.4 Site hygiene

Maintaining site hygiene at all times in an area where invasive non-native species are present is essential to prevent further spread. It is also necessary on sites where invasive non-native species are not present but where there is risk of contaminated material being brought to site, for example, site machinery being used on multiple sites, construction staff travelling between infested and not infested sites. Preventative measures must be taken. Construction equipment, vehicles and footwear may provide a vector for the spread of invasive non-native species.

The following site hygiene measures shall be taken for each site where applicable:

- In relation to Knotweed plant species, understand the possible extent of the rhizome (root) system underground up to 7m horizontally and 3 meters vertically.
- Fence off the infested areas prior to and during construction works where possible in order to avoid spreading seeds or plant fragments around or off the construction site. In relation to Knotweed plant species, allow for a 10m buffer around the area.
- Clearly identify and mark out infested areas. Erect signs to inform Contractors of the risk.
- Avoid, if possible, using machinery with tracks in infested areas.
- Clearly identify and mark out areas where contaminated soil is to be stockpiled on site and cannot be within 50m of any watercourse or within a flood zone.
- Create designated entry and exit points for operators on foot and for small mobile equipment.

A delineated access track to be maintained free of non-native invasive species to be established through the site to avoid the spread of Japanese Knotweed by permitted vehicles accessing the site.

- Installation of a dedicated footwear and vehicular wheel wash down facility into a contained area within each works site.
- Vehicles leaving the site to be inspected for any plant material and washed down into a contained area.
- Vehicles used in the transport of contaminated material will need to 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.
- Transportation of contaminated material will need to be in covered trailers and haul routes should be prepared in advance using root barrier membrane and hardcore as required.
- Material gathered in dedicated wash down contained areas will need to be appropriately treated along with other contaminated soil on site. Refer to sections below in relation to treatment methods.
- If soil is imported to the site for landscaping, infilling or embankments, the Contractor shall gain documentation from suppliers that it is free from invasive species.
- Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan.
- Erection of adequate site hygiene signage in relation to the management of non-native invasive material.

5.5 **Treatment methods**

In addition to the advance treatment works and pre-construction survey, when the works areas become available to the Contractor for fencing and commencement of site clearance, areas identified as requiring specific treatment will be demarcated and the designated control measures implemented at the earliest possible stage to reduce the risk of spread along the proposed scheme or beyond the land take.

There are a number of management options that may be implemented to control and prevent the spread of invasive species. These are presented in the sections below. It is also noted that it may not be possible to completely eradicate the invasive species before or during the construction phase. For example, where structures are proposed at sites that contain Japanese Knotweed, root barrier membranes may require to be installed to protect the structures from the plant. The design of these membranes will form part of the detailed design stage.

It should be noted that those involved in the application of herbicides/pesticides must be competent to do so and, consequently, must have sufficient training, experience and knowledge in the area of herbicides/pesticides application.

It is important that all staff involved in the application of herbicides/pesticides have received appropriate training, which may include achieving competency certification in the safe use of herbicides/pesticides through a National Proficiency Tests Council registered assessment centre or achieving an appropriate FETAC award in this area.

Given the constraints of the physical site boundaries and flooding risks in the area, it is likely that chemical treatment, as described in Section 5.5.1, will be the most suitable method for the identified invasive species.

5.5.1 Chemical treatment

The control of some species will require the use of herbicides (if not buried), which can pose a risk to human health, to non-target plants or to wildlife. In order to ensure the safety of herbicide applicators and of other public users of the site, a qualified and experienced Contractor will be employed to carry out all work. It is advised that the Contractor refer to the following documents, which provides detailed recommendations for the control of invasive species and noxious weeds:

- Chapter 7 and Appendix 3 of the TII Publication: The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA, 2010)
- Invasive Species Ireland Best Practice Management Guidelines for Japanese Knotweed (2015)
- The Knotweed Code of Practice: Managing Japanese Knotweed on development sites (UK Environment Agency, 2013)

These documents include measures to aid the identification of relevant species, with details for the timing, chemicals and methodology for chemical control, and for measures to avoid environmental damage during the use of herbicides.

Chemical treatment involves the application of an herbicide to invasive species plant such as Japanese Knotweed stands without any excavation or removal of the plant material. The preferred types of herbicides to be used in the treatment of Knotweed are Glyphosate and 2,4-D Amine. Generally, if herbicide is applied as the treatment option, it will need to be reapplied for up to five years after the first application to ensure the plant control measures have been effective, or monitored for a minimum of two years during which no regrowth is recorded.

Glyphosate is non-persistent and can be used near water but it is not selective (i.e. it is a broad spectrum chemical - will impact all plant species) whereas 2,4-D Amine, can be persistent for up to one month, can also be used near water but is more selective on certain plants. The selection of chemical will depend on the site conditions, proximity to water, surrounding habitats etc.

The most effective time to apply Glyphosate is from July to September (or before cold weather causes leaves to discolour and fall). The majority of herbicides are not effective during the winter dormant stage because they require living foliage to take up the active ingredient. It is essential that a competent and qualified person carries out the herbicide treatment.

Reapplication rates will depend on site specific considerations including the extent of the infestation, its location, and the time of year treatment commences. Details of the proposed chemical treatment plan will be required in the site-specific invasive species management plan.

Foliar treatment (spraying) is usually applied with a sprayer such as a knapsack sprayer or a larger spray system. It is important to use a treatment dye to identify clearly all areas treated. It is an efficient way to treat large monocultures of invasive plants, or to spot-treat individual plants that are difficult to remove mechanically such as Japanese Knotweed.

In the case of Knotweed, depending on weather and temperatures in the days following the initial treatment, and to ensure optimal uptake of herbicide into the rhizome system, a second similar treatment will be required usually within ten days, before the internal vascular system is no longer capable of translocating the herbicide to the root system. While the upper surface of the leaves will be easier to treat, it is also important to treat the leaf under surface as Knotweed possesses many stomata openings on the leaf under surface. Dead stems should be cut, removed and burned on/off site in accordance with the Waste Management Acts 1996 as amended and the Waste Management (Prohibition of Waste disposal by burning) Regulations 2009 (SI 286).

The stem injection method is sometimes used for Japanese Knotweed control. This treatment requires a higher concentration of the active ingredient than is used in foliar applications. It involves the use of a specialist herbicide injection tool whereby the injection tool injects the herbicide directly into each of the canes approximately 20-30cms from the base of each cane (between the 1st and 2nd nodule).

Subsequently approximately 10 mL of herbicide mix is injected into each cane at a ratio of 5:1 through the use of a specialist stem injection tool. The application of glyphosate based products, are most effective when applied in the early Autumn (mid to late Sept). Regrowth will occur in subsequent years, albeit much less vigorously, which will require follow up treatment at the appropriate time of year. Spot treatment will be required each year until no regrowth is observed.

In order to ensure that the use of herbicides does not contravene legislation, the Contractor must comply with Circular Letter NPWS 2/08 dealing with the application on to non-target areas from the National Parks and Wildlife Service.

Similar chemical treatment can be used for Gunnera during active growth late in the growing season between late August to early September.

5.5.2 Excavation and chemical treatment

This option employs both physical and chemical methods of treatment. This method is employed in situations where treatment of invasive species, in particular Knotweed, is required to be completed in a shorter timeframe. The Environment Agency suggest that by digging up the rhizomes and recultivating it stimulates plant growth and will result in more successful herbicide application and management.

In summary this management method requires cutting and killing of the surface plant. The cut material must be left on top of plastic sheeting until dried out and subsequently monitored for any sign of regrowth (this is not recommended for a river bank habitat where there is the possibility of flooding occurring). They should not be placed in a green waste recycling bin. Once dried out, the material should be burned on site in accordance with the Waste Management Acts 1996 as amended and the Waste Management (Prohibition of Waste disposal by burning) Regulations 2009 (SI 286). The surface of the affected area should be raked with tines to remove crowns and surface material, and in order to break up the rhizomes, bringing them to the surface, which will stimulate leaf production. This will make the plant more vulnerable to herbicide treatment. The more rhizomes that are brought to the surface, the more growth will occur and allowing for a more successful treatment. An excavator can be used to scrape the surface crowns and rhizomes into a pile and then cultivate the ground to stimulate rhizomes to produce higher density of stems for treatment. Reapplication of herbicide may be required for up to five years after initially application, subject to the site specific management plan.

As the site for the proposed scheme is at risk of flooding, the excavation and chemical treatment is not deemed suitable for this project unless the Contractor can identify a suitable area that is not at risk of flooding and within the confines of the site boundary.

5.5.3 Excavation and burial

Excavated material containing Knotweed can also be buried on site. This will require burying the material at a depth of at least five metres. The contaminated material must be covered with a root barrier membrane before being backfilled with topsoil or other suitable fill material. The membrane must stay intact for at least 50 years. A manufacturer's guarantee is required. An accurate map and record of the location of the burial site to prevent any future accidental disturbance is required, and future owners shall be informed of its position. If soil containing Japanese Knotweed is stockpiled, the material must be stored in a manner that will not harm health or the environment. The stockpile should be on an area of the site that will remain undisturbed. The area should be clearly fenced and signed, and should be regularly treated with herbicide to prevent any regrowth or reinfestation.

As a precaution, the stockpiled material should be laid on a root barrier membrane and covered to avoid contaminating the site further.

As the site for the proposed scheme is at risk of flooding, the excavation and burial treatment is not deemed suitable for this project unless the Contractor can identify a suitable area that is not at risk of flooding and within the confines of the site boundary.

5.5.4 Excavation and root barrier cell method

Excavated material containing Knotweed can also be buried on site within a root barrier membrane cell. Similar procedure to above.
This will require burying the material at a depth of at least two metres. The contaminated material must be within a contained cell consisting of a root barrier membrane before being backfilled with topsoil or other suitable fill material. The membrane must stay intact for at least 50 years. A manufacturer's guarantee is required. Stockpiling method as above.

Due to concerns over future land use, this method is not deemed suitable for this project.

5.5.5 Excavation and bund method

Where there is not sufficient depth on a site for deep burial the Environmental Agency Guidelines set out another option whereby such excavated material is placed in a structured bund. The bund will comprise 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 needs to be clearly signed and protected from potential accidental damage. Reapplication of herbicide may be required for up to five years after the initial application, subject to the site-specific management plan.

This method is not deemed suitable for the proposed scheme, as a suitable bund location could not be identified within the site boundary.

5.5.6 Excavation and removal from site

Where the above treatment options are not possible (site is too small to contain excavated material, too shallow for burial, or where there is lack of space or where the infestation simply cannot be avoided by the construction works) removal of excavated material may be the only option. Where there are small amounts of Knotweed material to be removed it is possible to double bag the material and send to a fully licenced waste facility for disposal (i.e. landfill). Where the amount of material is larger in volume it will be necessary to haul from site to a suitably licenced waste facility. It should also be noted that in the process of excavated material will need to be classified as hazardous waste and there will need to be disposed of to a hazardous waste facility.

If any invasive species plant material is collected (e.g. by hand-pulling or mowing), it is important that its disposal will not lead to a risk of further spread. The movement of invasive plant material requires a licence from the National Parks and Wildlife Service (NPWS) under Section 49 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended).

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Invasive species (particularly roots, flower heads or seeds) will be disposed of at licensed waste facilities or composting sites, appropriately buried, or incinerated having regard to relevant legislation. For example Section 32 of the Waste Management Act, 1996 to 2008; Section 4 of the Air Pollution Act, 1987; relevant local authority byelaws and any other relevant legislation). All disposals will be carried out in accordance with the relevant Waste Management legislation (as per guidance from NRA, 2010). It should be noted that some invasive species plant material or soil containing residual herbicides may be classified as either 'hazardous waste' or 'non-hazardous waste' under the terms of the Waste Management Acts, and both categories may require special disposal procedures or permissions. Advice will be sought from a suitably qualified waste expert regarding the classification of waste and the suitability of different disposal measures. As noted above, additional specific measures for the management of Japanese Knotweed cuttings or contaminated soil can be found in the UK Environment Agency document The Knotweed Code of Practice: Managing Japanese Knotweed on development sites (UK Environment Agency, 2013).

6 Management during the operational phase

6.1 **Protecting flood defence structures**

As part of the operation phase there will need to be on-going treatment of nonnative invasive species. A management plan for the operational phase will need to be formulated by the Contractor in consultation with the relevant bodies i.e. NPWS, IFI, OPW, and Cork County Council.

Site hygiene protocols will need to be implemented.

6.2 Channel maintenance works

During channel maintenance works, a management plan will need to be put in place to prevent the spread of non-native invasive species downstream during those works.

Site hygiene protocols will need to be implemented.

As discussed above, the management plan for the operational phase will need to be formulated in consultation with the NPWS, IFI, OPW, and Cork County Council.

7 Conclusion

The presence of non-native invasive species along the works areas of the proposed scheme requires the need for an Invasive Species Management Plan to be finalised prior to construction commencing. This Plan shall be written by a qualified ecologist.

Given the nature of the species and the rate of growth, each proposed works site will need to be re-surveyed prior to works. Site hygiene will be particularly important on sites where invasive species are present but also 'clean' sites. Incoming vehicles, and equipment (including footwear worn by all site visitors) will need to be cleaned and inspected before coming on site and upon leaving, to prevent the further spread of the plant.

Where possible material will remain on site and be reused. Any material that must be removed off site to landfill or other suitable facility will require a licence from the National Parks and Wildlife Service.

The Plan must be clearly communicated to all site staff and must be adhered to if it is to be implemented successfully.

An updated treatment report and mapping will be received from JKI detailing the completed programme from September 2020.

8 References

NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2010)

Managing Japanese Knotweed on development sites - The Knotweed Code of Practice produced by the Environmental Agency (2013)

Managing Invasive Non-native Plants in or near Freshwater, Environment Agency (2010)

Best Practice Management Guidelines Japanese Knotweed *Fallopia japonica*, Invasive Species Ireland (2015).

Appendix A

All About Trees Mapping 2016



