O'Hanrahan Bridge Widening

Natura Impact Statement | March 2023

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KILDARE
nro
NATIONAL ROADS OFFICE

Wexford
County Council

O'Hanrahan Bridge Widening

Natura Impact Statement

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1. INTRODUCTION

1.1 Background

Roughan & O'Donovan (ROD) was commissioned by Kildare County Council (KCC) to prepare a Natura Impact Statement (NIS) in relation to the widening of O'Hanrahan Bridge, New Ross ("the proposed development").

The requirements arising out of Article 6(3) of Council Directive 92/43/EEC of 21 August 1992 on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive") in relation to appropriate assessment are transposed into Irish law by Part XAB, Appropriate Assessment (sections 177R to 177AE of the Planning and Development Act 2000 (as amended)) and by the European Communities (Birds and Natural Habitats) Regulations 2011 as amended[1] (S.I. No.477 of 2011) (the Habitats Regulations), including Part 5 thereof). In accordance with Article 6(3) of the Habitats Directive and Part XAB of the Planning and Development Act, 2000 (as amended), an Appropriate Assessment (AA) Screening Report was prepared to assess whether or not the proposed development, either individually or in combination with other plans or projects, was likely to have a significant effect on one or more sites of Community importance for nature conservation ("European sites").

The AA Screening Report, which was prepared by ROD on behalf of KCC concluded, in view of best scientific knowledge and the Conservation Objectives of the sites concerned, that, in the absence of appropriate mitigation, the proposed development had the potential to significantly affect two European Sites, namely the River Barrow and River Nore SAC and the River Nore SPA. On the basis of that conclusion, it was determined that AA was required in order to assess the implications of the proposed development for those sites.

In accordance with Article 6(3) of the Habitats Directive and section 177V of the Planning and Development Act 2000 (as amended), it is the Competent Authority – in this case Wexford County Council – which carries out the appropriate assessment (AA) which includes inter alia (i) an examination (ii) an analysis (iii) an evaluation (iv) the making of findings (v) the making of conclusions and (vi) the making of a final determination.[2]

This document comprises the NIS in respect of the proposed development and has been prepared by ROD on behalf of KCC. It contains an examination, analysis and evaluation of the likely impacts from the proposed development, both individually and in combination with other plans and projects, in view of best scientific knowledge and the Conservation Objectives of the European sites concerned. It also prescribes appropriate mitigation to ensure that the proposed development will not adversely affect the integrity of those sites. Finally, it provides complete, precise and definitive findings which are capable of removing all reasonable scientific doubt as to the absence of adverse effects on the integrity of the European sites concerned and sets out detailed reasons which explains the basis for such findings.

1.2 Competent Experts

This AA Screening Report was prepared by Patrick O'Shea and Kalvin Townsend-Smyth with assistance from Rachel Heaphy. Patrick is a Senior Ecologist with over ten

[1] Including inter alia S.I. 290 of 2013; SI 499 of 2013; SI 355 of 2015; the Planning, Heritage and Broadcasting (Amendment) Act 2021, Chapter 4; SI 293 of 2021.
[2] *Waddenzee* (CaseC-127/02) [2004] ECR I-7405; *Commission v Spain* (Case C-404/09) [2011] E.C.R. I-11853; *Sweetman* (Case C-258/11).

years' experience in ecological assessment. He holds a degree in Botany from Trinity College Dublin and an MSc in Ecological Management and Conservation Biology from Queen's University Belfast. Patrick is a Full member of the Chartered Institute of Ecological and Environmental Management (CIEEM). Kalvin is an Ecologist with over three years' experience in ecological assessment. He holds a BSc (Hons) in Wildlife Biology from Munster Technological University and is a Qualifying member of CIEEM (QualCIEEM). Rachel is a Graduate Ecologist with one year's experience in ecological assessment. She holds a BSc (Hons) in Zoology from University College Cork and an MRes degree (with distinction) from the University of Roehampton. She is a Qualifying member of CIEEM (QualCIEEM).

1.3 Legislative Context

Council Directive 92/43/EEC of the 21st May 1992 on the conservation of natural habitats of wild fauna and flora ("the Habitats Directive") and Directive 2009/147/EC of the European Parliament and of the Council of the 30th November 2009 on the conservation of wild birds ("the Birds Directive") list habitats and species which are important for conservation and in need of protection. This protection is afforded in part through the designation of sites which support significant examples of habitats or populations of species ("European sites"). Sites designated for birds are termed "Special Protection Areas" (SPAs) and sites designated for natural habitat types or other species are termed "Special Areas of Conservation" (SACs). The complete network of European sites is referred to as "Natura 2000".

In order to ensure the protection of European sites in the context of land use planning and development, Article 6(3) of the Habitats Directive provides for the assessment of the implications of plans and projects for European sites, as follows:

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

The requirements arising out of Article 6(3) are transposed into Irish law by Part XAB, including section 177V, of the Planning and Development Act 2000 (as amended)), and in other circumstances by Part 5 of the Habitats Regulations.

The determination of whether or not a plan or project meets the two thresholds for requiring AA is referred to as "Stage 1" or "AA Screening". The first threshold is reached if the plan or project is not directly connected with or necessary to the management of one or more European sites. In its ruling in Waddenzee[3], the Court of Justice of the European Union (CJEU) interpreted the second threshold as being reached where "it cannot be excluded, on the basis of objective information, that [the plan or project] will have a significant effect on that site". Thus, in applying the Precautionary Principle, the CJEU interpreted the word "likely" to mean that, as long as it cannot be demonstrated that an effect will not occur, that effect is considered "likely". A likely effect is considered to be "significant" only if it interrupts or causes a delay in achieving the Conservation Objectives of the site concerned[4].

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

[4] Conservation Objectives are referred to, but not defined, in the Habitats Directive. In Ireland, Conservation Objectives are set for Qualifying Interests (the birds, habitats or other species for which a given European site is selected) and represent the overall

Prior to approval of a plan or project which is the subject of AA (also referred to as "Stage 2"), it is necessary to "ascertain" that the plan or project will not "adversely affect the integrity of the site". In its guidance document (EC, 2018), the European Commission stated that "*the integrity of a site involves its constitutive characteristics and ecological functions*" and that "*the decision as to whether it is adversely affected should focus on and be limited to the habitats and species for which the site has been designated and the site's conservation objectives*". Regarding the word "ascertain", the CJEU, also in Waddenzee, interpreted this as meaning "where no reasonable scientific doubt remains as to the absence of such effects". Therefore, the legal test at Stage 2 is satisfied (and the plan or project may be authorised) when it can be demonstrated beyond reasonable scientific doubt that the plan or project will not interrupt or cause delays in the achievement of the Conservation Objectives of the site or sites concerned. AA is informed by a "Natura Impact Report" (NIR) in the case of plans or a "Natura Impact Statement" (NIS) in the case of projects.

The CJEU has made a relevant judgment on what information should be contained within documents supporting AA[5] (in the NIR or NIS):

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

The High Court and Supreme Court[6] have also provided clarity on how competent authorities should undertake AA[7] and has stated that the following four matters require to be addressed:

- First, an appropriate assessment must identify, in the light of the best scientific knowledge in the field, all aspects of the development project which can, by itself or in combination with other plans or projects, affect (a) European site(s) in the light of its conservation objectives;
- Second, there must be complete, precise and definitive findings and conclusions regarding the previously identified potential effects on any relevant European site(s) and may not have lacunae or gaps. The requirement for precise and definitive findings and conclusions requires analysis, evaluation and decisions. Further, the reference to findings and conclusions in a scientific context requires both findings following analysis and conclusions following an evaluation each in the light of the best scientific knowledge in the field;
- Third, on the basis of those findings and conclusions, the Competent Authority (here Wexford County Council) must be able to determine that no scientific doubt remains as to the absence of the identified potential effects;
- Fourth, where the aforesaid three requirements are satisfied, Wexford County Council may determine that the proposed development will not adversely affect the integrity of any relevant European site. Accordingly, an appropriate assessment may only include a determination that the proposed development will not adversely affect the integrity of any relevant European site where upon the basis of complete, precise and definitive findings and conclusions made,

target that must be met for that Qualifying Interest to reach or maintain favourable conservation condition in that site and contribute to its favourable conservation status nationally.

[5] Sweetman v. An Bord Pleanála [2013] Case C-258/11.

[6] See Kelly (Eoin) v An Bord Pleanála [2014] I.E.H.C. 400 where the High Court (Finlay Geoghegan J.) held that section 177V(1) of the Planning and Development Act 2000 (as amended) must be construed so as to give effect to Article 6(3) of the Habitats Directive, and hence, an appropriate assessment carried out under section 177V(1) of the 2000 Act must meet the requirements of Article 6(3) of the Habitats Directive as interpreted by jurisprudence of the CJEU case law; Connelly v An Bord Pleanála [2018] 2 I.L.R.M 453; [2018] I.E.S.C. 31.

[7] Kelly v. An Bord Pleanála [2014] I.E.H.C. 422.

Wexford County Council decides that no reasonable scientific doubt remains as to the absence of the identified potential effects.

1.4 Methodology

In accordance with the requirements for AA, this NIS assesses the likely effects of the proposed development on the integrity of the European sites "screened in" at Stage 1. This assessment is undertaken in six steps, as follows:

1. Step 1 involves gathering all of the information and data that will be necessary for a full and proper assessment. These include, but are not limited to, the details of all phases of the plan or project, environmental data pertaining to the area in which the plan or project is located, e.g., rare or protected habitats and species or invasive species present or likely to be present, and the details of the European sites within the zone of influence.
2. Step 2 involves examination of the information gathered in the first step and detailed scientific analysis of the effects of the plan or project on the ecological structure and function of the receiving environment, focussing on European sites.
3. Step 3 evaluates the effects analysed in Step 2 against the Conservation Objectives of the relevant European site or sites, thereby determining whether or not they constitute adverse effects on site integrity.
4. Having established that the plan or project will adversely affect the integrity of one or more European sites, Step 4 involves the development of appropriate mitigation, including, where appropriate, monitoring and enforcement measures, to eliminate or minimise those effects such that they no longer constitute adverse effects on the integrity of the site(s) concerned, as well as consideration of the significance of any residual (post-mitigation) effects.
5. Step 5 involved the assessment of the significance of any residual effects arising from the proposed development in combination with other plans or projects.
6. Step 6 involves the final determination of whether or not the plan or project will adversely affect the integrity of one or more European sites. Notwithstanding the final recommendation made in the NIS, the responsibility for completing this step lies solely with the competent authority.

The following guidance documents informed the assessment methodology:

- EC (2021) *Assessment of plans and projects in relation to Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. Environment Directorate-General of the European Commission.
- EC (2018) *Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Commission, Brussels.
- DEHLG (2010) *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government, Dublin.
- NPWS (2010) *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities*. Circular Letter NPWS 1/10 & PSSP 2/10. Department of the Environment, Heritage and Local Government, Dublin.
- OPR (2021) *Appropriate Assessment Screening for Development Management*. Office of the Planning Regulator, Dublin.

1.5 Ecological Assessment

In order to fully inform this NIS, it was necessary to establish the baseline ecological conditions in the receiving environment, particularly with regard to European sites. This was achieved by undertaking desktop studies, carrying out field surveys and engaging in consultations with the relevant stakeholders, including the National Parks & Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI).

1.5.1 Desk Study

During the desk study, the statutory consultee, the NPWS, provided data on designations of sites, habitats and species of conservation interest. This included reports pursuant to Article 17 of the Habitats Directive[8] (NPWS, 2019a, b, c) and Article 12 of the Birds Directive (Eionet, 2018)[9], as well as the Site Synopses, Natura 2000 Standard Data Forms and Conservation Objectives (including supporting documents) for the relevant European sites. A review of the literature relating to aquatic species of conservation concern likely to be present in the Barrow-Nore-Suir Estuary was undertaken and included a number of local studies including a review of records from IFI's fish sampling, conducted under the Water Framework Directive (WFD) and as part of reporting requirements under Article 17 of the Habitats Directive. A review of the EPA Q-value status and WFD surface water quality and risk status for the River Barrow was also undertaken.

The desk studies involved thorough reviews of existing information relating to ecology in the vicinity of the proposed development. A number of web-based geographic information systems (GISs) were used to obtain information relating to the natural environment surrounding the proposed development. These included the NPWS *Designations Viewer* (NPWS, 2022b), which provided information on the locations of protected sites, the National Biodiversity Data Centre's *Biodiversity Maps* (NBDC, 2022), which provided recent and historic records of rare and protected species in the area, and Ordnance Survey Ireland's *GeoHive*, which provided additional information on the wider environment.

Other resources used during the desk study included the following:

- Environmental Protection Agency (EPA) Unified GIS Application provided data in relation to the Water Framework Directive Risk/Status of waterbodies in the Zone of Influence.
- IFI fish sampling reports for the Water Framework Directive (2010-2018).

As with all desk studies, the data considered were only as good as the data supplied by the recorders and recording schemes. The recording schemes provide disclaimers in relation to the quality and quantity of the data they provide, and these were considered when examining outputs of the desk study.

1.5.2 Consultations

Throughout both the design and the environmental assessment processes, there were consultations both with the NPWS and IFI, as the statutory consultees. These included both written correspondence and meetings.

[8] Under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive.
[9] Every three years, Member States of the European Union are required by Article 12 of the Birds Directive to report on implementation of the Directive. The most recent reporting available is for the period 2008-2012.

Consultation allowed for in-depth discussion of ecological sensitivities at the site of the proposed development and at specific stages in its construction, as well as discussion of how the adverse effects could be mitigated.

A summary of these consultations relevant to Appropriate Assessment is presented in Table 1-1 below. All issues raised by the consultees have been addressed in this NIS as far as possible.

Table 1-1 Details of consultations

Consultee	Date	Summary of Response
National Parks & Wildlife Service (NPWS) / Development Application Unit (DAU)	27th January 2022	NPWS provided records of rare and protected species and habitats in the zone of influence.
	23rd February 2022	NPWS was invited to provide observations relating to the proposed development. The DAU made the following observations: • No significant details of the project or its construction may be deferred to the post-consent stage as this may suggest the impacts are not fully known at consent stage. • In-combination effects of this project should be included as required and appropriate. • The quantum and proportion of Annex I habitat which will be permanently lost should be provided and an impact assessment be made with reference to the targets of the SAC's Conservation Objectives. • The views of Inland Fisheries Ireland should be sought at pre-planning stage. • Impacts to Otter including disturbance from any increase in lighting of the bridge must be assessed as it is an offence to disturb these Annex IV species wherever they occur, particularly during breeding, rearing, hibernation and migration. • Control or management of invasive alien species should be undertaken with *'The Management of Invasive Alien Plant Species on National Roads – Standard'* and *'The Management of Invasive Alien Plant Species on National Roads – Technical Guidance'* (TII 2020).
Inland Fisheries Ireland (IFI)	20th December 2021	IFI was invited to provide observations on the proposed development. IFI made the following observations following a request for a preplanning consultation: • Consideration for the potential for suspended solids to enter the waterbody. • Noise and vibration impacts associated with the works. • The storage of fuels, oils, materials and equipment associated with the works.

Consultee	Date	Summary of Response
	26th January 2022	A meeting was held with IFI over Microsoft Teams on 26th January 2022. IFI made the following points and requests: • No-net deterioration of artificial light spill onto water should be allowed from existing conditions of the bridge. • Method statements should be prepared in accordance with the construction methodology outlined in the planning report and the NIS. • Allowing area to dewater naturally is acceptable to provide fish time and routes to escape during piling. • IFI should be kept informed throughout the development of the project and be made aware of any issues that may arise.

1.5.3 Field Surveys

Field surveys were conducted within the study area on 9th September 2021 and 19th January 2023 by ROD ecologist Kalvin Townsend-Smyth.

The surveys adhered to the following guidelines:

- *Ecological Survey Techniques for Protected Flora and Fauna during the Planning of National Road Schemes* (TII, 2008c).
- *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (TII, 2009).
- *Best Practice Guidance for Habitat Survey and Mapping* (Smith et al., 2011).

The purpose of the ecological surveys was to establish the presence or likely presence of features, habitats and species of conservation interest at the site. The potential presence of habitats or species listed as Qualifying Interests of European sites in the vicinity of the proposed development was a material consideration in the planning and execution of the ecological surveys.

The surveys with relevance to the NIS are described below.

Habitats

Habitats were classified in accordance with *A Guide to Habitats in Ireland* (Fossitt, 2000) and mapped following Smith et al. (2011). The whole site plus a 150 m buffer around the proposed development was systematically and thoroughly walked, and all habitats were classified and sketched onto maps. The field surveys also aimed to identify any habitats corresponding to types listed on Annex I to the Habitats Directive using the *Interpretation Manual of European Union Habitats* (EC, 2013). The presence (or signs) of protected fauna, including birds, mammals, amphibians and reptiles were noted during the surveys.

Watercourses, Fisheries and Aquatic Fauna

Aquatic habitats were assessed as part of the field surveys. Notes were made on the morphology, physical characteristics and potential of the river habitat to support protected flora and fauna. The surveys focussed particularly on the suitability of the River Barrow in the vicinity of the proposed development for fish and other aquatic

species. The survey also aimed to confirm the presence or likely presence of Qualifying Interests of the River Barrow and River Nore SAC, e.g., Sea Lamprey, River Lamprey, Twaite Shad, Atlantic Salmon and Otter, as well as estuarine Annex I habitats.

Given that the proposed development is located within the tidal reach of the River Barrow, species which are limited to freshwater habitats, the presence of Freshwater Pearl Mussel and White-clawed Crayfish could be excluded.

Otter

An Otter survey was conducted adhering to best practice guidelines (TII, 2008a & b), and involved a systematic search of the footprint of the proposed development and a 50 m buffer, where accessible. It also included 150 m upstream and downstream of O'Hanrahan Bridge along the River Barrow. The survey involved a search for signs of otter activity (prints, spraints, trails, holts, couches, slides, feeding remains etc.).

Birds

Birds were recorded incidentally during the field surveys both within and outside of the footprint of the proposed development. All bird species were recorded using standard species codes from the British Trust of Ornithology (BTO). Breeding evidence for each species was also collected, noting 'possible', 'probable' and 'confirmed' breeding status outlined in *Bird Atlas 2007-11* (BTO, 2011).

Invasive Alien Plant Species

During the field survey, the presence of invasive species was recorded. The focus was on identifying species subject to restrictions under Section 49 of the Habitats Regulations or which pose a threat to the integrity of European sites. Target notes were taken on any invasive species identified. Information recorded included the area of infestation, plant condition, height and location. Site features that could affect control measures such as adjacent land use, structures and services were also recorded.

Benthic Surveys

UCC Aquatic Services Unit carried out surveys at low tide. A site walkover was undertaken to identify any hard benthos habitats and to obtain general overview of the site. Soft sediment sampling was undertaken at six locations (three on either side of the River Barrow), which were selected from the high water to low water level. At each of the sampling locations, replicate core samples were taken and an area was marked out and dug through to identify any large fauna. A small sample of sediment was also collected from each site for granulometric and loss on ignition analyses. The full methodology used during the benthic habitat survey is detailed in the reports provided in Appendix C.

1.5.4 Assessment

Once established, the ecological baseline in the receiving environment was used to inform the assessment of the likely ecological effects of the proposed development, particularly with regard to European sites. Any assumptions that had to be made in view of gaps in the ecological data or other information were made in strict accordance with the Precautionary Principle.

2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Overview of the Proposed Development

O'Hanrahan Bridge is a 9-span post-tensioned concrete beam and reinforced concrete slab bridge over the River Barrow in New Ross town, Co. Wexford. The overall length of the bridge is 175m with an overall width of 11.6m. The proposed works aim to widen the bridge deck by approx. 1m in order to accommodate an enhanced combined pedestrian and cycleway. The widening works are to take place on the southern side of the bridge through the replacement of the existing bridge deck cantilever and parapet edge beam. As a result, the instream piers will not be affected. However, in order to tie the new widened section into the quays at the eastern end and ensure continuity of the new cycleway, the proposed development requires for a 20m long section of the existing quay wall on the south-east corner of the bridge to be reconstructed up to 2m out from the existing quay wall. This section will require working instream. Similarly, approx. 60m section of the south-west corner of the bridge will require widening works by approximately 1m out from the existing wall. The length of new sheet piles in front of the wingwalls will be approximately 19m, of which 5m will be located directly in the river. The remaining 41m of new wall will be constructed in front of the existing flood wall, all driven at the top of the embankment above the water level.

In addition, the edge beam on the northern side of the bridge will be strengthened to accommodate upgrading of the existing parapet. The existing surfacing and footways will be removed to allow the provision of bridge deck waterproofing and joint replacements before the widened footways are constructed and carriageway surfacing reinstated. The works will involve a number of service diversions and upgrades in both footways. Finally, it is also proposed to replace the existing bridge lighting.

Concrete repair works will also be undertaken on the existing O'Hanrahan bridge in areas where minor concrete defects are identified.

2.2 Location of the Proposed Development

O'Hanrahan Bridge is located in the urban centre of New Ross, in Co. Wexford, where it carries the single carriageway R723 Regional Road over the River Barrow as shown in Figure 2-1 below. The River Barrow system rises in the Slieve Bloom Mountains in Co. Laois and flows predominantly through undulating lowlands before entering the sea along the border of Co. Waterford and Co. Wexford. The river forms the boundary between County Wexford and County Kilkenny for the most part, the catchment includes a considerable amount of arable land, as well as pasture, woodland and large towns such as New Ross.

The bridge is located within the urban environment of New Ross town, with the adjacent land use mainly consisting of commercial and residential use. The setting is urban with the bridge site surrounded by a mix of historic buildings and structures, tourism sites and commercial properties on the eastern side; and residential, commercial, and industrial properties on the western side.

The N25 previously travelled over O'Hanrahan Bridge as the main link between County Wexford and County Waterford until January 2020 when the New Ross Bypass was officially opened.

The primary function of the proposed development is to provide a shared pedestrian and cycleway from the New Ross quay front to Rosbercon Quay on the southern side

of the bridge (see Figure 2-1), that is accommodated along the widened section of O'Hanrahan Bridge.

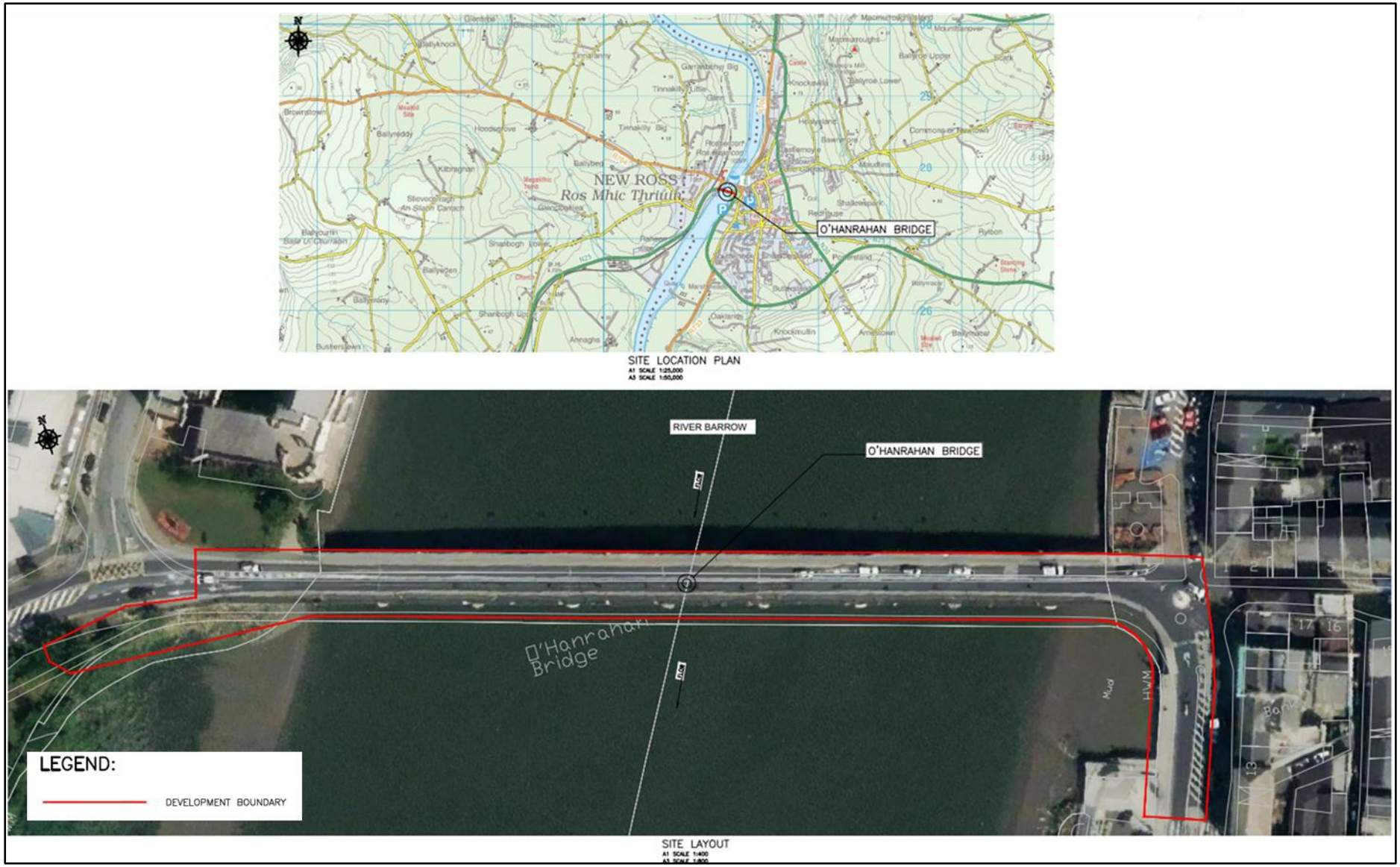


Figure 2-1 Location of the proposed development © Google Maps

Plate 2-1 **New Ross Quay with view to the north. In the foreground are the existing road, footpath and the existing flood defence wall at the south-east corner that is within the proposed development. In background is the O'Hanrahan Bridge. © Google Street View**

Plate 2-2 **O'Hanrahan Bridge with view to the north-west. In the foreground are the existing road of the bridge and the narrow footpaths along the sides that are proposed to be widened as part of the development. The existing parapets are proposed to be replaced. © Google Street View**

Plate 2-3 **New Ross Quay with views to the south. In the foreground are the existing road, parking spaces, existing flood defence wall and a public realm consisting of a small square with benches and flower beds. In the background is the O'Hanrahan Bridge and the Rosbercon Quay. © Google Street View**

Plate 2-4 **Rosbercon Quay with view to the east. The proposed development will provide a connection to the South – East Greenway that will be part of the existing road in the foreground. In the background is the O'Hanrahan Bridge. © Google Street View**

2.3 Design of the Proposed Development

2.3.1 Ground Investigations

A separate Ground Investigation (GI) works contract will be undertaken prior to the commencement of the main works. The proposed GI is focused on the southeast and southwest quay wall to inform the design of the proposed sheet pile wall and consists

of three river boreholes BH01, BH02 and BH03, see Drawing No. WBRC-ROD-ENV-S101-DR-CB-30012 in Appendix A for more details. A trial pit (TP01) will also be carried out on the land side to survey the utilities at this location.

2.3.2 Widening of the Bridge Deck

The widening works on the bridge itself consist of an approx. 1m wide reinforced concrete cantilever slab made integral with the existing deck slab, see Drawing No. WBRC-ROD-ENV-S101-DR-CB-30007 and 30008 in Appendix A. The cantilever slab includes an upstand edge beam to support the proposed N2 parapet. The proposed footway / cycleway will be provided up to this edge beam. The design of the widening works to the bridge will prioritise the use of precast concrete as opposed to in-situ concrete in order to minimise the risk of any spills or debris from entering the River Barrow. However, some in-situ concrete will be required to stitch together the widened section and existing structure.

Refer to Table 2-1 and Figure 2-2 below for details of the existing and proposed cross section. Also refer to Drawing no. WBRC-ROD-ENV-S101-DR-CB-30009 in Appendix A.

Table 2-1 Cross Section of Existing and Proposed Carriageway of the Bridge

Element width	Existing (m)	Proposed (m)
Parapet Edge Beam (southern)	0.3m	0.5m
Footpath (Southern, proposed as new shared cycleway / footway)	1.8m	3m (min)
Carriageway	7.3m	6.5m
Footpath (Northern)	1.84m	2m (min)
Parapet Edge Beam (Northern)	0.3m	0.5m
Overall Bridge Width	**11.54m**	**12.5m**

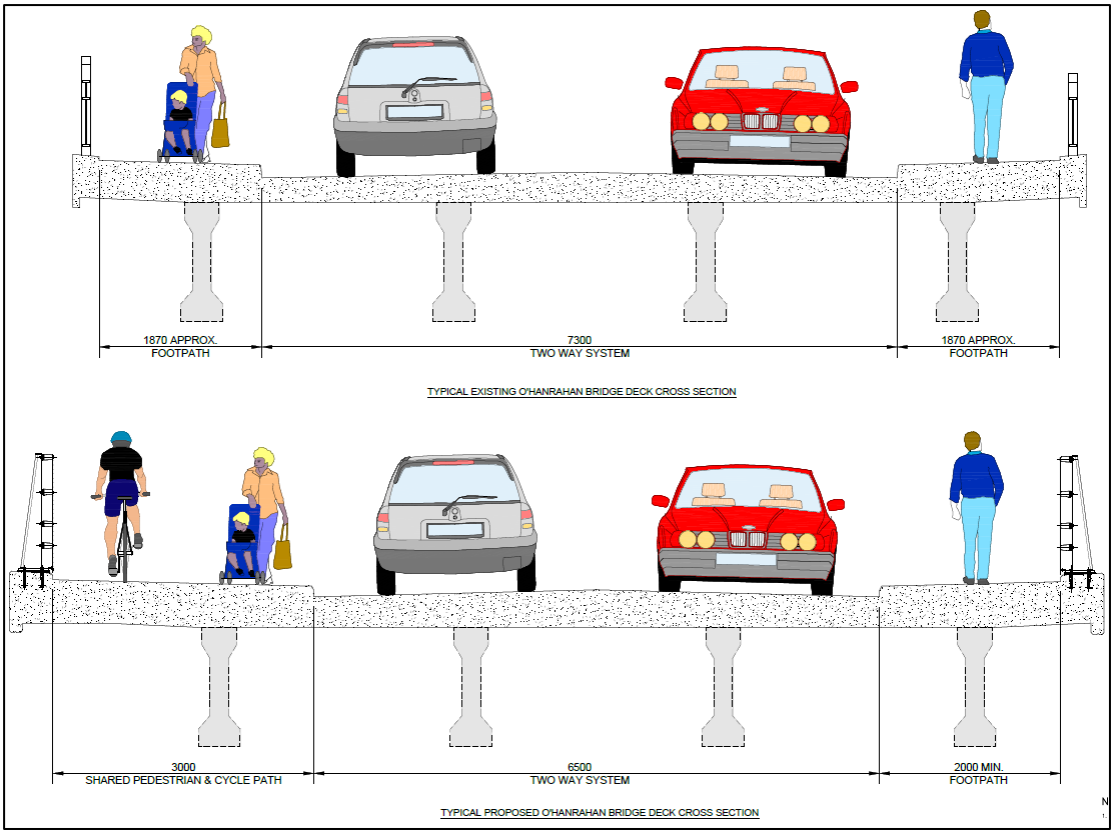


Figure 2-2 Cross Section of Existing and Proposed Carriageway (dimensions in mm)

The extent of the widening was largely dictated by current and future traffic levels, the requirements to provide connectivity between New Ross and the South-Eastern Greenway, and also the load carrying capacity of the existing bridge beams for the additional dead load.

Following reclassification of Bridge Street, which was previously a national road, to a regional road due to the opening of the new bypass outside New Ross (leading to a reduction in traffic levels), a reduction in carriageway width was considered acceptable (and permit a 3m shared surface) given the reduced traffic volumes. Without reducing the carriageway, the 3m shared surface would not have been achievable as the extent of the widening is limited by the structural capacity of the existing bridge.

2.3.3 Parapet Replacement

The existing parapets, approximately 1m high, constructed of painted steel, were constructed in the 1960s as part of the main bridge. As part of a structural assessment of the bridge in 2020, these were deemed incapable of withstanding collisions from modern vehicles. Due to the level of traffic crossing the bridge, it was decided to replace these with 1.4m high N2 containment level parapets in accordance with DN-REQ-03034 (formerly NRA TD 19). The new parapets will likely be comprised of either steel or aluminium. This involves strengthening the existing reinforced concrete parapet edge beams. Whilst the new parapet edge beam on the southern (downstream) end of the bridge will be reconstructed as part of the widening works, it is also necessary to reconstruct the parapet edge beam on the northern (upstream) side of the bridge in order to facilitate the higher containment parapet. Refer to Drawing No. WBRC-ROD-ENV-S101-DR-CB-30015 in Appendix A for details.

The existing plaque, see Plate 2-5 below, located on the northwest corner of the bridge will be relocated to facilitate the upgrade of the bridge parapets. The plaque will be imbedded into the concrete wing wall on the southwest corner of the bridge.

Plate 2-5 Existing Plaque located on the northeast corner of O'Hanrahan Bridge

2.3.4 Widening of quay/wing walls (south-east corner)

The existing O'Hanrahan Bridge abutments, constructed in 1967, are founded on sheet-piles which also act as wing walls to interface with the quay on the eastern end of the bridge. The original railings on the south-east corner were recently replaced with a solid masonry clad reinforced concrete parapet wall as part of the New Ross Flood Alleviation Scheme as shown in Plate 2-6 below.

Plate 2-6 Masonry-clad reinforced concrete parapet wall developed as part of the New Ross Flood Alleviation Scheme (southeast corner)

The function of the proposed quay wall extension (varying from 1m to 2m) on the southeast corner is to facilitate the transition from the widened section of O'Hanrahan Bridge (southern edge) to the existing quay wall on the eastern end of the bridge.

The works in this area involve the construction of a new quay wall in front of the existing via the installation of sheet piles to match the width of the widening of O'Hanrahan Bridge as shown in Figure 2-3, and in Drawing No. WBRC-ROD-ENV-S101-DR-CB-30013 in Appendix A. The width of the widening will vary from approx. 1m (at O'Hanrahan Bridge) to 2m at the interface with the existing quay wall and glazed flood defence panels, in order to maintain the 3m combined pedestrian and cycleway from the bridge onto the quays.

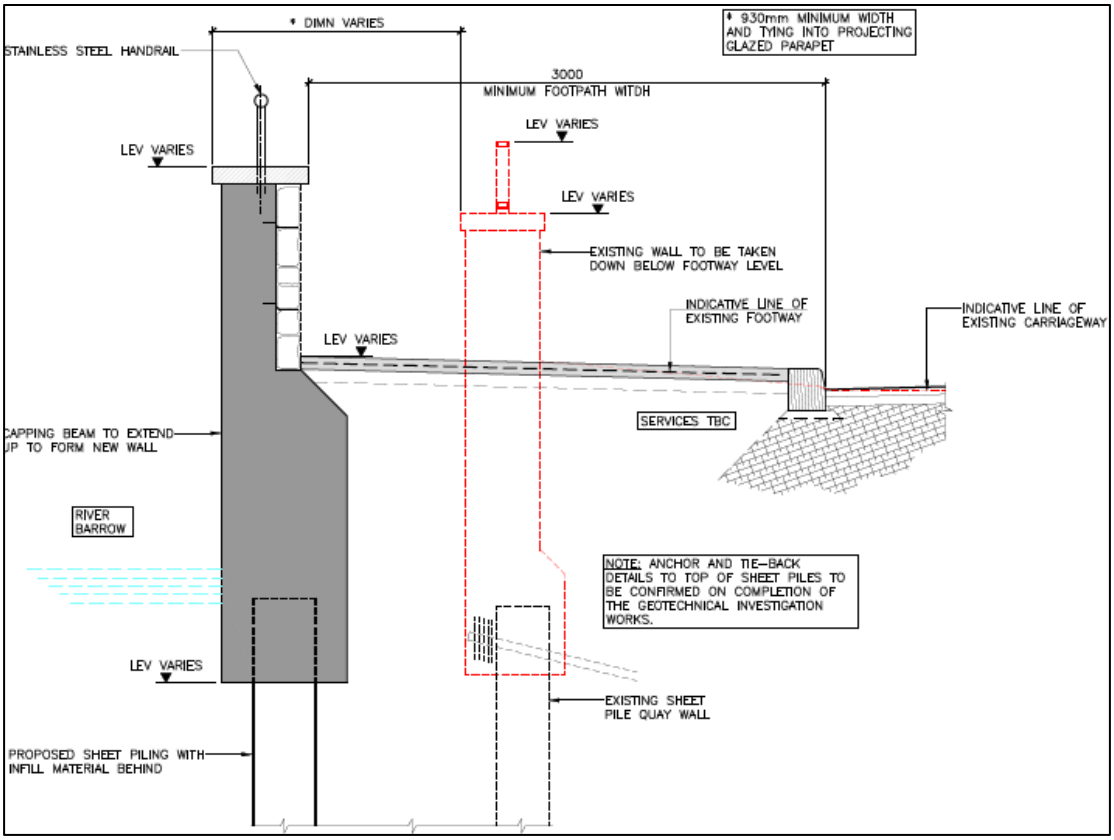


Figure 2-3 Cross Section of Proposed Southeast Quay Wall (existing in red)

The sheet piled design of the flood defence wall (see Figure 2-3) offers the simplest construction methodology as the installation of driven sheet piles is a standard construction technique and allows the permanent works and temporary works to be combined. Construction work being largely confined to outside of the existing quay wall would minimise the impact on the existing services beneath the existing footway.

The existing flood defence wall will be taken down below footway level and replaced by a matching flood defence wall along the line of the widened quay wall. This new wall will be supported by a new reinforced concrete capping beam on the sheet piles. The existing flood defence wall can be left in place until completion of the construction of the new flood defence wall.

Installation of the sheet piles will be completed via a piling rig from a river jack-up barge. The sheet piles will be driven into the riverbed as far as rock level and will be backfilled with compacted fill material.

With the exception of the flood defence wall being taken down below footway level, there will be no demolition works to the existing quay wall. The proposed wall will be structurally separate from the existing and will not impose any additional active earth pressures on the existing structure.

2.3.5 Widening of quay/wing walls (south-west corner)

Similar to the eastern end of the bridge, the western abutments are founded on sheet-piles which also act as wing walls to interface with the quay on the western end of the bridge. On the approaches to the wingwalls on the southwest corner, a reinforced concrete restraining slab acts as a flood wall as part of the New Ross Flood Alleviation Scheme. The restraining slab, constructed in the last decade, includes a masonry clad wall and guardrail. As part of the proposed widening works to O'Hanrahan Bridge, it is proposed to widen the southwestern end of the bridge by approximately 1m in order to continue the shared pedestrian and cycleway from the bridge to the South-Eastern Greenway, refer to Drawing no. WBRC-ROD-ENV-S101-DR-CB-30014 in Appendix A.

The works in this area involve the construction of a new sheet piled quay wall in front of the existing via the installation of sheet piles, similar to the south-eastern corner. The existing rock armour will be removed prior to commencement of piling works. The sheet piles will be installed approximately 1m in front of the existing southwestern wingwalls (beginning at the line of the abutments where the bridge widening ends) and continuing in front of the existing flood wall for a total distance of approximately 60m. The length of new sheet piles in front of the wingwalls will be approximately 19m, of which 5m will be located directly in the river. The remaining 41m of new wall will be constructed in front of the existing flood wall, all driven at the top of the embankment above the water level.

The existing wingwall parapet will be taken down below footway level and replaced by an N2 parapet as per the proposed bridge upgrade. Similarly, beyond the wingwall, the existing flood defence wall will be taken down below footway level and replaced by a matching flood defence wall along the line of the widened quay wall. These will be supported by a new reinforced concrete capping beam on the sheet piles. The new sheet piled wing wall will be tied back to the existing and backfilled with compacted fill material. The sheet pile section in front of the existing flood wall will require ground anchors to prevent excessive lateral movement under accidental vehicle impact. The existing flood defence wall and wingwall parapet can be left in place until completion of the construction of the new flood defence wall / wingwall parapet.

Installation of the sheet piles will be completed via a piling rig either from the landside, a river barge, or a combination of both. The sheet piles will be driven into the riverbed as far as rock level and will be backfilled with compacted fill material.

With the exception of the flood defence wall and parapet being taken down below footway level, there will be no demolition works to the wingwall or restraining slab, the proposed wall will be structurally separate from the existing and will not impose any additional active earth pressures on the existing structure.

On the north-western corner of the bridge, the proposed parapet on the bridge will continue for approximately 20m. This will involve permanently closing off a private entrance to the Riverside Apartment complex. Currently, this entrance poses a risk for road users as it exits onto the main R723 Regional Road just before the main bridge itself.

2.3.6 O'Hanrahan Bridge The Quay Mini Roundabout Junction

The general arrangement of the O'Hanrahan Bridge The Quay Mini Roundabout Junction currently requires large commercial vehicles to either mount the near side kerb or take a wide turn into the opposing traffic lane to perform a left turn movement onto O'Hanrahan Bridge.

It is proposed to modify the proposed O'Hanrahan Bridge The Quay Mini Roundabout Junction to increase the safety of vulnerable road users on the new proposed active travel facilities by easing the movement of commercial vehicles at the junction. This will be achieved by removing the median traffic island approaching the mini roundabout on The Quay and building out the road edge with road marking and frangible bollards.

2.3.7 Drainage

The proposed surface water drainage system of the bridge will follow the existing longitudinal profile of the deck. There is a vertical fall from a high point in the centre of the bridge towards the abutments at either end. Transverse falls in the carriageway and footpaths/cycle paths will also be provided to facilitate surface water drainage. Any runoff from the bridge (rainfall intensity also accounting for future effects of climate change) will flow into an approved combined kerb/drainage unit which is provided at the interface of the carriageway and footpaths/cycleways. Inspection units will be provided to allow inspection, rodding and maintenance. Water from the kerb/drainage system will flow into gullies / manholes at the ends of the bridge, which will tie into Wexford County Council's drainage network.

The proposed system will replace the existing drainage system on the bridge whereby the surface water flows to gullies adjacent to the existing footway kerbs and is discharged directly into the River Barrow via outlet pipes cast into the soffit of the bridge deck. The proposed system will contain all surface water and divert it to the drainage network on the east and west approaches of the bridge.

Where there are outfalls on the existing south-eastern quay wall that are obstructed by the proposed sheet piled wall, these outfalls will be extended through the new wall.

2.3.8 Utilities

2.3.8.1 Existing Utilities

A significant number of services are present underneath the existing footpaths of O'Hanrahan Bridge which continue through the abutments and into the quays. These services were identified as part of a previous Ground investigation contract undertaken in 2020.

At the southern (downstream) end where the widening works are taking place, the following services have been identified:

- 1 No. 150mm dia. public lighting duct;
- 3 No. 150mm dia. water mains (not in use);
- 1 No. 150mm dia. Aurora duct;
- 1 No. 150mm dia. existing duct (unknown, possibly spare).

On the northern (upstream) end of the bridge, the following services have been identified:

- 2 No. 150mm dia. water mains (in use);
- 5 No. 80mm dia. existing ducts (unknown function);

- 3 No. 150mm dia. existing ducts (unknown function);
- 1 No. 200mm dia. pipe (unknown function).

In addition to the above, there is also an existing foul sewer suspended from the underside of the northern deck cantilever.

All existing services will be protected and / or diverted prior to, and during construction. Phasing of the works will be required (see construction sequence in Section 4).

On the southern (downstream) end, the existing Aurora duct, lighting duct and 150mm dia. spare duct shall remain in place and be protected throughout the works. In addition, it is proposed to provide 2 no. new 100mm dia. HDPE watermains.

On the northern (upstream) end, it is proposed to temporarily divert the 2 no. existing 150 mm dia. watermains in use to the southern end whilst works are taking place on the northern end. The other remaining ducts (3 No. 150 mm dia. existing ducts, 5 No. 80 mm dia. existing ducts and 1 No. 200mm dia. pipe) shall be protected throughout the works. The foul sewer suspended from the underside of the deck cantilever, shall be unaffected during the edge beam reconstruction, and shall be protected. Refer to the services drawings and general arrangement drawings for further details.

Existing utilities are discussed in more detail in Section 15 (Material Assets) of the Planning Report.

2.3.8.2 Lighting

It is proposed to replace the existing lighting columns on the bridge. The proposed columns will be installed on reinforced concrete corbels which will protrude out from the new parapet edge beams, see Drawing no. WBRC-ROD-ENV-S101-DR-CB-30011 in Appendix A. The lighting columns will be of a similar height and spacing to the existing, will utilise the existing lighting duct in the footpath and will provide a lighting intensity similar to what is already in place.

2.4 Construction & Operational Phase

2.4.1 Construction Sequence and Methodology

The following section describes the likely construction sequence and timescales for the works at O'Hanrahan Bridge.

2.4.1.1 Timescale for Construction

The works are expected, subject to Wexford County Council's approval, to commence in late 2023, with construction likely to be approximately 9 months in duration.

2.4.1.2 Construction sequence and methodology

The works will consist of the widening and upgrade of the main bridge itself, and the construction of the south-east and south-west quay wall. Due to the length of the bridge, and the need to keep traffic open with at least one lane open at all times, it is likely that the work will consist of at least four phases on the bridge itself and a possible fifth phase for the quay walls. The proposed works will be undertaken on a live carriageway and will necessitate the use of lane closures and potential night works to complete the construction. Refer to Drawing No. WBRC-ROD-ENV-S101-DR-CB-30017 to 30021 in Appendix A for construction traffic management phases.

2.4.1.3 Ground Investigations

A separate GI contract will be carried out prior to the commencement of the main works.

GI river works will be undertaken in the following sequence (river borehole):

- Drilling equipment and personnel to be loaded onto jack-up barge at access point as agreed with the Client;
- The drilling rig will be positioned and secured over the moon pool (an opening inside the barge);
- Geotextile membrane will be placed on the working area;
- Absorbing padding and drip tray will be positioned beside/below rig engine;
- Positioning of barge and securing of jack-up legs once GPS location has been confirmed;
- Drilling will be carried out at low tide only using geobor-s rotary drilling and sample recovery of rock and soil;
- Once the scheduled depth is reached and upon approval from the Engineer, the drilling will stop, the barge will be positioned and secured at the next location and the process will be repeated.

GI road works will be undertaken in the following sequence (road trial pit):

- Appropriate Road Opening License (ROL) will be applied and received before commencing of the works;
- Traffic Management will be implemented;
- The engineer will CAT scan the location of the works and mark the location of the existing utility services;
- The excavator will move into position and excavate to the required depth;
- If services are encountered impeding or preventing the full excavation of the trial pit relocation may be required;
- Excavated material will be logged and sampled for laboratory testing;
- Backfilling will be carried out immediately after the completion of the excavation.

2.4.1.4 Main Bridge Work Sequencing

(1) Implement traffic management measures and lane closures for south-eastern side of bridge;

(2) Implement protective measures to prevent debris entering the river;

(3) Remove existing footpaths, road surfacing, waterproofing, expansion joints whilst protecting / diverting existing services and expose concrete deck;

(4) Remove existing lighting columns, parapets and breakout parapet edge beam and deck cantilever;

(5) Construct new widened cantilever slab, edge beams and lighting column corbels. Scaffolding to construct this slab will be propped/cantilevered off the existing bridge structure;

(6) Carry out concrete deck repairs where necessary;

(7) Install new parapets and lighting columns;

(8) Install new waterproofing;

(9) Construct new footpath/cycleway and drainage system;

(10) Install new carriageway surfacing and expansion joints;

(11) Switch traffic management to south-western end of bridge and repeat steps 2 to 11;

(12) Switch traffic management to north-eastern end of bridge;

(13) Implement protective measures to prevent debris entering the river, such as the use of silt-screens to trap and arrest any falling debris;

(14) Remove existing footpaths, road surfacing, waterproofing, expansion joints whilst protecting / diverting existing services and expose concrete deck;

(15) Divert existing watermain on northern side of bridge to southern side;

(16) Remove existing lighting columns, parapets and breakout parapet edge beam;

(17) Construct new edge beams and lighting column corbels;

(18) Carry out concrete deck repairs where necessary;

(19) Install new parapets and lighting columns;

(20) Install new waterproofing;

(21) Construct new footpath and drainage system;

(22) Install new carriageway surfacing and expansion joints;

(23) Switch traffic management to north-western end of bridge and repeat steps 14 to 24;

(24) Redivert watermain to northern side of bridge;

(25) Remove traffic management;

(26) Undertake concrete repairs to bridge abutments, piers and underside of deck as necessary;

(27) Remove protective measures in river.

2.4.1.5 Construction Sequence of Southeast Quay Wall

(1) Procurement of sheet piles and traffic management set up;

(2) Mobilisation of piling rig;

(3) Transportation of structural steelwork to lay down area;

(4) Installation of sheet piles to required embedded depth (approx. 22 linear m in length);

(5) Back-filling behind newly installed sheet piles with compacted granular 6N/P fill (approx. 150m^3), monitoring for movement;

(6) Following the installation of the sheet piled wall, scaffolding will be erected to facilitate the construction of the reinforced concrete capping beam (new flood wall). The scaffolding will be cantilevered off of the sheet pile in order to avoid further instream work and also to prevent any concrete spillage or debris from entering the river;

(7) Erect formwork for reinforced concrete capping beam and tie reinforcement steel;

(8) Pour in-situ concrete for new capping beam and upstand wall to match existing flood defence wall (approx. 40m^3 of concrete);

(9) Take down existing flood defence wall to below footpath level (reuse existing stonework where possible);

(10) Completion of footway pavement and erection of stone cladding to new flood defence wall (approx. 10m^3 of stonework);

(11) Removal of traffic management.

Piling Methodology

Piling is anticipated to be carried out from a jack-up barge positioned in the River Barrow to avoid disruptions to traffic and costly traffic management. The typical dimensions of such a barge are 25m x 15m (length x width). The barge will carry a crane and/or long reach excavator equipped with a vibratory hammer that drives piles into the ground by vibration. In case of reaching a lower pile toe level than the specified impact driving may be required. The stack of sheet piles will be placed on an additional pontoon placed next to the barge, which can be tugged by a tugboat from a loading / unloading point on the west side of the River Barrow either at the marina, or on lands south of the O'Hanrahan bridge.

Piling works will start from the southern end and progress towards the south-eastern abutment. It is proposed to complete the closing sheet pile at low tide so as to reduce impacts on aquatic species (i.e., avoid trapping fish).

The work process involves the barge anchoring and stabilising itself, for which the barge shall be position / repositioned during high tide. Similarly, all the necessary material and personnel shall be transported during high tide.

The pile is lowered to a position and the vibrating clamp is attached to the head of the pile. The vibrations generated by vibratory hammer drive the pile into the ground. The vibration and noise generated by this process are continuous during the driving time but are less than those induced by impact driving. With the extent of piling works limited to approximately 20-25m in length, barge relocations are anticipated to be minor, or not required.

The sheet pile alignment is set so that the back side of the sheet piles is at a distance of approximately 1m from the front face of the existing quay wall. Localised obstacles such as dislodged blocks in the mudflats will be removed by an excavator bucket prior to piling works.

The gap between the sheet pile wall and the existing quay wall will be backfilled with clean imported granular fill, TII Specification for Road Works Series 600 Class 6. The top of the fill is envisaged to be flush with existing ground level or up to 500mm lower. The backfilling can be carried out once the entire sheet pile wall has been installed or can progress simultaneously with sheet piling – once a segment of sheet piles has been installed, the gap can be filled. A temporary transversal pile can be installed at the end of each segment to prevent washout of the backfill. Alternatively, the fill can be placed once all piling is completed.

It is envisaged that piles will be embedded into the upper layer of weathered rock or dense gravels anticipated at *c.* 15-20m below ground level (to be confirmed by the ground investigation). Sheet piles will meet the required top of wall level matching the existing quay wall level.

The construction is assumed to be carried out during normal working hours (daytime), 6 days a week. The estimated timeframe for 20-25m sheet pile driving is approximately 4 weeks. This excludes set up and other activities on site, either prior to, or after pile driving. The piling will occur intermittently throughout the day, with the remainder of the time spent on ancillary processes such as setting up the barge, positioning the piles, checking tolerances, delivering material and personnel, and similar.

Piling durations to satisfy environmental requirements.

The following general procedure will be followed for any pilling activities ("piling event" means any period of continuous piling; "quiet period" means any period in which there is no piling by any rig):

- Piling works shall not be undertaken between the 1st of April and the 31st May;
- There shall be no night-time piling;
- Vibratory piling shall be the standard method for the installation of all piles. Impact piling shall only be employed where the required pile toe level cannot be achieved by vibratory piling;
- The duration of any vibratory piling event shall not exceed 180 piling minutes,
- The length of any impact piling event shall not exceed 200 strikes;
- Following every piling event, there shall be a quiet period of at least 30 minutes. Only following 30 minutes of no piling whatsoever can the cumulation of piling minutes be re-zeroed.

The above limitations apply to all piling activity for the proposed widening of the quay wall.

Based on the time expected to be required for the installation of each pile (including ancillary processes), the limits prescribed above will not prolong the proposed programme for riverside or landside piling.

2.4.1.6 Construction Sequence of Southwest Quay Wall

(1) Temporary removal of existing rock armour using an excavator;

(2) Procurement of sheet piles and traffic management set up;

(3) Mobilisation of piling rig;

(4) Transportation of structural steelwork to lay down area;

(5) Installation of sheet piles to required embedded depth (60 linear m);

(6) Back-filling behind newly installed sheet piles with compacted granular 6N/P fill (approx. 100m^3) and reinstatement of rock armour, monitoring for movement;

(7) Erect formwork for reinforced concrete capping beam and tie reinforcement steel;

(8) Following the installation of the sheet piled wall, scaffolding will be erected to facilitate the construction of the reinforced concrete capping beam (for new flood wall and parapet). The scaffolding will be cantilevered off of the sheet pile in order to avoid further instream work and also to prevent any concrete spillage or debris from entering the river;

(9) Pour in-situ concrete for new capping beam and upstand wall to match existing flood defence wall (approx. 60m x 1.5m^2 = 90m^3 of concrete);

(10) Install new N2 parapet;

(11) Take down existing flood defence wall and existing parapet to below footpath level (reuse existing stonework where possible);

(12) Completion of footway pavement and erection of stone cladding to new flood defence wall (approx. 10m^3 of stonework);

(13) Removal of traffic management.

Piling methodology for the southwest corner is as described in Section 4.1.5.

2.4.1.7 Resurfacing and waterproofing of bridge deck

- To facilitate the waterproofing of the bridge deck, the existing road surface will be excavated to expose the top of the bridge deck;
- Deck surface will be prepared, cleaned and primed for application of bridge deck waterproofing;
- Spray-applied bridge deck waterproofing will be installed on the primed surface;
- New (narrower) road surfacing material will be laid and rolled, and footpaths will be reconstructed; and
- Road markings will be reapplied.

2.4.1.8 Concrete repairs to Piers, Abutments and Deck Soffit

- Concrete repairs will be carried out where minor areas of defective concrete are identified;
- Defective concrete will be broken out by handheld drill/impact hammer or other specified method; and
- The exposed surfaces will be suitably primed, and an approved proprietary prebagged repair mortar/concrete will be placed by hand and allowed to dry.
- Protective measures will be in place at all times during construction to prevent debris from falling into the river.

2.4.2 Overview of Construction Programme

Table 2-2 Construction Programme

Construction Element	Approx. Duration of each task
Mobilisation, compound set up	2 weeks
Works on southern side of bridge	Approx. 4 months
Works on northern side of bridge	Approx. 4 months
Works on southeast quay wall*	Approx. 2 months (incl. 4 weeks of pile-driving)
Works on southwest quay wall**	Approx. 2 to 2.5 months (incl. 4 to 6 weeks of pile driving)
Concrete repairs to underside of bridge*	4-6 weeks
Total Construction Phase	**Approx. 9 months**
* These works can be carried out in parallel with the main bridge works ** These works can be carried out following completion of the southeast corner and in parallel with the main bridge widening works	

2.4.3 Construction Materials

Sustainable decisions made during the design process will have a positive impact on the cost and carbon footprint of the scheme. To support sustainable construction, the following principles have been embedded in the design:

- Design for minimum waste;
- Aim for lean efficient design and construction methodology;
- Minimise energy in construction by adoption of blended mixes;
- Conservation of water resources by the adoption of water reducing admixtures;
- Use of precast construction off site as much as possible.

Estimated Quantities

- Structural concrete: approx. 328 m^3
- Reinforcement steel: approx. 66 t
- Fill material: approx. 250 m^3
- Sheet piles: approx. 85 lin. m
- Road surfacing: approx. 145 m^3
- Verge concrete: approx. 346 m^3
- Temporary formwork for concrete: approx. 2,301 m^2
- Masonry stonework for cladding: approx. 23 m^3
- Bridge deck waterproofing: approx. 2,202 m^2
- Steel / Aluminium parapets: approx. 406 m
- RC wall with handrail: 59 m
- Expansion joint: approx. 125 m
- Steel / aluminium lighting columns: approx. 16 no.

2.4.3.1 Sourcing of Materials

All imported material will be sourced from the nearest possible locations, where possible. Concrete, backfill and surfacing materials can be found from a number of manufacturers / quarries locally. Only those quarries that conform to all necessary statutory consents will be used in the construction phase.

It is assumed that the Contractor will source the sheet piles directly from the manufacturer/supplier. While Irish-based sheet pile suppliers exist, there is a greater range of sheet piles from the manufacturers/suppliers that exist in the UK.

2.4.4 Temporary Construction Compound

The site compound will be set up and maintained by the successful Contractor. The construction compound and the associated temporary access road is located within lands on the west side of the River Barrow, with access onto the R704 Regional Road as shown in Figure 2-4 below. The lands are in the ownership of Wexford County Council.

At the time of writing, these lands are being used as a construction compound for the separately proposed South East Greenway project which will be completed prior to the commencement of the construction phase for the proposed development.

Figure 2-4 Location of the Construction Compound

2.4.4.1 Site Access and Haulage Routes

Access to the proposed construction compound will be from the R704 / R723 Regional Road connecting to the N25 National Road as shown in Drawing no. WBRC-ROD-ENV-S101-DR-CB-30016 in Appendix A.

2.4.5 Working Hours

The permitted working hours arising from construction works is as shown in the following table. The Contractor may propose night-time works outside of these hours provided it is agreed with Kildare County Council. On O'Hanrahan bridge, night works will likely be confined to the eastern half and underside of the structure only due to the close proximity of residential apartments on the western side.

Table 2-3 Working Hours

Period	Hours
Mon to Thurs	08:00 - 19:00
Mon to Thurs (where evening working is approved by WCC)	19:00 - 22:00
Fri	08:00 - 17:00
Sat	08:00 - 16:00
Sun and Bank Holiday	Not permitted

2.4.6 Operation of the Proposed Development

O'Hanrahan Bridge was previously under the remit of Transport Infrastructure Ireland's EIRSPAN Bridge Management System due to its classification as a National Route. Since reclassified as a regional route, it is under the remit of Wexford County Council and will be maintained and managed in accordance with the bridge management procedures of Wexford County Council.

2.4.7 Project Change and Decommissioning

There are no plans proposed for the decommissioning of the proposed development given the nature of the project – i.e., the widening of O'Hanrahan Bridge can in this instance, be considered as a 'permanent' operation. The decommissioning of the proposed development is likely to form part of subsequent planning consent procedures and in the unlikely event that specific decommissioning requirements are necessary, appropriate mitigation can be applied to those consents.

2.4.8 Construction Environmental Management Plan

Appendix E contains the Construction and Environmental Management Plan (CEMP) which shall be finalised by the Contractor, in agreement with Kildare County Council, prior to the commencement of the construction phase.

A CEMP deals with the Contractor's overall management and administration of a construction project in addition to any environmental control measures required during construction. A CEMP is prepared by the Contractor during the pre-construction phase, to ensure that the project is completed on-time and within budget. The CEMP will include a detailed programme of works. The CEMP is also developed to ensure that all construction activities are undertaken in a satisfactory and safe manner, to a delivery program meeting the Clients requirements. The Contractor will be required to include details under the following headings;

- Details of working hours and days;
- Details of emergency plan - in the event of fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incident within an area of traffic management. The plan must include contact names and telephone numbers for: Local Authority (all sections/departments); Ambulance; Gardaí and Fire Services;
- Details of chemical/fuel storage areas, (including location and bunding to contain runoff of spillages and leakages);
- Details regarding refuelling areas for machinery and vehicles.
- Details of construction plant storage, temporary offices;
- Traffic management plan (to be developed in conjunction with the Local Authority – Roads Section) including details of routing of network traffic; temporary road closures; temporary signal strategy; routing of construction traffic; programme of vehicular arrivals; on-site parking for vehicles and workers; road cleaning; other traffic management requirements such as traffic calming where necessary;
- Truck wheel wash details (including measures to reduce and treat runoff);
- Dust management to prevent nuisance and harmful effects (demolition & construction);
- Site run-off and drainage management plan;
- Noise and vibration management to prevent nuisance (demolition & construction);
- Landscape management;

- Soil management plan
- Management of contaminated land and assessment of risk for same by suitably qualified, trained and licenced personnel;
- Management of demolition of all structures and assessment of risks for same;
- Stockpiles;
- Project procedures & method statements for:
    - Site clearance, site investigations, excavations and working with asbestos containing materials (ACMS);
    - Management and removal of ACMs;
    - Demolition & removal of buildings, services, pipelines (including risk assessment and disposal);
    - Diversion of services;
    - Excavation;
    - Piling;
    - Construction of pipelines;
    - Temporary hoarding & lighting;
    - Disposal of surplus geological material (peat, soils, rock etc.);
    - Protection of watercourses from contamination and silting during construction;
- Site Compound:
    - Temporary car parks for staff and site workers
    - Material processing areas / Material storage areas / plant storage

The production of the CEMP will also detail areas of concern with regard to Health and Safety and any environmental issues that require attention during the construction phase. Adoption of good management practices on site during the construction and operation phases will also contribute to reducing environmental impacts.

The CEMP has been appended (Appendix D). This is a preliminary document, which will be updated and finalised by the successful Contractor. Appended to the CEMP are the following constituent plans, also to be finalised by the Contractor:

- **Appendix C:** Environmental Operating Plan (EOP)
- **Appendix D:** Incident Response Plan (IRP)

Each of these plans is discussed in the following sections. The obligation to develop, maintain and implement the CEMP and all of the above-listed plans will form part of the contract documents for the construction phase.

Environmental Operating Plan

The Environmental Operating Plan (EOP) is a document that outlines procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of developments. Essentially the EOP is a project management tool. It is prepared, developed and updated by the Contractor during the construction stage and will be limited to setting out the detailed procedures by which the mitigation measures proposed as part of the EIAR and NIS and arising out of Wexford County Council's decision (if approving the proposed development) will be achieved. The EOP will not

give rise to any reduction of mitigation measures or measures to protect the environment.

Before any works commence on site, the Contractor will be required to prepare an EOP in accordance with the TII Guidelines for the Creation and Maintenance of an Environmental Operating Plan. The EOP will set out the Contractors approach to managing environmental issues associated with the construction of the road and provide a documented account to the implementation of the environmental commitments set out in the EIAR and measures stipulated in the planning conditions. Details within the plan will include, as a minimum:

- All environmental commitments and mitigation stipulated in the planning documentation in respect of the proposed development, including sediment controls and other measures to ensure that water quality in the River Barrow is not degraded.
- Any requirements of statutory bodies such as the NPWS and IFI, including adherence to *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016).
- A detailed Biosecurity Protocol.
- A list of all applicable legislative requirements in relation to environmental protection and a method of documenting compliance with these requirements.
- Outline methods by which construction activities will be managed in such a manner as to avoid, reduce or remedy potential negative impacts on the environment.

To oversee the implementation of the EOP, the Contractors will be required to appoint a person to ensure that the mitigation measures included in the EIAR, the EOP and the statutory approvals are executed in the construction of the works and to monitor that those mitigation measures employed are functioning properly.

Incident Response Plan

The Incident Response Plan (IRP) describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts during the construction stage of the proposed development are prompt, efficient, and appropriate to particular circumstances.

The Contractor will finalise the IRP prior to the commencement of the proposed works to include the following information, at a minimum:

- Contact names and telephone numbers for the local authority, i.e. Kildare County Council (all sections and departments), An Garda Síochána and ambulance and fire services; and,
- Method statements for weather forecasting and continuous monitoring of water levels in the River Barrow. The plan must outline how the Contractor will respond to forecasted flood events, including but not limited to, details of removal of site materials, fuels, tools, vehicles and persons from flood zones.
- The measures to be taken to avoid or reduce the incident risk potential;
- Reference to the method statement and management plans for construction activities, insofar as they are relevant for the purposes of mitigating against health and safety and pollution incidents;
- Procedures to be adopted to contain, limit and mitigate any adverse effects, as far as reasonably practicable, in the event of a health and safety or pollution incident;

- Persons responsible for dealing with incidents and their contact details;
- Procedures for alerting key staff, appropriate emergency services, authorities, the Employer's Representative and clean-up companies, where required, and contact details of same;
- Procedures for notifying relevant statutory bodies, environmental regulatory bodies, local authorities and local water and sewer providers of pollution incidents, where required, and contact details of same;
- Standby / rota systems; and
- The types and location of emergency response equipment available and appropriate personal protective equipment to be worn.

An IRP has been appended to the CEMP (i.e., Appendix D of Appendix E). The document in its current form will be finalised by the successful Contractor prior to the commencement of the construction phase of the proposed development.

Implementation of the EOP

It will be a condition of the Contract for the construction of the proposed development that the successful Contractor fully implement the EOP throughout the works. To oversee the implementation of the EOP, the Contractor will be required to appoint a responsible Site Environmental Manager (SEM) to ensure that the environmental commitments (as described above) and the EOP are fully executed for the duration of works, and to monitor whether the mitigation measures employed are functioning properly (i.e., are effectively addressing the environmental impact(s) which they were prescribed for).

2.5 Receiving Natural Environment

2.5.1 General Description and Context

O'Hanrahan Bridge is a 9-span post-tensioned concrete beam and reinforced concrete slab bridge over the River Barrow in New Ross town, Co. Wexford. The principal habitat types that exist along the footprint of the proposed development include mudflats, buildings and artificial surfaces, and a tidal river. Treelines, lower salt marsh, grassy verges and scattered trees and parkland can all be found in the area immediately adjacent to the footprint of the proposed development. The River Barrow is tidal at O'Hanrahan Bridge and is a habitat for rare and protected species including lamprey, Atlantic salmon, Twaite Shad and Otter.

2.5.2 Habitats

This section describes the habitats recorded during the field survey within the proposed development footprint and a 150m buffer. A total of 14 different Fossitt (2000) habitats were identified in the study area. These habitats are listed below, and mapping of these habitats is presented in Appendix B of this NIS:

- Buildings and Artificial Surfaces (BL3)
- Sea Walls, Piers and Jetties (CC1)
- Tidal Rivers (CW2)*
- Recolonising bare ground (ED3)
- Reed and large sedge swamps (FS1)
- Improved agricultural grassland (GA1)
- Amenity Grassland (GA2)

- Mud Shores (LS4)*
- (Mixed) broadleaved woodland (WD1)
- Scattered Trees and Parkland (WD5)
- Hedgerows (WL1)
- Treelines (WL2)
- Scrub (WS1)
- Immature woodland (WS2)

Buildings and artificial surfaces (BL3)

Much of the land surrounding the proposed development is built land consisting of the urban centre of New Ross. Further away from the river, the majority of the surrounding area comprises built areas including roads and buildings. Generally, built habitats are not considered to be of high ecological significance.

Sea walls, piers and jetties (CC1)

This category is used for all coastal constructions that are partially or totally inundated by sea water at high tide. This habitat was recorded along both banks of the River Barrow at the location of the proposed development as a masonry, concrete sea walls and rock armour. In addition to this, a small jetty is located *c.* 50m upstream of the bridge on the eastern bank which is included in this habitat category.

Aquatic Services Unit (2022a & 2022b) surveyed the hard intertidal surfaces within and adjacent to the footprint of the proposed sheet pile walls in January and September 2022. The description of these habitats is reproduced below, and the full reports are presented in Appendix C to this NIS.

South-east corner:

> "*The quay walls were covered in green algae […], the majority of which was* Vaucheria *sp., a genus of alga common in freshwater and estuarine sites. In addition, there were trace amounts of filamentous green algae and very small amounts of* Ulva intestinalis *also present. Higher up on the quay walls were scattered small amounts of the moss* Cinclidotus fontinaloides*, a species often found on rocks and other hard substrates above the water line but subject to frequent inundation. The only higher plant visible were very scarce amounts of stunted plants of an Oenanthe species, possibly* O. crocata *(Hemlock waterdropwort) a common species in freshwater sites. There were no rare or unusual plants noted*."

South-west corner:

> *"Along the foreshore below the bridge there has been the import of protective rocks and an area of artificially made ground associated with the base of the bridge. Here vegetation has developed that is more typical of recolonising ground and is an eclectic mix of species. Species that indicate the coastal nature of the area include Sea Aster (*Aster tripolium*) and Common Mallow (*Malva sylvestris*). Also, several species of disturbed ground occur including a variety of species of yellow* asteraceae*, Dandelions, Hawkbits, Sow thistles, docks (*Rumex *species),* Brassicaceae*, rank grasses Couch Grass, Cock's foot grass, False Oat Grass, Teasel, Willowherbs, Thistles, Plantains, Red Valerian, occasional woody saplings e.g., Ash."*

While these habitats are not species-rich or of a very natural or locally distinct character, they are one of the principal ecosystem features which define this part of the River Barrow and support the integrity of habitats and species of conservation interest in the River Barrow and River Nore SAC.

Tidal rivers (CW2)

The proposed development runs along the northern bank of the River Barrow. The river within the extents of the proposed development is subject to the influence of the tides and is designated as part of the River Barrow and River Nore SAC. This habitat class contains other habitat types within it, namely 'Sea walls, piers and jetties' (CC1), and 'Mud shores' (LS4). In addition, the River Barrow at this location corresponds to the Annex I habitat 'Estuaries' (1130) which is listed as a Qualifying Interest of the River Barrow and River Nore SAC. EC (2013) describes this habitat as the downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. Therefore, the Annex I type applies to the intertidal areas.

Specialist surveys of these habitats were undertaken by UCC Aquatic Services Unit in January and September 2022, and the results are included as relevant.

Plate 2-7 Estuary / Tidal River flowing under O'Hanrahan Bridge.

Recolonising bare ground (ED3)

This category includes areas where disturbed or bare ground in derelict sites or artificial surfaces have been invaded by herbaceous plants. This habitat is present within the footprint of the construction site compound and the surrounding area.

Reed and large sedge swamps (FS1)

This category includes species-poor stands of herbaceous vegetation that are dominated by reeds and/or other large grasses or large, tussock-forming sedges. An area of this habitat (*c.*180m^2) is present along the western bank of the River Barrow, approximately 40m south of O'Hanrahan Bridge. UCC Aquatic Services Unit (2022b) surveyed this habitat in September 2022. The description of this habitat from the

survey report is reproduced below and the full data are presented in Appendix C to this NIS.

> "*The River Barrow is tidal at New Ross and is considered to be at the upper estuarine extent of the Barrow. Fringing the muddy river channel of the Barrow River at Hanrahan's Bridge is typical reed bed vegetation which is common in upper estuarine environments on muddy substrates and where saline influence is more limited.* Phragmites *reed beds are an important component of emergent vegetation communities in estuarine systems. Here at the upper portion of the Estuary Common Reed (*Phragmites australis*) dominates over more halophytic plants which occur in more saline conditions such as Cord grasses (*Spartina *spp.).*
>
> *Common Reed (*P. australis*) is tall and a dominant competitor for light, so that dense stands of the common reed tend to be species poor in other plants but at the fringes of the reedbed trees (i.e., willows* Salix *spp.) occur at the inland edge of the shore.*
>
> *Fringing the reedbed towards the estuary side species such as Soft Stem Bulrush* Schoenoplectus *spp. (likely* tabermontani*) and Club Rush (*Bolboschoenus maritimus*) grow on the open mud and shoreward species such as some Reed Canary-grass (*Phalaris arundinacea*), Buck's horn plantain (*Plantago coronopus*) and Willowherbs (*Epilobium *spp.) also occur*."

Plate 2-8 Reed Bed and Intertidal Mudflats.

Improved agricultural grassland (GA1)

This category includes highly modified or intensively managed agricultural grasslands. This habitat can be found on the northern and eastern sides of the construction site compound.

Amenity grassland (GA2)

This category includes improved or species poor grasslands including amenity, recreational or landscaped grasslands. UCC Aquatic Services Unit (2022b) surveyed this habitat in September 2022. The description of this habitat from the survey report is reproduced below and the full data are presented in Appendix C to this NIS.

> "*A small area of amenity grassland (improved) occurs adjacent to the Bridge. This habitat is dominated by a variety of grasses including* Poa *species and with broadleaved herbs such as Daisy (*Bellis perennis*), Dandelion (*Taraxacum *spp.), clovers (*Trifolium *spp.) and plantains (*Plantago *spp.) are common*."

Mud shores (LS4)

Mud shores are formed primarily of very fine sediment and usually occur along the most sheltered sections of coastline. The silt/clay fraction of the sediment is typically found in the upper reaches of estuaries. They are subject to variable, reduced or low salinity conditions. Mud shores are often characterised by elevated mudflats that are dissected by networks of shallow channels associated with flooding and drainage. This habitat is present in the intertidal areas of the River Barrow, including within the footprint of the proposed development.

UCC Aquatic Services Unit (2022a & 2022b) surveyed the mudflats within the extents of the proposed sheet pile wall in January and September 2022. The description of the mudflats from the survey reports is reproduced below and the full data are presented in Appendix C to this NIS.

> "*The infaunal and granulometric results point to a single habitat type within the survey area. This has been identified as* Tubificoides benedii *and other oligochaetes in littoral mud [LS.LMu.UEst.Tben] (Conner et al., 2004). This habitat type has been described as extremely species-poor. Consisting almost exclusively of oligochaetes. It is known to occur at the head of estuaries, in sheltered locations with no strong river flow and a strong freshwater influence, which is consistent with the conditions in the survey area at O'Hanrahans Bridge*."

This habitat corresponds to the Annex I habitat 'Mudflats and sandflats not covered by seawater at low tide' (1140) and is listed as a Qualifying Interest of the River Barrow and River Nore SAC. While the mudflat habitats at this location are very species-poor and do not represent best examples of this habitat type, they support the integrity of other habitats and species that are listed as Qualifying Interests of the River Barrow and River Nore SAC.

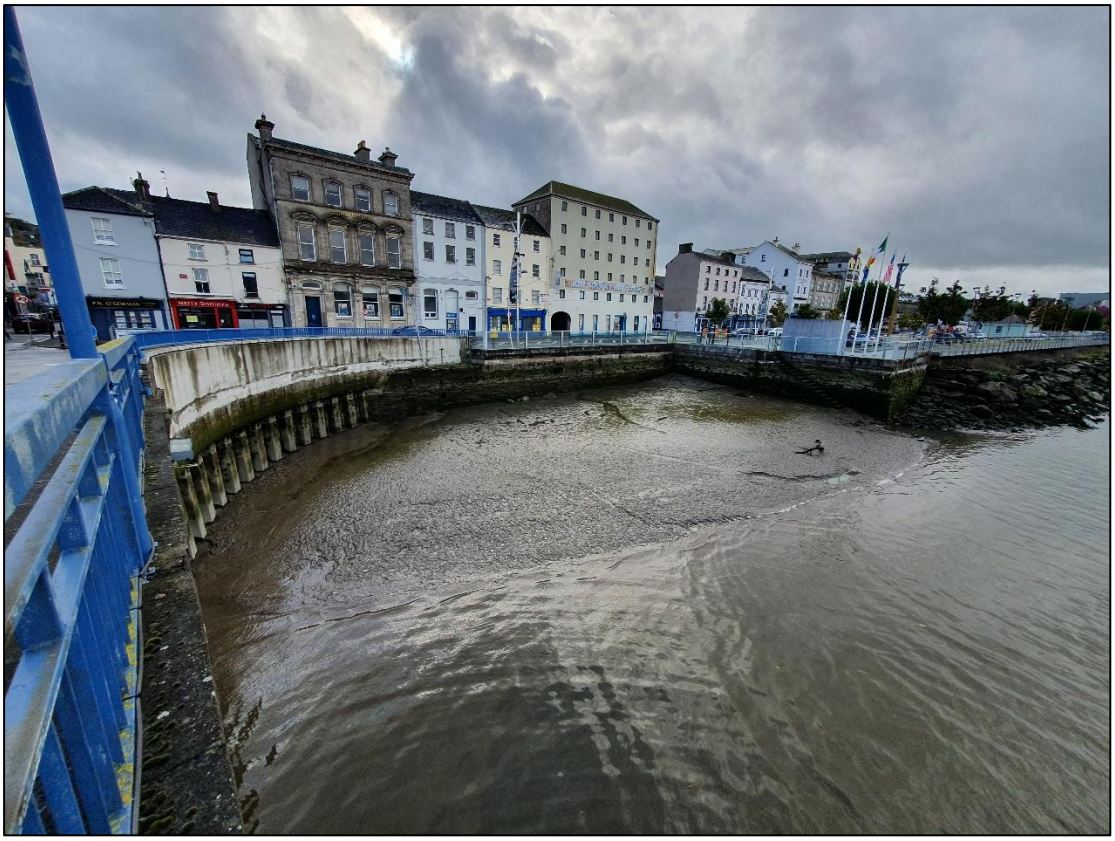


Plate 2-9 **Mud Shores, Sea Walls, Piers and Jetties, and Buildings and Artificial Surfaces at the south-eastern corner of O'Hanrahan Bridge.**

(Mixed) broadleaved woodland (WD1)

This woodland type includes woodlands which are composed of a mixture of both native and non-native tree species. Examples of this habitat can be found within and adjacent to the residential areas to the west of the site.

Scattered Trees and Parkland (WD5)

This category can be used in situations where scattered trees, standing alone or in small clusters, cover less than 30% of the total area under consideration but are a prominent structural or visual feature of the habitat. This usually occurs in areas of cultivated grassland, particularly amenity areas. This habitat has been created for amenity use on the western banks of the River Barrow on both sides of the bridge. Within the study area, this habitat included Silver Birch (*Betula pendula*) and Sweet Chestnut (*Castenea sativa*) tree species.

Hedgerows (WL1)

This habitat type includes linear strips of shrubs with occasional trees that form field and property boundaries. Examples of this habitat type can be found along throughout the residential and agricultural areas within the study area.

Treelines (WL2)

Treelines are narrow rows or single lines of trees that are greater than 5m in height and typically form property of field boundaries. Examples of this habitat type can be found throughout the residential and agricultural areas within the study area.

Scrub (WS1)

This category includes areas that are dominated by shrubs, stunted trees or brambles where canopy height is less than 5m. This habitat is present along the western bank of the River Barrow on the southern side of O'Hanrahan Bridge. UCC Aquatic Services Unit (2022a & 2022b) surveyed this habitat in September 2022. The description of this habitat from the survey report is reproduced below and the full data are presented in Appendix C to this NIS.

> "*At the upper extent of the Reed bed a small patch of White Willow (*Salix alba*) occurs this is associated with some bramble (*Rubus fruticosus *agg.) on the landward side. The herbaceous layer consists of herbs, including nettle (*Urtica dioica*), Hogweed (*Heracleum sphondylium*), Willowherbs e.g., (*Epilobium hirsutum*) Hedge woundwort (*Stachys sylvatica*), Docks (*Rumex *spp.) and rank grasses Couch Grass, False Oat Grass, etc*."

Himalayan Balsam was recorded growing beneath the trees which is an invasive species restricted under Section 49 of the Habitats Regulations.

Immature woodland (WS2)

Immature woodlands are areas dominated by young or sapling trees. This habitat type can be on the northern boundary of the construction site compound. This habitat is dominated by silver birch.

2.5.3 Watercourses, Fisheries and Aquatic Fauna

Water Quality

The Water Framework Directive (WFD) requires that each EU Member State protects and improves water quality in all waters so that good ecological status is achieved. Additionally, proposed actions (within discrete River Basin Management Plans) are also required, to secure national natural water resources for the future. The EPA is the competent authority responsible for monitoring, protecting and improving the water environment in the Republic of Ireland. In accordance with WFD guidelines, water quality 'Status' is assigned using a variety of available data on aquatic flora and fauna (including fish), the availability of nutrients, and aspects like salinity, temperature and pollution by chemical pollutants. Morphological features, such as quantity, water flow, water depths and structures of the riverbeds, are also taken into account.

The original EPA water quality classification (Quality Rating System (Q-values)) is also used to assess water quality in Irish rivers, taking into account aquatic macrophytes, phytobenthos and hydromorphology. The Q-value system has been shown to be a robust and sensitive measure of riverine water quality and has been linked with both chemical status and land-use pressures in catchments. Individual macroinvertebrate taxa are ranked for their sensitivity to organic pollution and the Q-value of the watercourse is based primarily on the relative abundance of these taxa within a biological sample. A review of both the Q-value status and WFD status for the watercourses was undertaken.

The online EPA Unified GIS Application provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters) or to groundwater. Table 2-4 below shows the information recorded regarding water quality status at the location of the proposed development.

Table 2-4 EPA water quality results

Transitional Waterbody	WFD Status (2010-2012)	WFD Status (2013-2018)	WFD Risk
Barrow Nore Estuary Upper	Moderate	Moderate	At Risk
New Ross Port	Poor	Moderate	At Risk
Upper Barrow Estuary	Good	Good	Review
Nore Estuary	Moderate	Good	At Risk
River Waterbody Name	**Station Name**	**Q Value**	
Barrow_240	St. Mullins	4	Good
Nore_240	Brownsbarn Br	4	Good

The 'Poor' and 'Moderate' statuses of the waterbodies are indicated to be as a result of poor Phytoplankton and Macroinvertebrate Status, respectively as per the EPA Catchments website.

Fisheries

The River Barrow catchment is internationally important for the presence of fish species including lamprey species, Twaite Shad (*Alosa fallax*), and Atlantic Salmon (*Salmo salar*), European Eel (*Anguilla anguilla*).

Lamprey Species

Sea Lamprey (*Petromyzon marinus*) and River Lamprey (*Lampetra fluviatilis*) are both likely to be present at the proposed development location in significant numbers during their upstream spawning migrations and downstream migrations following metamorphosis. The major upstream movements of Sea Lamprey occur in April, May and, to a lesser extent, June, while those of River Lamprey occur earlier, beginning in August and continuing over the winter and spring. The downstream migration of Sea Lamprey occurs in September and October, while that of River Lamprey occurs over an extended period from late winter to early summer.

Literature review

Two lamprey species, Sea Lamprey and River Lamprey, migrate past the proposed development. Brook Lamprey is restricted to the freshwater stretches of the River Barrow and River Nore and, therefore, will not be affected by the proposed development. Sea Lamprey is present at the proposed development location at two key phases in its life cycle: 1) adults migrate upstream from the sea to their spawning grounds in the freshwater stretches of the river; and 2) newly metamorphosed adults migrate downstream from their juvenile habitats to the sea to feed as adults. River Lamprey is also present at the proposed development location during its migrations between its spawning and juvenile habitats in the freshwater reaches and its adult habitats in the estuary, as well as during its adult phase, when it resides in the estuary. All lamprey species are semelparous (Maitland, 2003), i.e., adults undergo a single spawning event and then die. Thus, no spent adults occur in the vicinity of the proposed development.

The upstream migration of adult Sea Lamprey is concentrated in the months of April, May and June (Maitland, 2003; King & Roche, 2008). The upstream migration period of River Lamprey is less well-known and may occur over a long period beginning in August and continuing throughout autumn and winter, until the spawning season in spring (King & Roche, 2008). Peak migration periods have been proposed as being

from October to December (Maitland, 2003). In the case of both Sea Lamprey and River Lamprey, upstream migration is almost exclusively nocturnal (Maitland, 2003; Andrade et al., 2007; Quintella et al., 2009; Vrieze et al., 2011).

Lamprey larvae, known as "ammocoetes", burrow into fine sediments at the bottom of fresh waters and live as filter-feeders. Metamorphosis occurs after c. 5 years in Sea Lamprey and after 3-5 years in River Lamprey (Maitland, 2003a). The downstream migration of recently metamorphosed lampreys, known as "macrophthalmia", is not well-studied, but it appears to vary between years and river systems. MOR (2010) stated that Sea Lamprey begin their downstream migration once metamorphosis is complete (usually by September) and most arrive in the estuary in October. MOR (2010) also suggested that newly metamorphosed River Lamprey "*begin their downstream migration over an extended period from late winter to early summer*". Downstream migration by both Sea Lamprey and River Lamprey is predominantly nocturnal (Maitland, 2003; Potter, 1980; Lucas & Bracken, 2010; Silva et al., 2013; Moser et al., 2014; Dawson et al., 2015).

Twaite Shad

Adult shad move from the sea into estuaries in spring and spawn just above the top of tidal waters in May and June. During the breeding season, large numbers of adult shad move up and down the estuary with the tide. Most adults return to the lower estuary within days of spawning and to sea by the end of the summer. Juvenile shad spend one or two years in the estuary, moving up and down with the tides and feeding on planktonic crustaceans and other invertebrates. Twaite Shad is classed as vulnerable to extinction in Ireland (King et al., 2011).

Inland Fisheries Ireland Data

As part of its national monitoring programme for Habitats Directive: Annex II and Red Data Book fish species, IFI has been studying the ecology and behaviour of Twaite Shad in the estuaries of the larger rivers in the South-East of Ireland since 2010. The following reports describe the methods used to survey for shads and their respective degrees of success:

- King, J.J. and Linnane, S.M. (2004) The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. *Irish Wildlife Manuals* 14. National Parks & Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.
- Kelly, F., Harrison, A., Connor, L., Matson, R., Morrissey, E., Feeney, R., Wogerbauer, C., O'Callaghan, R. and Rocks, K. (2011) *Sampling Fish for the Water Framework Directive – Summary Report 2010*. Inland Fisheries Ireland, Dublin.
- IFI (2011) *Sampling Fish for the Water Framework Directive – Transitional Waters 2010: Barrow, Nore and Suir Estuaries.* Inland Fisheries Ireland, Dublin.
- IFI (2012a) *National Programme: Habitats Directive and Red Data Book Fish species. Executive Report 2011. IFI Report Number: IFI/2012/1-4103.* Inland Fisheries Ireland, Dublin.
- Rooney, S.M., O'Gorman, N.M., King, J.J. (2013) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2012.* Inland Fisheries Ireland, Dublin.
- Rooney, S.M., O'Gorman, N.M., Cierpial, D. and King, J.J. (2014) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2013.* Inland Fisheries Ireland, Dublin.

- O'Gorman, N.M., Rooney, S.M., Cierpial, D. and King, J.J. (2015) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2014.* Inland Fisheries Ireland, Dublin.
- Rooney, S. and King, J.J. (2015) *A poster on acoustic tracking of twaite shad by the Habitats Directive and Red Data Book Species team presented at the 3rd International Conference on Fish Telemetry (ICFT) in Halifax, Nova Scotia in 2015.* Inland Fisheries Ireland, Dublin.
- Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coughlan, B., and King, J.J. (2016) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2015.* Inland Fisheries Ireland, Dublin.
- Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coghlan, B., and King, J.J. (2017) *National Programme: Habitats Directive and Red Data Book Species Summary Report 2016.* Inland Fisheries Ireland, Dublin.
- Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coghlan, B., and King, J.J. (2019) *National Programme: Habitats Directive and Red Data Book Species Summary Report 2017.* Inland Fisheries Ireland, Dublin.
- Gallagher, T., O'Gorman, N.M., Rooney, S.M., and King, J.J. (2020) *National Programme: Habitats Directive and Red Data Book Species Summary Report 2018.* Inland Fisheries Ireland, Dublin.
- Gallagher, T., O'Gorman, N.M., Rooney, S.M., Brett, A., and O'Leary, C. (2022) *National Programme: Habitats Directive and Red Data Book Species Summary Report 2021.* Inland Fisheries Ireland, Dublin.
- IFI (2022a) *Twaite Shad* <https://www.fisheriesireland.ie/fish-species/twaite-shad .html> [Accessed 28/01/2022]. Inland Fisheries Ireland, Dublin.
- IFI (2022b) *Juvenile Shad Monitoring* <https://www.fisheriesireland.ie/Habitats-and-Red-Data-Book/juvenile-shad-monitoring.html> [Accessed 28/01/2022]. Inland Fisheries Ireland, Dublin.
- IFI (2022c) *Adult Shad Monitoring* <https://www.fisheriesireland.ie/Habitats-and-Red-Data-Book/adult-shad-monitoring.html> [Accessed 28/01/2022]. Inland Fisheries Ireland, Dublin.

Monitoring of juvenile Twaite Shad is challenging due to the small size of the fish and large extent of their estuarine habitat, as well as other environmental factors such as flooding and tidal influences. Given these challenges, IFI's monitoring programme has focussed primarily on sampling young-of-the-year fish in Waterford Harbour and the Barrow, Nore and Suir Estuaries. The main survey technique used to target post-larval and young-of-the-year fish is fine-mesh zooplankton or bongo netting. Other techniques include beach seining, fyke netting and beam trawling, though only bongo and seine netting have produced positive results.

Bongo netting

Sampling using bongo nets is carried out 4-8 weeks after spawning, which occurs in June. Samples are collected in a pair of bongo nets mounted at the front of a boat moving against the tide for 10 minutes. These trawls are carried out along the margins of depositional banks at 1-2km intervals along the estuary/harbour. This technique has had mixed success over the years, with the highest numbers of fish (178 young-of-the-year shad) captured in 2011 and only small numbers in later years, with none being recorded using this method in some years. This is despite considerable annual survey effort (70 trawls in 2014). The low catch-per-unit-effort may be accounted for by poor timing, inadequate technique or some other underlying cause. The fact that

many of these surveys have formed part of IFI's National Bass Programme may point to suboptimal tidal conditions for surveying.[10]

Beach seining

IFI carries out seine netting surveys in August each year as part of the National Bass Programme and in September-October on a three-year rolling program during WFD surveillance monitoring of transitional waters. These surveys have been successful in recording young-of-the-year shads 50-100mm in length and have highlighted the wide distribution of juvenile shads within the Barrow, Nore and Suir Estuaries. In August 2016, sixteen seine net samples were collected from four locations in the Barrow and Suir Estuaries over two days. A total of 90 shads were recorded during this survey. Of the three techniques used in October 2016, juvenile shads were only captured in beach seine nets. A total of 42 shad was recorded in seine net samples from the mouth of Waterford Harbour to the upper tidal limits of the Rivers Barrow, Nore and Suir.

As part of its monitoring of adult shad, IFI has collected data from a wide variety of sources, including surveys and information and samples submitted by third parties. IFI has sampled adult shad via trawling surveys and an acoustic telemetry study. In addition, samples of shad from by-catch in commercial netting and from surveys by other agencies, as well as angling logbooks have also contributed to IFI's monitoring of Twaite Shad.

Trawling surveys

Since 2014, trawling surveys using commercial trawlers with IFI officers on board have been carried out in the Lower Barrow and Suir Estuary and Waterford Harbour as part of the National Bass Programme. Sampling takes place in September and each trawl lasts 10-15 minutes. This technique usually captures larger specimens in comparison with seine netting. In 2014, a total of 26 shad (61-28 mm in length) was recorded in three of the 34 trawls. In 2015, a total of only three shad (215-320mm in length) was recorded in three of the 36 trawls undertaken.

Acoustic telemetry

Since 2012, IFI has been using acoustic telemetry to study the behavioural ecology of spawning and post-spawning Twaite Shad in the Barrow, Nore, Suir and Munster Blackwater Estuaries. Fish are first captured by drift netting or recreational angling and external acoustic transmitters are fitted. The fish's movements are then detected up by acoustic receivers within the estuaries. The telemetry study is ongoing, and future work will examine knowledge gaps regarding residency and behaviour in the outer estuaries, as well as site fidelity in repeated spawning migrations.

Angling surveys and logbooks

IFI staff conduct angling surveys to determine the distribution of adult shad and also attended shad angling competitions to measure the size distribution of fish caught by anglers. These methods have yielded information regarding the locations and timing of spawning events and the sizes and ages of spawning fish, as well as establishing iteroparity in this species. This data is supplemented by records submitted by third parties, e.g., district fisheries inspectors, and such data has included particularly interesting records, such as a rod-caught shad from Careysville, *c*. 25km upstream of the tidal limit of the Munster Blackwater.

[10] A study in Cornwall (Hillman, 2003) has identified that the optimal time for bass surveys is near high water while the optimal time for surveying shad and other clupeomorphs is near low water.

Commercial netting by-catch

Commercial netsmen using seasonal drift, draft and snap nets in the Barrow, Nore, Suir, Slaney and Muster Blackwater Estuaries (and coastal waters) are the most significant source of information and material for studies of shads. These netsmen operating in the SAC estuaries regularly make records and samples of shad by-catch available to IFI for inclusion in its ongoing monitoring of these species.

Marine fisheries surveys

Fisheries monitoring is also carried out in the marine environment by Bord Iascaigh Mhara and the Marine Institute. As with commercial netsmen, these agencies also make shad records and samples available to IFI for inclusion in its studies.

Kick sampling for shad eggs

In 2017, 2018 and 2021, IFI used kick sampling as a technique for confirming the occurrence of shad spawning in the Barrow, Nore, Suir and Munster Blackwater. This technique is recommended in the Common Standards Monitoring Guidance for Freshwater Fauna (JNCC, 2015). The methodology involves repeated 15-second kick samples upstream of a handheld 250µm net in a transect across the river. Eggs are collected and sent for genetic analysis to confirm species. In 2017 and 2021, this method confirmed shad spawning in the River Barrow near St Mullin's and also in the River Nore near Inistioge, in the River Suir near Carrick-on-Suir and in the Munster Blackwater near Lismore in 2017 alone. It is expected that IFI will continue to employ this method as part of its annual monitoring of shad.

Environmental DNA analysis

In 2018, IFI undertook a pilot study on the use of eDNA to identify the presence of shad in four rivers for which there are recent or historical records of these species, but which are not known to support significant populations, namely the Boyne, Liffey, Lee and Ilen. The samples taken had not yet been analysed for eDNA at the time of that reporting was published (Gallagher et al., 2020). Further eDNA sampling was undertaken in 2021 at St. Mullins to measure the effects of the weir on shad migration. The results of this analysis have also not been published (Gallagher et al., 2022).

Notwithstanding the significant ongoing survey effort in IFI's monitoring programme over the last 9 years, gaps remain in the understanding of the ecology and behaviour of Twaite and Allis Shad, particularly in relation to juveniles during their residency in estuaries, and anecdotal records from anglers and commercial netsmen remain the most significant source of information. However, having thoroughly reviewed existing literature relating to this species, it was considered that sufficient information was available to inform this NIS. Furthermore, having examined the survey methods used by IFI and others, it was considered that any additional surveys carried out to inform this NIS would not contribute any significant additional information regarding the distribution, densities and movement patterns of post-larval and juvenile Twaite Shad in the Barrow Estuary.

Further literature review

Adult Twaite Shad gather outside estuaries in April and enter rivers in May and June (Maitland & Hatton-Ellis, 2003; Freyhof & Kottelat, 2008; Rooney & King, 2015). This can vary with water temperature, tides and fluvial conditions (Doherty et al., 2004). Twaite Shad are commonly recorded congregating in Waterford Harbour in March and occasionally in February (Doherty et al., 2004; Gallagher et al., 2016). Upstream migration from the estuaries peaks at water temperatures of 10-14°C (IFI, 2022a). Acoustic telemetry studies by IFI (Rooney & King, 2015; IFI, 2022c) have found that

shads are highly mobile during their spawning migration, moving up to 35km upstream and downstream with the tides.

Spawning occurs over gravel (IFI, 2022a) at the top of tidal waters (King et al., 2011). Once the adults reach the spawning grounds in late May and early June, they remain there for 1-2 weeks, when there is a steady rise in water temperatures from 13°C to 19°C (Rooney & King, 2015; IFI, 2022c). Fish move onto the breeding area at dusk (IFI, 2022a) and spawning takes place throughout the night in large, noisy schools (Maitland & Hatton-Ellis, 2003; Doherty et al., 2004; Freyhof & Kottelat, 2008; King et al., 2011). The eggs sink into the gravel or float downstream, hatching 4-8 days later (Maitland & Hatton-Ellis, 2003; Doherty et al., 2004). Most juveniles move to the lower estuary during their first summer and migrate to sea at end of their second year (Freyhof & Kottelat, 2008). Once in brackish water, these fish feed primarily mysids and copepods (Maitland & Hatton-Ellis, 2003). The movements and ecology of Twaite Shad during their residency in estuaries are not fully understood (IFI, 2022a) and are the subject of ongoing research (IFI, 2022c).

Twaite Shad is an iteroparous species, i.e., individuals can spawn multiple times over their lifespan (Rooney & King, 2015, IFI, 2022a). Examination of scales by King & Roche (2008) showed that repeat spawning is the norm and angling returns from the River Barrow also reveal a relatively well-established population of repeat-spawners there (King et al., 2011). After spawning, spent fish migrate back to sea (Freyhof & Kottelat, 2008) and most surviving adults return to sea almost immediately (Doherty et al., 2004; IFI, 2022a). As part of IFI's acoustic telemetry studies, Rooney & King (2015) found that, following presumed spawning, tagged shad returned to the lower part of the estuary within 1-3 days (IFI, 2022c).

Apart from the nocturnal spawning habit, the diel activity patterns of Twaite Shad are not well defined/studied. However, it appears that, with the exception of the spawning period, Twaite Shad is a mainly diurnal species. Gregory & Clabburn (2003) found that the numbers of adult shad migrating upstream and downstream were much reduced between 21:00 and 03:00 and that a peak in activity occurred around dawn. Esteves & Andrade (2008) found that shad larvae were more common during daylight hours, particularly in the afternoon, than they were at night.

Twaite Shad, like all members of the herring family, is considered a "hearing specialist" as it has a much greater auditory range than other fishes (Teague & Clough, 2011). As Twaite Shad is a hearing specialist and predominantly diurnal, and as both adults and juveniles are likely to be pass by the proposed development location in significant numbers, this species is considered to be the most sensitive receptor in terms of noise impacts.

Summary

During the period from March to May, inclusive, adult Twaite Shad are expected to migrate upstream through the works area in significant numbers during daylight hours. Later in the summer, i.e., in June and July, spent adult shad are likely to be present in significant numbers on their return from their spawning grounds to the lower estuary and, eventually, the sea. The timing of the arrival of young-of-the-year (0+) shad at the location of the proposed development is not known, but it is thought that they gradually move down the tidal reaches of the river from June to August/September. Similarly, little is known of the behaviour and ecology of juvenile Twaite Shad during their residency in the estuary. Therefore, following the Precautionary Approach, juveniles are assumed to move upstream and downstream through the works area at all times of the year and to be most active during daylight. Owing to their sensitive

auditory systems, diurnal habit and year-round presence, as well as their small body size, juvenile Twaite Shad are considered highly vulnerable to noise impacts arising from pile driving.

Salmonids

While the River Barrow at the location of the proposed development does not provide suitable spawning habitat for salmonids, e.g., Atlantic Salmon (*Salmo salar*) and Brown Trout (*S. trutta*), it is an important link between the estuarine, coastal and oceanic feeding grounds for these species and their spawning beds further upstream. Salmonid species may be present at the proposed development location at any time of year but occur in most significant numbers during their upstream spawning migration (predominantly in autumn and winter) and out-migration of smolts (almost entirely in spring). In addition, sea or slob trout (Brown Trout with a marine or estuarine adult phase) may be present at any time of the year.

Literature review

Like lampreys and shads, Atlantic Salmon is an anadromous species, i.e., the adult life stage is marine, with mature fish returning to their natal freshwater streams to spawn. Adults can begin their spawning migration at any time of year, but there are two main migration periods: fish who have spent one winter at sea, known as "grilse", ascend rivers in late winter, while fish who have spent more than one winter at sea, known as "multi-sea-winter (MSW)" (or "spring" salmon, if they enter fresh water before 1st June), generally enter rivers earlier in the year. Movement of spawning salmon upstream through the estuary is predominantly nocturnal and usually occurs on the ebb tide (Smith & Smith, 1997). Once spawning has occurred, most adults die, though as many as 36% may survive and return to sea as kelts (Hendry & Cragg-Hine, 2003). Only 3-6% survive to spawn in subsequent years (Mills, 1989; Hubley et al., 2008).

The eggs hatch in spring and the young, known as "alevins", remain within the gravel interstitia until the yolk-sac is depleted, which takes a number of weeks, at which point the rise to the surface and begin their free-swimming phase. At this point the juvenile fish are known as "fry". At the end of their first summer these fish develop parr marks on their sides and are thereafter known as "parr". Juveniles spend 2-4 years in fresh waters (Hendry & Cragg-Hine, 2003), normally undergoing smoltification (a series of physiological changes or metamorphosis which prepares the young salmon for life in the marine environment) and migrating to sea in the spring (March-June) of their third year (King et al., 2011). Out-migrating smolts are predominantly nocturnal (Moore et al., 1995). However, they become increasingly active during daylight hours with increasing water temperatures (Thorpe et al., 1994; Ibbotson et al., 2006, 2011; Haraldstad et al., 2017). Smolts do not require a period of acclimation to saline conditions and so tend not to delay in the estuary, preferring to move directly to sea (Moore et al., 1995).

As the up-estuary section of the migration of adult Atlantic Salmon is predominantly nocturnal, the vast majority of individuals will migrate past the proposed development location during the hours of darkness. Similarly, any out-migrating kelts are likely to migrate at night. In addition, these fish are likely to spend only a very short time in the estuary, instead migrating directly from the river to the sea.[11] Furthermore, only a very small portion of kelts contribute to future spawning, and so impacts on kelts are generally imperceptible at the population scale.

[11] Atlantic Salmon kelts occasionally spend longer periods (up to several weeks) in estuaries on their post-spawning migration to the sea (Lindberg, 2011).

Smolts are likely to pass through the construction area in significant numbers on their migration from the river to the sea in the period from March to May, inclusive. As with adult salmon, smolts migrate mostly at night. As with kelts, smolts do not tend to delay in the estuary, preferring to migrate directly to sea.

European Eel

Unlike salmonids and lampreys, European Eel (*Anguilla anguilla*) has a catadromous life history, i.e., spawning occurs at sea and juveniles migrate into fresh waters to feed and mature. The major influx of juvenile eels occurs in early spring. Large numbers of eels are expected to be present at the proposed development location during this time.

Migration Periods

Based on the literature review above, Table 2-5 below illustrates the known migration patterns of these species through the Barrow Estuary.

Table 2-5 Indicative migration periods for Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon species in the Barrow Estuary. Blue shading indicates mostly nocturnal activity, orange indicates mostly diurnal activity, shade indicates relative abundance of fish.

Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sea Lamprey												
Upstream												
Downstream												
River Lamprey												
Upstream												
Downstream												
Twaite Shad												
Upstream												
Downstream (spent)												
Downstream (0+)												
Juveniles (<2 years)												
Atlantic Salmon												
Upstream												
Downstream (kelts)												
Downstream (smolts)												

2.5.4 Otter

There are frequent and widespread records of Otter throughout the study area according to data supplied by the NPWS and the NBDC (2022). However, no evidence of Otter (e.g., holts, couches, spraints or prints) were recorded during the walkover survey, which assessed 150m upstream and downstream of the proposed development. Nevertheless, records and data reviewed as part of the desk study indicate that Otter are present at the location of the proposed development and within the study area.

2.5.5 Flora

No species protected under the Flora (Protection) Order, 2022 were recorded within the study area. Species identified within specific habitats are detailed in Section 2.5.2 above and invasive alien plant species identified within or adjacent to the site are discussed in Section 2.5.6 below.

2.5.6 Invasive Alien Species

During the field survey, two species restricted under Regulation 49 of the Habitats Regulations, namely *Spartina* sp*.* and Himalayan Balsam (*Impatiens glandulifera*), were recorded on the bank of the River Barrow *c*. 15m downstream of the bridge. *Spartina* sp. was found growing within reed bed habitat which covers a total area of *c.* 750m^2 within proximity of the bridge. Himalayan Balsam was recorded growing along a 15m stretch of the riverbank under a treeline *c.* 30m south of the proposed development. These species have potential to be spread as a result of construction works.

Chinese Mitten Crab (*Eriocheir sinensis*) was recorded in the Waterford Estuary in 2009 (Invasive Species Ireland, 2021) and is presumed to still be present there. This is the only record of this species in Ireland. However, it is much more widespread in Great Britain (NIEA, 2020) and remains a threat.

2.5.7 Potential Impacts on the Natural Environment

Construction Phase

Habitat Loss

The proposed development will result in the loss of *c.* 22 m^2 of intertidal mudflats and estuarine habitat on the eastern bank of the River Barrow, and 60 m^2 of estuarine habitat, of which 10 m^2 is also intertidal mudflats, on the western bank of the River Barrow, south of O'Hanrahan Bridge.

The total loss of habitat as a result of the proposed development is 82m^2 of estuarine habitat, of which 32m^2 is also intertidal mudflat.

These habitats correspond to Annex I habitats, namely, 'Mudflats and sandflats not covered by seawater at low tide' (1140) and 'Estuaries' (1130).

A small area of hard intertidal substrates (i.e., the existing quay wall on the eastern banks and rock armour on the western bank) and their associated biological communities will be permanently lost as a result of the proposed development.

Additionally, the proposed development will result in the loss of recolonising bare ground (ED3) and built land (BL3) as these are the habitats found within the construction site compound. However, as the compound site is currently in use as a construction compound for the separately proposed South-east Greenway project, habitat loss at this location is expected to be minimal.

Disturbance/Displacement

Sheet piling, which will be undertaken from a barge, poses a risk of injury to fauna in the River Barrow from hydroacoustic impacts, most notably on Twaite Shad. Twaite Shad is particularly sensitive to hydroacoustic impacts given that it is a hearing-specialist species and that juveniles are likely to be present in the estuary at all times of the year. Injury from noise or vibration can alter behaviour (i.e., leaving safe shallow areas to avoid high levels of disturbance) which can result in increased rates of predation of these species.

Hydroacoustic impacts from noise and vibration can also displace Otter and any impacts on fish species will have an indirect negative effect on Otter as they rely on the local fish populations as a food source.

Piling and other construction activities may cause additional physical disturbance to invertebrate fauna which may result in the mortality of small numbers of these species.

Artificial lighting poses a risk of negative impacts on biodiversity, particularly Otter and fish, by fragmentation of commuting/foraging corridors, disruption of circadian rhythms and increased risk of predation.

Owing to the scale, the proposed development does not have potential to give rise to significant shading impacts on the River Barrow or the species it supports during the construction phase.

Water Quality

Due to the use of barges and other construction machinery on and in close proximity to the River Barrow, there is a risk of pollution to the river during construction. This could be in the form of spilled fuel, oil, concrete or grout. The aspects of the construction of the proposed development which pose the greatest risk of such impacts include:

- Elevated silt/sediment loading within watercourses from construction site runoff and sheet piling. Sheet piling will be undertaken from a barge for river-side installation. Elevated silt loading can lead to long-term damage to aquatic ecosystems by smothering spawning grounds and gravel beds and clogging the gills of fish. Increased silt load in receiving watercourses stunts aquatic plant growth, limits dissolved oxygen capacity and overall reduces the ecological quality with the most critical period associated with low flow conditions. Other pollutants in the watercourse can bind to silt which can lead to increased bioavailability of these pollutants. Effects on erosion and deposition processes during construction are likely to be *negative, temporary, imperceptible to slight* and highly localised to the works area.
- Spillage of concrete, grout and other cement-based products. These cement-based products are highly alkaline (releasing fine highly alkaline silt) and extremely corrosive and can result in significant impact to watercourses altering the pH, smothering the stream bed and physically damaging fish through burning and clogging of gills due to the fine silt.
- Accidental spillage of hydrocarbons from construction plant and at storage depots / construction compound have the potential to enter drainage ditches/land drains and subsequently the River Barrow, via surface water runoff.
- Faecal contamination arising from inadequate treatment of on-site toilets and washing facilities.
- There is also potential for pollutants derived from construction materials to be mobilised by flood waters.

Given the naturally high sediment load in the River Barrow at this location, sedimentation is not considered to pose a significant risk. However, the synergistic effects of the naturally occurring sediment with any pollutants must be considered. Any pollution incident could have significant negative impacts on aquatic and shoreline life depending on the severity of the pollution. Pollution can also have indirect negative impacts on water-dependent terrestrial habitats and species that are hydrologically connected to the source of the pollution.

Invasive Alien Species

Construction activities pose a risk of the spread of invasive non-native species to, from or within the vicinity of the works. Species of particular concern in this case is Chinese Mitten Crab and *Spartina* sp., which could be spread within the Barrow-Nore-Suir Estuary by barges and other vessels associated with the construction of the proposed development.

Operational Phase

Disturbance / Displacement

The proposed development has the potential to lead to disturbance from noise, vibration, visual cues, and lighting, which would lead to the displacement of certain species from the general area. Artificial lighting poses a risk of negative impacts on biodiversity, particularly otter and fish species by fragmentation of commuting/migration/foraging corridors, disruption of circadian rhythms and increased risk of predation.

Hydrological Impacts

Bridge works have the potential to cause permanent disturbance to river channels, floodplains and the flood regime. Watercourse crossings and embankments, if not appropriately designed, create an obstacle to flow, particularly under flood conditions resulting in increased flood risk and damage in the vicinity of the proposed development. Such structures can locally alter channel morphology resulting in changes in flow velocity and water depth. These structures can also result in localised riverbed and riverbank erosion, resulting in long-term changes to the morphology of the river channel.

Following the widening of the quay walls, the finish will replicate the existing smooth concrete and sheet piling currently present. Given the minor scale of the intervention, the proposed layout of the development will likely have negligible impact on channel cross section and resultant flow and sediment transport characteristics.

The proposed development will not alter the cross-sectional area of the bridge openings and general flow characteristics will not be affected. A section of the existing flood defences on the east quays will be altered where they tie into the abutment. The existing standard of protection (1 in 200 year coastal) will be reinstated. The proposed widening of quay walls will displace some flood waters, though the volume is considered negligible in the context of the Barrow system. Conversely, the widening of the quay walls will also increase the area of defended lands though this is also seen as insignificant.

3. IDENTIFICATION OF ADVERSE EFFECTS

3.1 Establishing the Zone of Influence

Section 3.2.3 of DEHLG (2010) outlines the procedure for selecting the European sites to be considered in AA. It states that European sites potentially affected should be identified and listed, bearing in mind the potential for direct, indirect and in-combination effects. It also states that the specific approach in each case is likely to differ depending on the scale and likely effects of the plan or project. However, it advises that the following sites should generally be included:

- All European sites within or immediately adjacent to the plan or project area;
- All European sites within the zone of influence of the plan or project; and,
- In accordance with the Precautionary Principle, all European sites for which there is doubt as to whether or not they might be significantly affected.

The "zone of influence" of a plan or project is the geographic extent over which significant ecological effects are likely to occur. In the case of projects, the guidance recognises that the zone of influence must be established on a case-by-case basis using the Source-Pathway-Receptor Model (OPR, 2021) with reference to the following key variables:

- The nature, size and location of the project;
- The nature of the impacts which may arise from the project;
- The sensitivities of the ecological receptors; and,
- The potential for in-combination effects.

For example, in the case of a project that could affect a watercourse, it may be necessary to include the entire upstream and/or downstream catchment in order to capture all European sites with water-dependent features of interest.

For example, in the case of a project that could affect a watercourse, it may be necessary to include the entire upstream and/or downstream catchment in order to capture all European sites with water-dependent features of interest.

Having regard to the above key variables, the zone of influence was defined as:

- The entire area within 550 m of the proposed development
- The entire extent of the transitional waters of the River Barrow and the River Nore upstream and downstream of the proposed development.
- The transitional waters of the River Suir as far as the Lower Suir Estuary (Little Island-Cheekpoint)

This area was defined as the zone of influence and extends to the maximum distance at which potential impacts may occur, including via hydrological connections, i.e., surface water pathways. Beyond this limit, noise and visual disturbance to birds will not occur.

European sites outside of the zone of influence are excluded due to various factors such as considerable overland or upstream distance, lack of hydrological connection and/or lack of supporting habitat for qualifying interest species in the vicinity of the proposed development. There are no pathways for impact arising from the proposed development to reach those sites, therefore there is no potential for likely significant effects to occur to the qualifying interests of those European sites.

A geographical representation of the zone of influence was produced in ArcGIS 10.5 using the boundary of the proposed development and publicly available Ordnance Survey Ireland maps. This was used in combination with NPWS shapefiles to identify the boundaries of European sites in relation to the zone of influence (Figure 3-1). It was determined that two European sites, namely the River Barrow and River Nore SAC and the River Nore SPA occur within the zone of influence. Detailed descriptions of these sites are given in Section 3.2.

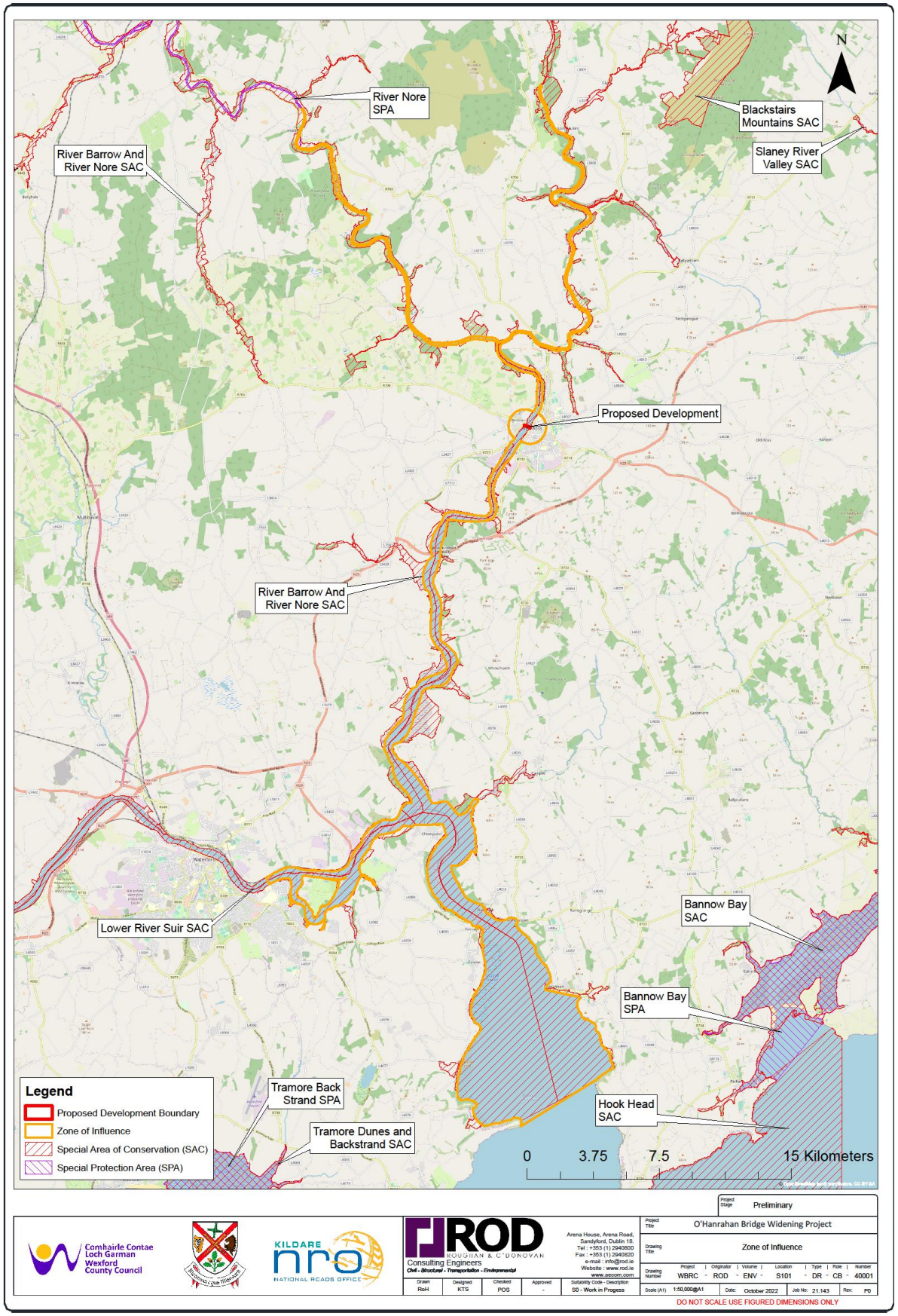


Figure 3-1 **Location of European sites in relation to the zone of influence of the proposed development.**

Table 3-1 European sites located within the zone of influence.

European site [site code]	Are there potential pathways for impacts from the proposed development to this site?
River Barrow and River Nore SAC [002162]	**Yes.** The proposed development is located within the River Barrow and River Nore SAC.
Lower River Suir SAC [002137]	**Yes.** The shortest absolute distance from the proposed development to this site is 14 km to the south. This is the direct over land distance between the SAC and the proposed development. This SAC adjoins the boundary of the River Barrow and River Nore SAC to the south at the confluence of the River Suir and the River Barrow. The shortest distance from the proposed development to the site via a hydrological connection is 16.5 km south, through the River Barrow. The proposed development and the location of this SAC are within the transitional waters of the River Barrow and River Suir, respectively. Therefore, there is a tidal influence which can potentially bring waters (and suspended matter) from the River Barrow upstream into the River Suir. Therefore, there is potential for adverse effects to the Qualifying Interests of this site as a result of the proposed development.
River Nore SPA [04233]	**Yes.** The shortest absolute distance from the proposed development to this site is 9.2 km to the northwest. This is the direct over land distance between the SPA and the proposed development. The shortest distance from the proposed development to the site via a hydrological connection is 12.8 km northwest, upstream through the River Barrow and the River Nore. This SPA is designated for Kingfisher, and there is suitable supporting habitat for this species in the area surrounding the proposed development and downstream of the proposed development. As the proposed development and the location of this SPA are within the transitional waters of the Barrow Nore Estuary and Nore Estuary, respectively, there is a tidal influence which can potentially bring waters (and suspended matter) from the River Barrow upstream into the River Nore, potentially impacting Kingfisher habitat and distribution within this SPA. Therefore, there is potential for adverse effects to the Qualifying Interests of this site as a result of the proposed development.

3.2 Site Descriptions

3.2.1 River Barrow and River Nore SAC

The description of the River Barrow and River Nore SAC provided here is based on the Site Synopsis (NPWS, 2016), Conservation Objectives (NPWS, 2011a) and Natura 2000 Standard Data Form (NPWS, 2020a) for the site, as well as the Conservation Objectives Supporting Documents (NPWS, 2011b, c & e). Pathways for negative effects exist between the proposed development and this European site. This European site has been considered under the Key Ecological Receptor headings 'River Barrow including Annex I 'Estuaries', 'Intertidal Habitats including Annex I Mudflats and sandflats not covered by seawater at low tide', 'Fish species including Annex II migratory species', and 'Otter'.

Site Overview

This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadan Head. The site passes through eight counties: Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge,

Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore.

Overall, the River Barrow and River Nore SAC is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II to the Habitats Directive. Furthermore, it is of high conservation value for the populations of bird species that use it. The occurrence of several plant species listed in *Ireland Red List No. 10: Vascular Plants* (Wyse Jackson et al., 2016), including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10km stretch of the Nore, add further interest to this site.

Qualifying Interests of the Site

[1130] Estuaries

[1140] Mudflats and sandflats not covered by seawater at low tide

[1170] Reefs

[1310] *Salicornia* and other annuals colonising mud and sand

[1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

[1410] Mediterranean salt meadows (*Juncetalia maritimi*)

[3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

[4030] European dry heaths

[6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

[7220] *Petrifying springs with tufa formation (*Cratoneurion*)

[91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

[91E0] *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

[1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)

[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)

[1092] White-clawed Crayfish (*Austropotamobius pallipes*)

[1095] Sea Lamprey (*Petromyzon marinus*)

[1096] Brook Lamprey (*Lampetra planeri*)

[1099] River Lamprey (*Lampetra fluviatilis*)

[1103] Twaite Shad (*Alosa fallax*)

[1106] Atlantic Salmon (*Salmo salar*)

[1355] European Otter (*Lutra lutra*)

[1421] Killarney Fern (*Trichomanes speciosum*)

[1990] Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*)

'Estuaries' (1130) and the other Annex I habitats within it form a large component of the site. Extensive areas of 'Mudflats and sandflats not covered by seawater at low tide' (1140), comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6km

from north to south between Passage East and Creadan Head and are over 1km wide in places. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*. An extensive area of Honeycomb Worm biogenic reef, i.e., 'Reefs' (1170), occurs adjacent to Duncannon, on the eastern shore of the estuary.

'*Salicornia* and other annuals colonising mud and sand' (1310) are found in the creeks of the saltmarshes and at their seaward edges. The habitat also occurs in small amounts on some stretches of the shore free of stones.

'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' (1330) and 'Mediterranean salt meadows (*Juncetalia maritimi*)' (1410) occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank, and Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub-types are generally intermixed. At the upper edge of the salt meadow, in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected Borrer's Saltmarsh-grass and Meadow Barley are found. The very rare and also legally protected Divided Sedge is also found. Sea Rush is also present. Other plants recorded and associated with salt meadows include Sea Aster, Thrift, Sea Couch, Spear-leaved Orache, Lesser Sea-spurrey, Sea Arrowgrass and Sea Plantain.

'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' (3260) are well represented in the River Barrow and in the many tributaries of the site. In the River Barrow, the species found include water-starworts, Canadian Pondweed, Bulbous Rush, water-milfoils, the pondweed *Potamogeton* × *nitens,* Broad-leaved Pondweed, Fennel Pondweed, Perfoliate Pondweed and crowfoots. The water quality of the River Barrow has improved since the vegetation survey was carried out in 1996.

'European dry heaths' (4030) occurs in pockets along the steep valley sides of the rivers, especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the riverbank consists of Bracken and Gorse, with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw, Foxglove, Common Sorrel and Creeping Bent. On rocky outcrops, Bilberry and Great Wood-rush are present. At Ballyhack, a small area of dry heath is interspersed with patches of lowland dry grassland. Dry heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the riverbank.

'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels' (6430) occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife, Marsh Ragwort, Ground Ivy and Hedge Bindweed. Himalayan Balsam, an alien invasive species, is abundant in places.

A good example of '*Petrifying springs with tufa formation (*Cratoneurion*)' (7220) occurs at Dysart Wood along the River Nore. This is a rare habitat in Ireland, and one listed with priority status on Annex I of the Habitats Directive. These hard-water springs are characterised by lime encrustations, often associated with small waterfalls.

A rich bryophyte flora is typical of the habitat and two diagnostic species, *Palustriella commutata* and *Eucladium verticillatum*, have been recorded.

The best examples of 'Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles' (91A0) are seen in the ancient Park Hill woodland in Abbeyleix Estate, at Kyleadohir on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods along the River Nore, and at Cloghristic Wood, Drummond Wood and Borris Demesne along the River Barrow, though other patches occur throughout the site.

Good examples of '*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)' (91E0) occur at Rathsnagadan, Murphy's of the River, Abbeyleix Estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow, White Willow, Rusty Willow, Crack Willow and Osier, along with Yellow Iris, Hemlock Water-dropwort, Wild Angelica, Thin-spiked Wood-sedge, Pendulous Sedge, Meadowsweet, Common Valerian and the Red Data Book species Nettle-leaved Bellflower.

Other habitats found throughout the site include wet grassland, marsh, reed swamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Irish Red List plant species have been recorded within the site: Killarney Fern, Divided Sedge, Clustered Clover, Basil Thyme, Red Hemp-nettle, Borrer's Saltmarsh-grass, Meadow Barley, Opposite-leaved Pondweed, Meadow Saffron/Autumn Crocus, Wild Clary/Sage, Nettle-leaved Bellflower, Saw-wort, Bird Cherry, Blue Fleabane, Fly Orchid, Ivy Broomrape and Greater Broomrape. Of these, the first nine are protected under the Flora (Protection) Order, 2015. Other plants that do not have a wide distribution in the country are found in the site, including Thin-spiked Wood-sedge, Field Garlic and Summer Snowflake. Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria.* The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of Annex II species, including Freshwater Pearl Mussel (both *Margaritifera* and *M. durrovensis*), White-clawed Crayfish, Atlantic Salmon, Twaite Shad, Sea Lamprey, Brook Lamprey, River Lamprey, Desmoulin's Whorl Snail and European Otter. This is the only site in the world for the hard-water margaritiferid, the Nore Freshwater Pearl Mussel, and one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore (main channel) is a designated salmonid river. The River Barrow/ River Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the River Nore. The upper stretches of the River Barrow and River Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Lists include Daubenton's Bat, Badger, Irish Hare and Common Frog. The rare Red List fish species Smelt occurs in estuarine stretches of the site. In addition to Freshwater Pearl Mussel, the site also supports two other freshwater mussel species, *Anodonta anatina* and *A. cygnea*.

The site is of ornithological importance for a number of Annex I (Birds Directive) species, including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Waterford Harbour. There is also an extensive autumnal roosting

site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country. The reedbed at Woodstown supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

Sensitivities of the River Barrow and River Nore SAC and its Qualifying Interests

Land use within the SAC consists mainly of agricultural activities, mostly intensive and principally grazing and silage production. Slurry is spread over much of the area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to water quality and populations of Annex II species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of angling clubs, some with a number of beats. Both commercial and leisure fishing takes place on the rivers. There is net fishing and a mussel bed in the estuary. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath, are also popular. There is a golf course on the banks of the River Nore at Mount Juliet and sports pitches at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port and shipping to and from Waterford and Belview ports also passes through the estuary.

The main threats to the SAC and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, over-grazing in the woodland areas, and invasion by non-native species, e.g., Cherry Laurel and Rhododendron. Water quality remains vulnerable. Good quality water is necessary to maintain the populations of Annex II species and is dependent on controlling fertilisation of the grasslands, particularly along the River Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as Lamprey and Shad. Land reclamation also poses a threat to the salt meadows and the protected species therein.

3.2.2 Lower River Suir SAC

The description of the Lower River Suir SAC provided here is based on the Site Synopsis (NPWS, 2013), Conservation Objectives (NPWS, 2017) and Natura 2000 Standard Data Form (NPWS, 2020) for the site, as well as the Conservation Objectives Supporting Documents (NPWS, 2017). Pathways for negative effects exist between the proposed development and this European site. This European site has been considered under the Key Ecological Receptor headings 'River Barrow and River Suir including Annex I, 'Estuaries', 'Fish species including Annex II migratory species', and 'Otter'.

Site Overview

The Lower River Suir SAC consists of the freshwater stretches of the River Suir south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore east of Cheekpoint, and many tributaries including the Clodiagh, Lingaun, Anner, Nier, Tar, Aherlow and Multeen. The River Suir and its tributaries flow through the counties of Tipperary, Kilkenny and Waterford.

The Lower River Suir SAC contains excellent examples of a number of Annex I habitats, including the priority habitats[12] alluvial forest and yew woodland. The site also supports populations of several important animal species, some listed on Annex II to the Habitats Directive or in *Ireland Red List No. 12: Terrestrial Mammals* (Marnell et al., 2019). The presence of two plant species protected under the Flora (Protection) Order, 2015 and the ornithological importance of the site adds further to its ecological interest and importance.

Qualifying Interests of the Site

[1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

[1410] Mediterranean salt meadows (*Juncetalia maritimi*)

[3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

[6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

[91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

[91E0] *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

[91J0] **Taxus baccata* woods of the British Isles

[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)

[1092] White-clawed Crayfish (*Austropotamobius pallipes*)

[1095] Sea Lamprey (*Petromyzon marinus*)

[1096] Brook Lamprey (*Lampetra planeri*)

[1099] River Lamprey (*Lampetra fluviatilis*)

[1103] Twaite Shad (*Alosa fallax*)

[1106] Atlantic Salmon (*Salmo salar*)

[1355] European Otter (*Lutra lutra*)

'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' (1330) and 'Mediterranean salt meadows (*Juncetalia maritimi*)' (1410) occur below Waterford City in old meadows where the embankment is absent, or has been breached, and along the tidal stretches of some of the in-flowing rivers below Little Island. There are very narrow, non-continuous bands of this habitat along both banks. More extensive areas are also seen along the south bank at Ballinakill, the east side of Little Island, and in three large salt meadows between Ballinakill and Cheekpoint. The Atlantic and Mediterranean sub-types are generally intermixed. The species list is extensive and includes Red Fescue, oraches, Sea Aster, Sea Couch, frequent Sea Milkwort, occasional Wild Celery, Parsley Water-dropwort, English Scurvygrass and Sea Arrowgrass. These species are more representative of the Atlantic sub-type of the habitat. Common Cord-grass is frequent along the main channel edge and up the internal channels. Meadow Barley, which is protected under the Flora (Protection) Order, 2015, grows at the landward transition of the saltmarsh. Sea Rush, an indicator of the Mediterranean salt meadows, also occurs.

'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' (3260) is evident in the freshwater stretches of the River Suir and along many of its tributaries. Typical species found include Canadian

[12] An asterisk (*) in the title of an Annex I habitat denotes that it is a "priority habitat", i.e., an Annex I habitat in danger of disappearing and for the conservation of which the EU has particular responsibility in view of the proportion of its natural range which falls within the European territory of Member States.

Pondweed, water-milfoils, Fennel Pondweed, Curled Pondweed, Perfoliate Pondweed, Pond Water-crowfoot, other crowfoots and the Greater Water-moss. At a couple of locations along the river Opposite-leaved Pondweed occurs. This species is protected under the Flora (Protection) Order, 2015.

'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels' (6430) occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife, Marsh Ragwort, Ground Ivy and Hedge Bindweed.

'Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles' (91A0) are also of importance at the site. The best examples are seen in Portlaw Wood on both sides of the Clodiagh River. On the south side, the stand is more open, and the oaks (mainly Pedunculate Oak) are well grown and spreading. Ivy and Bramble are common on the ground, indicating relatively high light conditions. Oak regeneration is dense, varying in age from 0-40 years, and Holly is common but mostly young. Across the valley, the trees are more closely spaced and poorly grown. There are no clearings; large oaks extend to the boundary wall. In the darker conditions, Ivy is much rarer and Holly much more frequent, forming a closed canopy in places. Oak regeneration is uncommon since there are few natural clearings. The shallowness of the soil on the north-facing slope probably contributes to the poor tree growth there. The acid nature of the substrate has induced a mountain-type oakwood community to develop. The site is quite species-rich, including an abundance of mosses, liverworts and lichens. The rare lichen *Lobaria pulmonaria*, an indicator of ancient woodlands, is found here.

The best examples of '*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)' (91E0) are found on the islands just below Carrick-on-Suir and at Fiddown Island. Species occurring here include Almond Willow, White Willow, Rusty Willow, Osier, Yellow Iris, Hemlock Water-dropwort, Wild Angelica, Pendulous Sedge, Meadowsweet and Common Valerian. The terrain is littered with dead trunks and branches and intersected with small channels that carry small streams to the river. The bryophyte and lichen floras appear to be rich. A small plot is currently being coppiced and managed by the NPWS. In the drier areas, species such as Ash, Hazel, Hawthorn and Blackthorn occur.

Two stands of '**Taxus baccata* woods of the British Isles' (91J0), a rare habitat in Ireland and the EU, occur within the site. These are on limestone ridges at Shanbally and Cahir Park.

Other habitats within the Lower River Suir SAC include wet and dry grassland, marsh, reed swamp, improved grassland, coniferous plantations, deciduous woodland, scrub, tidal river, stony shore and mudflats. The most dominant habitat adjoining the river is improved grassland, although there are wet fields with species such as Yellow Iris, Meadowsweet, rushes, Meadow Buttercup and Cuckooflower.

The site is of particular conservation interest for the presence of a number of Annex II species, including Freshwater Pearl Mussel, White-clawed Crayfish, Salmon, Twaite Shad, Sea Lamprey, Brook Lamprey and River Lamprey and Otter. This is one of only three known spawning grounds in the country for Twaite Shad.

Parts of the Lower River Suir SAC have been identified as of ornithological importance for a number of Annex I (Birds Directive) species, including Greenland White-fronted Goose, Golden Plover, Whooper Swan and Kingfisher. Flocks are seen in Coolfinn Marsh and along the reedbeds and saltmarsh areas of the Suir. Coolfinn supports nationally important numbers of Greylag Goose on a regular basis. Other species

occurring include Mallard, Teal, Wigeon, Tufted Duck, Pintail, Pochard, Little Grebe, Black-tailed Godwit, Oystercatcher, Lapwing, Dunlin, Curlew, Redshank, Greenshank and Green Sandpiper. Nationally important numbers of Lapwing were recorded at Faithlegg in the winter of 1996-1997. Kingfisher, a species listed on Annex I to the Birds Directive, occurs along some of the many tributaries throughout the site.

Sensitivities of the Lower River Suir SAC and its Qualifying Interests

Land use within the site consists mainly of agricultural activities including grazing, silage production (with the use of fertilisers) and land reclamation. The grassland is intensively managed, and the rivers are, therefore, vulnerable to pollution from run-off of fertilisers and slurry. Arable crops are also grown. Fishing is one of the main tourist attractions along stretches of the River Suir and some of its tributaries, and there are a number of angling clubs, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. The Aherlow River is a designated Salmonid Water under the Freshwater Fish Directive (2006/44/EC). Other recreational activities such as boating, golfing and walking are also popular. Several industrial developments, which discharge into the river, border the site, including three dairy-related operations and a tannery.

3.2.3 River Nore SPA

The description of the River Nore SPA provided here is based on the Site Synopsis (NPWS, 2011e), Generic Conservation Objectives (NPWS, 2022a) and Natura 2000 Standard Data Form (NPWS, 2020b) for the site. Pathways for negative effects exist between the proposed development and this European site. This European site has been considered under the Key Ecological Receptor headings 'River Barrow including Annex I 'Estuaries', and 'Fish species including Annex II migratory species'.

Site Overview

The River Nore SPA is a long, linear site that includes the following river sections: the River Nore from the bridge at Townparks, (north-west of Borris in Ossory) to Coolnamuck (approximately 3 km south of Inistioge) in Co. Kilkenny; the Delour River from its junction with the River Nore to Derrynaseera bridge (west of Castletown) in Co. Laois; the Erkina River from its junction with the River Nore at Durrow Mills to Boston Bridge in Co. Laois; a 1.5 km stretch of the River Goul upstream of its junction with the Erkina River; the Kings River from its junction with the River Nore to a bridge at Mill Island, Co. Kilkenny. The site includes the river channel and marginal vegetation.

For a large part of its course the River Nore traverses Carboniferous limestone plains; it passes over a narrow band of Old Red Sandstone rocks below Thomastown. The site is a Special Protection Area (SPA) under the E.U. Birds Directive of special conservation interest for the following species: Kingfisher. A survey in 2010 recorded 22 pairs of Kingfisher (based on 16 probable and 6 possible territories) within the SPA. Other species which occur within the site include Mute Swan (35), Mallard (267), Cormorant (14), Grey Heron (45), Moorhen (14), Snipe (17) and Sand Martin (1,029) – all figures are peak counts recorded during the 2010 survey.

Qualifying Interests of the Site

[A229] Kingfisher (*Alcedo atthis*)

The River Nore SPA is of high ornithological importance as it supports a nationally important population of Kingfisher, a species that is listed on Annex I of the E.U. Birds Directive.

Sensitivities of the River Nore SPA and its Qualifying Interests

This site is particularly sensitive to natural system modifications such as landfill, land reclamation and drying out, general transportation and service corridors such as port areas.

3.3 Evaluation against Conservation Objectives

Tables 3-2, 3-3 and 3-4 below detail the evaluation of the likely effects of the proposed development, as outlined in Section 2.5.8 above, in view of the Conservation Objectives of the sites identified in Section 3.1 and described in Section 3.2. As explained in Sections 1.3 and 1.4, AA is carried out in view of the Conservation Objectives of the relevant European sites, which are in turn defined by detailed Attributes and corresponding Targets. Therefore, the evaluation of whether or not a likely effect is significant (in view of the Conservation Objective in question) is made with regard to these Attributes and Targets.

Table 3-2 Evaluation of the likely effects of the proposed development in view of the Conservation Objectives of the River Barrow and River Nore SAC.

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Estuaries [1130]	"*To maintain the favourable conservation condition of Estuaries in the River Barrow and River Nore SAC*"	A total area of 82m^2 of Estuary habitat will be permanently lost as a result of the proposed development due to the installation of a sheet piled walls. The installation of the sheet piled wall will also give rise to vibration effects which could lead to an impact on the community distribution within the benthic sediment. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out.	Yes
Mudflats and sandflats not covered by seawater at low tide [1140]	"*To maintain the favourable conservation condition of the Mudflats and sandflats not covered by seawater at low tide in the River Barrow and River Nore SAC*"	A total area of 32m^2 of this habitat will be permanently lost due to the installation of the sheet piled wall as a result of the proposed development. Furthermore, the biological communities (i.e., benthic invertebrates and algae) that live within the mud will be lost due to loss of habitat from the installation of a sheet piled wall. In addition to this, the vibration effects from their installation and the potential for future erosion of mudflat habitat could lead to a further reduction in the distribution of these communities. Therefore, adverse effects cannot be ruled out.	Yes
Reefs [1170]	NPWS (2011a) does not contain a site-specific Conservation Objective for Reefs. Therefore, as per advice from the NPWS, the Conservation Objective for Reefs in another European site, in this case the Hook Head SAC [000764], was used: "*To maintain the favourable conservation condition of Reefs*" (NPWS, 2011b).	The closest known location of reefs is *c*. 23.6 km downstream of the proposed development within the zone of influence (NPWS, 2011c), therefore there will be no direct loss or damage to this habitat as a result of the proposed development. Nevertheless, as this habitat is hydrologically connected to the proposed development, there is a risk of water quality impacts occurring in the event of a spillage of pollutants such as wet concrete or fuel into the river which could lead to negative effects on the biological communities that form this habitat. However, considering the scale of the development, the duration of the works, the distance between the proposed development and this habitat and the dilution capacity of the River Barrow and the Barrow-Nore-Suir Estuary, any water quality impacts at the location of this habitat that may arise during the construction of the proposed development would be negligible. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not have any adverse effects on the Conservation Objective for this Qualifying Interest.	No

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
***Salicornia* and other annuals colonising mud and sand [1310]**	"*To maintain the favourable conservation condition of* Salicornia *and other annuals colonizing mud and sand in the River Barrow and River Nore SAC*"	The proposed development will slightly alter the physical structure of the river only within *c*. 50m of the proposed development as a result of slight changes made to the hydrological dynamic (i.e., rates of erosion and deposition) of the river. This habitat is not present within the *c*. 50 m radius and the nearest confirmed location is 12.8 km downstream. Therefore, the proposed development will not give rise to any likely significant effects on the physical structure of *Salicornia* and other annuals colonizing mud and sand within the River Barrow and River Nore SAC.	No
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	"*To restore the favourable conservation condition of Atlantic salt meadows in the River Barrow and River Nore SAC*"	No – This habitat occurs *c.* 9.4 km downstream of the proposed development. The proposed development will not result in the loss of any of this habitat within this European site. Considering the distance between the proposed development and this European site, as well as the assimilative capacity of the watercourses, potential indirect water quality impacts, such as accidental discharge of pollutants during the construction phase, will have dissipated by the time they have reached this habitat in the River Barrow and River Nore SAC. Therefore, the proposed development will not give rise to any likely significant effects on the conservation objectives of this qualifying interest within the River Barrow and River Nore SAC.	No
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	"*To restore the favourable conservation condition of Mediterranean salt meadows in the River Barrow and River Nore SAC*"	No – This habitat occurs *c.* 19 km downstream of the proposed development. The proposed development will not result in the loss of any of this habitat within this European site. Considering the distance between the proposed development and this European site, as well as the assimilative capacity of the watercourses, potential indirect water quality impacts, such as accidental discharge of pollutants during the construction phase, will have dissipated by the time they have reached this habitat in the River Barrow and River Nore SAC. Therefore, the proposed development will not give rise to any likely significant effects on the conservation objectives of this qualifying interest within the River Barrow and River Nore SAC.	No
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	"*To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in the River Barrow and River Nore SAC*"	This habitat type is found throughout the freshwater stretches of rivers in Ireland and also occurs in the upper part of river estuaries. The salinity levels in the River Barrow within the zone of influence of the proposed development are considered too high for this habitat to occur and no evidence of this habitat type was observed during the surveys. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not significantly affect the Conservation Objective for this Qualifying Interest.	No

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
European dry heaths [4030]	"*To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC*"	European dry heath is a strictly terrestrial based habitat and is not sensitive to the types of impacts that the proposed development could give rise to. Additionally, this habitat is not located within the footprint of the proposed development. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	"*To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC*"	The proposed development may slightly alter the physical structure of the river only within *c*. 50m of the proposed development as a result of slight changes made to the hydrological dynamic (i.e., rates of erosion and deposition) of the river. This habitat is not present within the *c*. 50m radius, and the nearest confirmed location is 19 km downstream. Therefore, the GI works will not give rise to any likely significant effects on the conservation objectives of this Qualifying Interest within the River Barrow and River Nore SAC.	No
***Petrifying springs with tufa formation (*Cratoneurion*) [7220]**	"*To maintain the favourable conservation condition of Petrifying springs with tufa formation (Cratoneurion) in the River Barrow and River Nore SAC*"	The closest known location of Petrifying springs with tufa formation is *c.* 22.2 km upstream of the proposed development (NPWS, 2011a). Field surveys ruled out the presence of this habitat within the footprint of the proposed development, therefore there will be no direct loss or damage to this habitat as a result of the proposed development. Furthermore, the proposed development has potential to give rise to water quality impacts that the vegetation composition of petrifying springs with tufa formation is sensitive to. However, considering the considering the scale of the development, the duration of the works, the distance between the proposed development and this habitat and the dilution capacity of the River Barrow there is no chance of these impacts could be carried to this location or have any impact on this habitat. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	"*To restore the favourable conservation condition of Old oak woodland with* Ilex *and* Blechnum *in the River Barrow and River Nore SAC*"	Old sessile oak woods, with *Ilex* and *Belchnum* in the British Isles, are a strictly terrestrial habitat and is not sensitive to the types of impacts that the proposed development could give rise to. Additionally, this habitat is not located within the footprint of the proposed development. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
***Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]**	"*To restore the favourable conservation condition of Alluvial forests with* Alnus *glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*) *in the River Barrow and River Nore SAC*"	There will be no development or land-take occurring within Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*alno-Padion, Alnion incanae, Alicion albae*). Furthermore, this is a terrestrial based habitat that is subject to periodic flooding and is not sensitive to any water quality impacts that may occur on the River Barrow or River Nore. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1016]	"*To maintain the favourable conservation condition of Desmoulin's whorl snail in the River Barrow and River Nore SAC*"	Desmoulins Whorl snail is a semi-terrestrial species that potentially occurs in salt marsh habitat downstream. Considering the distance between the proposed development and this European site, as well as the assimilative capacity of the watercourses, potential indirect water quality impacts, such as accidental discharge of pollutants during the construction phase, will have dissipated by the time they have reached this habitat in the River Barrow and River Nore SAC. Therefore, the proposed development will not give rise to any likely significant effects on the conservation objectives of this qualifying interest within the River Barrow and River Nore SAC.	No

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]	"*The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species.*" For the purpose of this report, the Conservation Objective is taken as: "*To restore the favourable conservation condition of Freshwater Pearl Mussel*" (as per the Conservation in the Lower River Suir SAC (NPWS, 2017)).	The proposed development could give rise to water quality impacts in the event of a spillage of pollutants such as wet concrete or fuel into the river. These pollutants can have toxic effects on aquatic life, including fish, depending on the concentration and type of pollutant that is spilled. Host fish play a vital role in the reproductive strategy of Freshwater Pearl Mussel. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes
White-clawed Crayfish (*Austropotamobius pallipes*) [1092]	"*To maintain the favourable conservation condition of White-clawed crayfish in the River Barrow and River Nore SAC*"	White-clawed Crayfish are limited to the freshwater stretches of the River Barrow and the River Nore, which occur at least 22.4 km and 18.5 km upstream of the proposed development, respectively. Therefore, the proposed development will not result in any direct physical alterations of the river channel within suitable habitat for this species. Furthermore, this is a sufficient distance such that any water quality impacts from potential spillages during construction would dissipate by the time they reached suitable habitat for this Qualifying Interest. Additionally, the barges which will be used during the construction works will remain in the saline stretches of the River Barrow. Alien crayfish species and plague spores (*Aphanomyces astaci)* will not be carried upstream to the freshwater extents of the rivers. There are no pathways for alien crayfish species or crayfish plague to impact White-clawed Crayfish in the River Barrow or the River Nore. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Brook Lamprey (*Lampetra planeri*) [1096]	"*To restore the favourable conservation condition of Brook lamprey in the River Barrow and River Nore SAC*"	Habitat for this species is limited to the freshwater extents of the watercourse which is located *c*. 18.5 km upstream at a minimum. Water quality impacts from sedimentation or potentially spilled pollutants cannot be carried into freshwater extents upstream. Furthermore, the proposed development will not limit access to any watercourses whatsoever. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
River Lamprey (*Lampetra fluviatilis*) [1099]	"*To restore the favourable conservation condition of River lamprey in the River Barrow and River Nore SAC*"	There is a possibility that the proposed development could give rise to water quality impacts due to the risk of spilled pollutants, such as concrete or fuel which can have toxic effects on aquatic life including migratory fish species (i.e., River lamprey, Sea Lamprey, Twaite Shad and Atlantic Salmon). Furthermore, the installation of the sheet piled wall will give rise to noise and vibration effects which are likely to cause changes in behaviour which may lead to a higher risk of predation. Increased intensity of artificial lighting can also trigger behavioural changes and can form a barrier preventing migration. As sheet piling will be taking place within the river, the level of noise could cause physical harm to these species. Therefore, adverse effects on the Conservation Objectives for these Qualifying Interests cannot be ruled out at this stage.	Yes
Sea Lamprey (*Petromyzon marinus*) [1095]	"*To restore the favourable conservation condition of Sea lamprey in the River Barrow and River Nore SAC*"		Yes
Twaite Shad (*Alosa fallax*) [1103]	"*To restore the favourable conservation condition of Twaite shad in the River Barrow and River Nore SAC*"		Yes
Atlantic Salmon (*Salmo salar*) [1106]	"*To restore the favourable conservation condition of Salmon in the River Barrow and River Nore SAC*"		Yes
European Otter (*Lutra lutra*) [1355]	"*To restore the favourable conservation condition of Otter in the River Barrow and River Nore SAC*"	Construction works associated with the proposed development will include noise and vibration effects which could result in the disturbance or displacement of Otter. Additionally, potential water quality impacts such as sedimentation or the potential discharge of pollutants which can have direct toxic effects on Otter. Habitat degradation may also occur as a result of potential changes in water quality arising from spilled pollutants, such as concrete or fuel. These pollutants can have toxic effects on aquatic life, causing fish mortality. This could affect the quality and quantity of prey items available for Otter. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Killarney Fern (*Trichomanes speciosum*) [1421]	"*To maintain the favourable conservation condition of Killarney Fern in the River Barrow and River Nore SAC*"	Killarney fern is a strictly terrestrial based species and is not located within the vicinity of the proposed development. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*) [1990]	"*To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC*"	The proposed development could give rise to water quality impacts in the event of a spillage of pollutants such as wet concrete or fuel into the river. These pollutants can have toxic effects on aquatic life, including fish, depending on the concentration and type of pollutant that is spilled. Host fish play a vital role in the reproductive strategy of Nore Freshwater Pearl Mussel. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes

Table 3-3 Evaluation of the likely effects of the proposed development in view of the Conservation Objectives of the Lower River Suir SAC.

Qualifying Interest	Conservation Objective as per NPWS (2017)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	"*To restore the favourable conservation condition of Atlantic salt meadows (Glauco-Puccinellietalia maritimae) in Lower River Suir SAC*"	The proposed development occurs *c*. 17.3 km upstream of this habitat within the Lower River Suir SAC. The proposed development will not result in the loss of any of this habitat within this European site. Considering the distance between the proposed development and this European site, as well as the assimilative capacity of the watercourses, potential indirect water quality impacts, such as accidental discharge of pollutants during the construction phase, will have dissipated by the time they have reached the Lower River Suir SAC. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	"*To restore the favourable conservation condition of Mediterranean salt meadows (Juncetalia maritimi) in Lower River Suir SAC*"	The proposed development occurs *c*. 22.2 km upstream of this habitat within the Lower River Suir SAC. The proposed development will not result in the loss of any of this habitat within this European site. Considering the distance between the proposed development and this European site as well as the assimilative capacity of the River Barrow and the River Suir, potential indirect water quality impacts, such as accidental discharge of pollutants during the construction phase, will have dissipated by the time they have reached the Lower River Suir SAC. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	"*To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in Lower River Suir SAC*"	This habitat is limited to the freshwater extents of this the Lower River Suir SAC, *c*. 20.5 km from the proposed development in a tributary of the River Suir. The proposed development will not result in the loss of any of this habitat within this European site. Considering the distance between the proposed development and this European site, as well as the assimilative capacity of the watercourses, potential indirect water quality impacts, such as accidental discharge of pollutants during the construction phase, will have dissipated by the time they have reached the Lower River Suir SAC. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No

Qualifying Interest	Conservation Objective as per NPWS (2017)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	"*To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in Lower River Suir SAC*"	The locations of this habitat within the Lower River Suir SAC are not mapped. Therefore, when applying the Precautionary Principle, this habitat is assumed to occur at the minimum possible distance from the proposed development which is *c.* 17.2 km downstream. The proposed development will not result in the loss of any of this habitat within this European site. Considering the distance between the proposed development and this European site, as well as the assimilative capacity of the watercourses, potential indirect water quality impacts, such as accidental discharge of pollutants during the construction phase, will have dissipated by the time they have reached the Lower River Suir SAC. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	"*To restore the favourable conservation condition of Old sessile oak woods with Ilex and Blechnum in the British Isles in Lower River Suir SAC*"	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles is a terrestrial habitat and it not located within the footprint of the proposed development. There are no pathways for impact between the proposed development and this Qualifying Interest. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
***Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]**	"*To restore the favourable conservation condition of Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) in Lower River Suir SAC*"	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) are a terrestrial habitat and would only be at risk during periods of high-water level or flooding. There are no pathways for impact between the proposed development and this Qualifying Interest. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
***Taxus baccata* woods of the British Isles [91J0]**	"*To restore the favourable conservation condition of Taxus baccata woods of the British Isles in Lower River Suir SAC*"	*Taxus baccata* woods of the British Isles is a terrestrial habitat and it not located within the footprint of the proposed development. There are no pathways for impact between the proposed development and this Qualifying Interest. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No

Qualifying Interest	Conservation Objective as per NPWS (2017)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]	"*To restore the favourable conservation condition of Freshwater Pearl Mussel in Lower River Suir SAC*"	Freshwater Pearl Mussel is limited to the freshwater stretches of the River Suir and any suitable habitat for this species is found at a distance of at least *c.* 28.2 km from the proposed development in a tributary of the River Suir. There are no pathways for direct impacts on Freshwater Pearl Mussel as a result of the proposed development. However, while Freshwater Pearl Mussel are limited to the freshwater stretches of the River Suir, their host fish (i.e., Salmonoids), which are essential to their life cycle are likely to be present in the estuary and connected watercourses. Potential impacts to host fish arising from the proposed development, e.g., water quality, may indirectly impact Freshwater Pearl Mussel. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes
White-clawed Crayfish (*Austropotamobius pallipes*) [1092]	*"To maintain the favourable conservation condition of White-clawed Crayfish in Lower River Suir SAC"*	White-clawed Crayfish is limited to the freshwater stretches of the River Suir and any suitable habitat for this species is found at a hydrological distance of at least *c.* 28.2 km from the proposed development in a tributary of the River Suir. Therefore, the proposed development will not result in any physical alterations of the river channel, within suitable White-clawed Crayfish habitat. Furthermore, habitat quality is not threatened by sedimentation as the river in the location of the proposed development already has a naturally high sediment load due to its estuarine nature and is of sufficient distance from suitable White—clawed Crayfish habitat in this European site. The barges which will be used during the construction works will remain in the saline stretches of the River Barrow. Alien crayfish species and plague spores (*Aphanomyces astaci)* will not be carried into the freshwater extents of adjoining rivers. There are no pathways for alien crayfish species or crayfish plague to impact White-clawed Crayfish. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Brook Lamprey (*Lampetra planeri*) [1096]	*"To restore the favourable conservation condition of Brook Lamprey in Lower River Suir SAC"*	The proposed development is located in a sediment-rich estuary and suitable habitat for this species is limited to the freshwater extents of the watercourse which is located at a hydrological distance of *c*. 28.2 km from the proposed development at a minimum. Water quality impacts from sedimentation or potentially spilled pollutants cannot be carried into freshwater extents upstream. Furthermore, the proposed development will not limit access to any watercourses whatsoever. Therefore, it can be concluded beyond reasonable scientific doubt that the proposed development will not adversely affect the Conservation Objective for this Qualifying Interest.	No

Qualifying Interest	Conservation Objective as per NPWS (2017)	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Sea Lamprey (*Petromyzon marinus*) [1095]	*"To restore the favourable conservation condition of Sea Lamprey in Lower River Suir SAC"*	Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon (i.e., migratory fish species) are known to migrate through the Barrow-Nore-Suir Estuary during their migrations, and juvenile Twaite Shad spend the first two years of their lives in the estuary. All of these species are sensitive to water quality impacts. As the proposed development provides for such impacts, adverse effects on the Conservation Objectives for these Qualifying Interests cannot be ruled out at this stage.	Yes
River Lamprey (*Lampetra fluviatilis*) [1099]	*"To restore the favourable conservation condition of River Lamprey in Lower River Suir SAC"*		Yes
Atlantic Salmon (*Salmo salar*) [1106]	*"To restore the favourable conservation condition of Atlantic Salmon in Lower River Suir SAC"*		Yes
Twaite Shad (*Alosa fallax fallax*) [1103]	*"To restore the favourable conservation condition of Twaite Shad in Lower River Suir SAC"*		Yes
European Otter (*Lutra lutra*) [1355]	*"To maintain the favourable conservation condition of Otter in Lower River Suir SAC"*	The proposed development could give rise to rise to habitat degradation impacts due through changes in water quality arising from spilled pollutants, such as concrete or fuel. These pollutants can have toxic effects on aquatic life, including causing fish mortality. This could affect the quality and quantity of prey items available for Otter. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage	Yes

Table 3-4 Evaluation of the likely effects of the proposed development in view of the Conservation Objectives of the River Nore SPA.

Qualifying Interest	Conservation Objective	Does the proposed development provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Kingfisher (*Alcedo atthis*) [A229]	"*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.*" No Attributes or Targets are defined at present for the River Nore SPA or any SPA in the Member State where Kingfisher is listed as a qualifying interest. The Attributes and Targets used below are taken from other SPAs in the Member State. According to the Generic Conservation Objectives for the SPA, favourable conservation status of a species is achieved when *"population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats", "the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future"* and *"there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis"* (NPWS, 2022).	The proposed development could give rise to water quality impacts in the event of a spillage of pollutants such as wet concrete or fuel into the river which may be pushed upstream in the incoming tides. These pollutants can have toxic effects on aquatic life, including on the migratory fish species that are local to the proposed development that Kingfisher depend on as a food source. This would lead to negative effects on the fish populations upstream of the proposed development where Kingfisher are known to feed, leading to indirect ex-situ impacts on this Qualifying Interest. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes

3.4 Summary of Adverse Effects

In Section 3.1, it was established that two European sites, namely the River Barrow and River Nore SAC and the River Nore SPA, occur the zone of influence of the proposed development and that there are no pathways for effects between the proposed development and any other European sites.

In Section 3.3, it was established that, in the absence of appropriate mitigation, interruptions or delays in achieving certain Conservation Objectives for those sites, i.e., adverse effects on the integrity of those sites, as a result of the proposed development, cannot be ruled out. A summary of the adverse effects identified is given in Table 3-5 below.

Table 3-5 Summary of the European sites and their Qualifying Interests for which, in view of their Conservation Objectives, adverse effects cannot be ruled out at this stage.

European site	Qualifying Interest
River Barrow and River Nore SAC	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029] Sea lamprey (*Petromyzon marinus*) [1095] River lamprey (*Lampetra fluviatilis*) [1099] Twaite shad (*Alosa fallax*) [1103] Atlantic salmon (*Salmo salar*) [1106] Otter (*Lutra lutra*) [1355] Nore Freshwater Pearl Mussel (*Mergaritifera durrovensis*) [1990]
Lower River Suir SAC	Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029] Sea Lamprey (*Petromyzon marinus*) [1095] River Lamprey (*Lampetra fluviatilis*) [1099] Twaite Shad (*Alosa fallax*) [1103] Atlantic Salmon (*Salmo salar*) [1106] European Otter (*Lutra lutra*) [1355]
River Nore SPA	Kingfisher (*Alcedo atthis*) [A229]

4. ASSESSMENT OF ADVERSE EFFECTS

4.1 Attributes and Targets

In Section 3 of this NIS, adverse effects of the proposed development on the integrity of the River Barrow and River Nore SAC and the River Nore SPA were identified. In accordance with EC (2021), the identification of these effects was focussed on and limited to the Conservation Objectives of the sites concerned.

Section 4 provides a detailed analysis and evaluation of the adverse effects identified in Section 3 (as summarised in Section 3.4). In order to fully assess the implications of the proposed development for the European sites concerned, each of the adverse effects are evaluated with reference to the Attributes and Targets which define the Conservation Objectives of those sites.

4.2 River Barrow and River Nore SAC

4.2.1 Annex I Estuaries and Mudflats

The two Annex I habitats listed as Qualifying Interests of the River Barrow and River Nore SAC which are likely to be affected by the proposed development are "Estuaries" and "Mudflats and sandflats not covered by seawater at low tide". The Conservation Objectives for these two Qualifying Interests are shown in Table 3-2 above and the Attributes of the same are summarised as follows:

- Habitat area; and,
- Community extent and distribution.

Habitat area

The extents and distributions of these Annex I habitats in the River Barrow and River Nore SAC are mapped in the Conservation Objectives supporting document for marine Qualifying Interests (NPWS, 2011c) and in Map 2 and 3 of the Conservation Objectives themselves (NPWS, 2011a). The intertidal and subtidal areas adjacent to O'Hanrahan Bridge are mapped as Annex I 'Estuaries'. While the intertidal mud and sandflats in the vicinity of O'Hanrahan Bridge are not mapped as the corresponding Annex I habitat in NPWS (2011a & c), they are treated as such for the purpose of this assessment.

The proposed development provides for the permanent loss estuarine and intertidal mudflat habitat. The total area of the Annex I habitats that will be lost will be no more than 82m^2 of 'Estuaries' [1130], of which 32 m^2 is Mudflats and sandflats not covered by seawater at low tide [1140]. These areas correspond to 0.00021% of the total area of Annex I 'Estuaries', and 0.00034% of Annex I 'Mudflats', in the SAC.

The mudflats and benthic habitats have low faunal diversity (Aquatic Services Unit, 2022a & 2022b). While this does not represent a significant proportion of the total area of these habitats within the site and, thus, will not significantly affect the overall structure and function of these habitats, any permanent reduction in the area of an Annex I habitat should be considered significant, in view of the relevant Conservation Objective. Therefore, monitoring is required to precisely quantify the area of habitat loss and inform the NPWS's reporting under Article 17 of the Habitats Directive.

As outlined in Section 2.5.8, the proposed development will not result in any significant change to the hydrological regime in the vicinity of the proposed development. Therefore, the proposed development will not result in any indirect loss of habitat through erosion or deposition.

Community distribution

The site-specific Targets for the distribution of estuary and intertidal mud and sandflat communities is that the following community complexes are "*maintained in a natural condition*": "Muddy estuarine community complex"; "Sand to muddy fine sand community complex"; and "Fine sand with *Fabulina fabula* community". The intertidal and subtidal mud habitats in the vicinity of the proposed development are mapped in NPWS (2011a) as "Muddy estuarine community complex". The nearest occurrence of the "Sand to Muddy fine sand community complex", "Fine sand with *Fabulina fabula* community" and "*Sabellaria alveolate* reef" communities are *c.* 16.7 km, 24.2 km and 26.5 km downstream, respectively, of the proposed development location (NPWS, 2011a). Adverse effects on these communities are assessed below.

Water quality

The proposed development is considered to pose a risk of pollution to the estuary and its intertidal mud and sandflat habitats. Pollution has the potential to adversely affect the Conservation Objectives for these Qualifying Interests by preventing or interrupting the maintenance or restoration of the natural condition of their community complexes. Potential impacts of the construction and operation of the proposed development on water quality, insofar as they are relevant for these habitats, are discussed below.

Construction phase

Construction activities within and adjacent to surface waters can negatively impact on water quality. In the case of construction, if not properly managed, has the potential to impact on water quality as follows:

- Sedimentation – In the absence of appropriate mitigation, the construction of the proposed development provides for sedimentation impacts as follows:
    - During the driving of sheet-piling fine sediments will be disturbed and become suspended in the water column. However, given the naturally high sediment load in the River Barrow in the vicinity of the proposed development, this will not lead to significant impacts.
    - Surface water run-off from construction areas is likely to contain high levels of suspended sediments (and also contaminants). Such run-off, if not attenuated and treated prior to discharge to the River Barrow, has the potential to cause significant ecological impacts. Large amounts of fine sediment deposition can smother benthic habitats, leading to changes in biological composition. Deposition of fine sediments can also increase the amounts and persistence of chemical contaminants in the receiving habitat, leading to further changes in the biological composition and overall condition of habitats.
    - Suspended sediments can also exacerbate other water quality impacts by providing chemical contaminants with a surface on which to bind, thereby increasing the bioavailability of these contaminants, eventually leading to ecological effects.
- Spillage of cementitious materials – During construction, concrete, grout or other cementitious materials may spill directly into the River Barrow or be washed into the water in construction site run-off. Cementitious materials are highly alkaline and, consequently, can drastically alter the pH of the receiving water body. This can lead to profound ecological impacts and can affect the condition of habitats by causing damage to pH-sensitive species.
- Spillage of hydrocarbons – Vehicles, plant and equipment which will be used during construction rely on hydrocarbons such as diesel, petrol and lubricating oils. Leaks from poorly maintained vehicles, plant, equipment or storage tanks

provide for a risk of input of hydrocarbons into the environment. In the absence of appropriate mitigation, hydrocarbons from the construction site may spill directly into the River Barrow or be washed into the river in construction site run-off. This has the potential to cause negative ecological impacts on the estuary, including intertidal habitats. Hydrocarbons can have direct toxic effects, including reducing the ability of organisms to absorb water and nutrients. Hydrocarbons can also alter the nutrient balance and microbiota in soil and water, which can benefit species while detrimentally affecting others. Such changes have the potential to alter the biological composition of the habitat.

- Faecal contamination – Inadequate treatment of waste water from on-site toilets and washing facilities also provides for potential water quality impacts leading to ecological effects in the estuary. Faecal contamination in surface water can alter the nutrient balance, causing changes in microbial communities and reductions in oxygen levels. This can have significant effects on the biological composition of receiving habitats.

Operational phase

The proposed surface water drainage system of the bridge will follow the existing longitudinal profile of the deck. There is a vertical fall from a high point in the centre of the bridge towards the abutments at either end. Where there are outfalls on the existing south-eastern quay wall that are obstructed by the proposed sheet piled wall, these outfalls will be extended through the new wall. The impact of increased impermeable area as part of the bridge deck is negligible given the short drainage runs required from the bridge deck to outfall to the River Barrow. There will be limited potential for impacts to the water quality of receiving waterbody and potential impacts are likely negative, long term and imperceptible.

Vibration and lighting impacts

The construction of the proposed development provides for vibration impacts in the benthic habitats in the vicinity of the proposed development. Owing to the scale of the proposed development, this will not cause any significant resuspension of sediments, or have any effect on benthic invertebrate communities, beyond the individuals' behavioural response to vibration through the sediment. Any such impacts are temporary and non-significant.

The proposed development also has the potential to lead to disturbance effects on aquatic species within the estuary from artificial lighting, which would lead to the displacement of certain species from the general area. Artificial lighting poses a risk of negative impacts on biodiversity such as fish species by fragmentation of commuting/migration/foraging corridors, disruption of circadian rhythms and increased risk of predation. Over a prolonged period, such impacts can lead to reduced reproductive success/recruitment.

Invasive alien species

The introduction of invasive alien species to the estuarine environment presents a risk to the conservation condition of intertidal and subtidal benthic communities in Barrow-Nore-Suir Estuary. The movement of barges during construction poses a risk that invasive alien species may be introduced into the Barrow-Nore-Suir Estuary. Coastal and marine invasive species of particular concern are Common Cord-grass, Japanese Wireweed, Chinese Mitten Crab or Carpet Sea Squirt, among others. The introduction or spread of these species in Barrow-Nore-Suir Estuary has the potential to cause habitat loss or changes in the biological composition of benthic community complexes. Therefore, mitigation is required to minimise the risk posed by invasive species.

Conclusion

In the absence of mitigation, the proposed development provides for adverse effects on the integrity of the river Barrow and River Nore SAC, in view of its Conservation Objectives for 'Estuaries' and 'Mudflats and sandflats not covered by seawater at low tide'. These effects include some permanent loss of mudflat and benthic habitat, water quality impacts during construction and the risk to the conservation condition of benthic communities posed by invasive species. Mitigation is, therefore, required in order to prevent such effects.

4.2.2 Annex I Saltmarsh Habitats

The three types of Annex I saltmarsh habitats listed as Qualifying Interests of the River Barrow and River Nore SAC and potentially adversely affected by the proposed development are '*Salicornia* and other annuals colonising mud and sand', 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' and 'Mediterranean salt meadows (*Juncetalia maritimi*)'. The Conservation Objectives for these habitats in the River Barrow and River Nore SAC are stated in Table 3-2 above and the Attributes of these are summarised as follows:

- Habitat area and distribution;
- Physical structure (sediment supply; creeks and pans; flooding regime);
- Vegetation structure (zonation; sward height; vegetation cover); and,
- Vegetation composition (typical species and subcommunities; negative indicator species, i.e., *Spartina anglica*).

Habitat Area and Distribution

None of these Annex I saltmarsh habitats are located within or immediately adjacent to the footprint of the proposed development. The closest known example of any of these habitats to the bridge is 'Mediterranean salt meadows (*Juncetalia maritimi*)', which is located *c.* 8 km downstream. Therefore, the proposed development will not result in any direct land take of these habitat types. Potential indirect impacts on these areas of Annex I saltmarsh habitats outside the proposed development boundary are discussed under the headings of physical structure, vegetation structure and vegetation composition below.

Physical Structure

Sediment Supply

Construction activities within and alongside surface waters associated with bridge rehabilitation, can contribute to the deterioration of water quality and can physically alter the stream/river bed and bank morphology with the potential to alter erosion and deposition rates locally and downstream. However, as outlined in Section 2.5.8, the proposed development will not result in any significant change to the hydrological regime in the vicinity of the proposed development. Therefore, the proposed development will not cause any change to sediment supply to any examples of Annex I saltmarsh habitats in the River Barrow and River Nore SAC.

Creeks and Pans

As the proposed development does not involve any physical disturbance within Annex I saltmarsh habitats, it does not provide for any change to the hydrological regime at, or sediment supply to, any Annex I saltmarsh habitats, it can be concluded on the basis of best scientific knowledge that the proposed development will not adversely affect the creek-and-pan morphology of any examples of Annex I saltmarsh habitats.

Flooding Regime

As stated in Section 2.5.8, The proposed widening of quay walls will displace some flood waters, though the volume is considered negligible in the context of the Barrow system. Conversely, the widening of quay walls will also increase the area of defended lands though this is also seen as insignificant. Overall, the potential impact is neutral, long-term, and imperceptible.

Therefore, there will be no significant change to the flooding regime in any example of Annex I saltmarsh habitats as a result of the proposed development.

Vegetation Structure and Composition

Water Quality

As the proposed development does not involve any physical disturbance to saltmarsh habitats, it will not cause any direct change in the structure or composition of any such vegetation, e.g., by clearing vegetation, encouraging grazing, removing characteristic species or introducing invasive species. However, there is considered to be a risk of pollution to this habitat, which could adversely affect these Attributes, in the event that potential impacts from the proposed development on water quality are conveyed to these habitats by inundation. Potential impacts of the construction and operation of the proposed development on water quality, insofar as they are relevant for saltmarsh habitats, are discussed below.

Construction Phase

Construction activities within and adjacent to surface waters, e.g., rivers, can negatively impact water quality. In the case of the proposed rehabilitation of O'Hanrahan Bridge, the construction of the proposed development, if not properly managed, has the potential to impact on water quality as follows:

- Elevated silt/sediment loading within the River Barrow from construction site run-off and sheet piling. Other pollutants in the watercourse can bind to silt which can lead to increased bioavailability of these pollutants. As noted above, naturally high levels of suspended sediment in the River Barrow at this location have the potential to magnify the effects of other pollutants.
- Spillage of concrete, grout and other cement-based products: Cement-based products are highly alkaline (releasing fine highly alkaline silt) and extremely corrosive and can result in significant impact to watercourses altering their pH, smothering the stream bed and physically damaging fish through burning and clogging of gills due to the fine silt.
- Accidental spillage of hydrocarbons from construction plant and at storage depots / construction compound have the potential to enter drainage ditches/land drains and subsequently the River Barrow, via surface water runoff.
- Faecal contamination arising from inadequate treatment of on-site toilets and washing facilities.
- There is also potential for pollutants derived from construction materials to be mobilised by flood waters.

Given the scale and duration of the construction works for the proposed development, the risk and magnitude of any effects on saltmarsh habitats arising from impacts on water quality are considered to be low. However, as such effects cannot be quantified, they are assumed to be significant and, therefore, require mitigation.

Operational Phase

The impact of increased impermeable area as part of the bridge deck is negligible given the short drainage runs required from the bridge deck to outfall to the River Barrow. There will be limited potential for impacts to the water quality of receiving waterbody and potential impacts are likely negative, long term and imperceptible.

As noted above in Section 4.2.1, maintenance painting of the exposed parts of the sheet pile wall will be required approximately every 10 years. Paints can contain toxic compounds which can negatively impact on aquatic life and water-dependent habitats. While the volumes of paint used will be low and there will be *c*. 10 years between applications, there remains potential for water quality impacts. Therefore, mitigation is required to control the risk of adverse effects on Annex I saltmarshes and other water-dependent habitats and species in the River Barrow and River Nore SAC.

Invasive Alien Species

The movement of vehicles, vessels, plant, equipment, materials and personnel to, from and within the construction site poses a risk of the introduction or spread of invasive alien species to or within habitats of conservation importance in the vicinity of the construction site or haul routes (terrestrial and marine). There is a risk that Common Cordgrass (*Spartina anglica*), which is present within 15m of the proposed development, could be transported and invade the lower saltmarsh communities in the River Barrow, altering the vegetation structure and composition of these habitats. If this were to occur, it would constitute an adverse effect on the Conservation Objective for this Qualifying Interest of the River Barrow and River Nore SAC. Therefore, mitigation will be required to control the risk of such an introduction.

Conclusion

In the absence of appropriate mitigation, both construction and operational phases of the proposed development have the potential to adversely affect the Conservation Objectives for 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' and 'Mediterranean salt meadows (*Juncetalia maritimi*)' in the River Barrow and River Nore SAC through the introduction or spread of invasive alien species and through impacts on water quality, both of which could affect the vegetation structure and composition of these Qualifying Interests.

4.2.3 Hydrophilous Tall Herb Communities

The Annex I habitat 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels' does not occur in the vicinity of the proposed development. However, it may occur in freshwater marshes or along watercourses in the wider zone of influence. The Conservation Objective for this habitat in the River Barrow and River Nore SAC is stated in Table 3-2 above and the Attributes of the same are summarised as follows:

- Habitat area and distribution;
- Hydrological regime (flooding depth/height of water table);
- Vegetation structure (height); and,
- Vegetation composition (broadleaf herb : grass ratio; typical species; negative indicator species).

Habitat area and Distribution

This Annex I habitat is not located within or immediately adjacent to the footprint of the proposed development. Therefore, the proposed development will not result in any direct land take of these habitat types. Potential indirect impacts on these areas of

'Hydrophilous Tall Herb Communities' outside the proposed development boundary are discussed under the headings of hydrological regime, vegetation structure and vegetation composition below.

Hydrological Regime

As detailed in Section 2.5.8, the construction and operation of the proposed development will give rise to imperceptible impacts on the local hydrological regime. Given the distance of any examples of hydrophilous tall herb communities from the proposed development, any impacts at these locations would be imperceptible and, therefore, would not give rise to adverse effects on the Conservation Objective for these habitats. Therefore, it can be concluded on the basis of best scientific knowledge that neither the construction nor the operation of the proposed development will adversely affect the hydrological regime in any example of Hydrophilous tall herb communities.

Vegetation Structure and Composition

The adverse effects of the proposed development on vegetation structure and composition in hydrophilous tall herb communities are considered to be the same as those for saltmarsh habitats, as per Section 4.2.2 above. Thus, it is concluded that, in the absence of appropriate mitigation, there is a risk of adverse effects as a result of water quality impacts and invasive alien species arising from the construction of the proposed development, but not its operation.

Conclusion

In the absence of appropriate mitigation, the construction of the proposed development has the potential to adversely affect the Conservation Objective for 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels' in the River Barrow and River Nore SAC through impacts on water quality and invasive alien species which may affect the vegetation structure and composition of this Qualifying Interest. Therefore, mitigation is required to avoid this adverse effect.

The proposed development does not provide for any other adverse effects on the Conservation Objectives for these Qualifying Interests during either operational phase of the proposed development.

4.2.4 Fish Species

The fish species which are listed as Qualifying Interests of the River Barrow and River Nore SAC and are potentially adversely affected by the proposed development are Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon. The Conservation Objectives for each of these species given in Table 3-2 above. The Attributes of these Conservation Objectives can be summarised as follows:

- Extent of anadromy/barriers to migration;
- Distribution, quantity and quality of spawning habitat;
- Number and distribution of redds;
- Availability of juvenile habitat;
- Abundance of individuals at different life stages/population structure; and,
- Water quality.

Anadromy and Barriers to Migration

The presence of the sheet pile walls within the River Barrow represents a partial obstruction of the channel. This reduces the cross-sectional area open for passage

by fish and constricts the flow of water, thereby increasing flow velocities. The partial obstruction and higher flow velocities have the potential to form a barrier to migratory fish species, including anadromous lampreys, Twaite Shad, and Atlantic Other effective barriers to fish migration may arise from acoustic or lighting impacts. These impacts are discussed in detail in the following paragraphs.

Physical Obstruction

The presence of the new sheet pile wall represents a permanent loss of a small portion of the cross-sectional area of the river channel over a length of *c*. 230m. The cross-sectional area occupied by the new wall varies with the tidal conditions/river levels and location along the proposed development. At low tide, there will be no encroachment into the river channel. At high tide, the full length of the quay wall will encroach into the channel, but by no more than 2 m at any location. Based on a minimum channel width (at low tide) of 175m, 2 m represents just under 1.2% of the total width and given that this is at the edge (shallowest part) of the channel, the percentage of the cross-sectional area will be significantly smaller. The obstruction of such a small portion of the channel by the new flood defence wall will not pose any significant barrier to fish passage past the proposed development.

Hydraulic Changes

As discussed in Section 2.5.8, changes to the tidal/flow regime resulting from the proposed development are imperceptible to not significant and limited to vicinity of the proposed development, for all conditions of fluvial and tidal flow. It can, therefore, be concluded that the proposed development will not impede the movement of migratory fishes upstream or downstream through changes in the tidal/flow regime.

Hydroacoustic Impacts

The effects of noise on fish species include, in order of increasing severity: behavioural change, auditory tissue damage, which can be temporary, i.e., temporary threshold shift (*TTS*), or permanent, i.e., permanent threshold shift (*PTS*), non-auditory tissue damage and death. Effects vary greatly between individuals of different sizes or life stages, with smaller/younger individuals being more vulnerable to injury and death, and between different species, i.e., between species classed as "hearing generalists", e.g., salmonids, and those classed as "hearing specialists", e.g., clupeids, including the shads. The effects of noise on a wide range of fish species have not been studied extensively and so any predictive assessment of such noise impacts on fish must rely on extrapolations from what studies have been carried out and thereafter follow the Precautionary Approach when making any necessary assumptions.

It is considered that the elements of the construction of the proposed development which present the highest risk of significant noise and vibration impacts on migratory fish species are the piling activities necessary to install the new sheet pile wall. The assessment of the effects of piling noise on migratory fish species in the River Barrow and River Nore SAC during the construction of the proposed development drew upon the following documents:

- *Environmental Impact Report* (MOR, 2010) for the Grattan Quay, Bilberry Road and Quarry Road Improvement Works in Waterford City, which specifically addressed the effects of piling noise in the River Suir.
- *Natura Impact Statement* (ROD, 2018b) for the River Suir Sustainable Transport Bridge in Waterford City, which assessed the hydroacoustic effects of impact piling of large tubular steel piles for the bridge.

- *Hydroacoustic Assessment* (Mason, 2020) for the Waterford North Quays Development, which assessed the hydroacoustic effects of rotary piling of large tubular piles for the reconstruction of the wharf structure.
- The California Department of Transportation's *Technical Guidance for the Assessment of Hydroacoustic Effects of Pile Driving on Fish* (Caltrans, 2020), which synthesises a broad range of recent literature on acoustic sensitivities of fish and empirical data from a large number of different construction projects in different environments and using different pile types and piling methods.
- *Natura Impact Statement* (ROD, 2021) for the Flood Defences West in Waterford City, which assessed the hydroacoustic effects of vibratory and impact piling of large steel sheet piles for the flood defence wall.

Sound intensity level (*SIL*) or "loudness" is usually expressed in decibels (dB), which is a logarithmic scale of the ratio of the measured pressure to a reference pressure. In water, this reference pressure is 1 µPa. Three main metrics of *SIL* are used to assess hydroacoustic impacts: peak and root-mean-square sound pressure levels (SPL_{peak} and SPL_{RMS}, respectively), both of which are expressed in dB re 1 µPa, and sound exposure level (*SEL*), which is expressed in dB re 1 µPa^2 s. Reference values for these metrics are usually given for a distance (D_1) of 10 m from the sound source. SPL_{peak} is the maximum *SIL* produced by a single event and SPL_{RMS} is the average of the squared pressures over the time containing 90% of the energy, whereas *SEL* is the energy of the sound emitted averaged over 1 s. In addition, for a sound that is repetitive or continuous, e.g. multiple pile strikes or vibration for more than 1 s, the cumulative *SEL* (SEL_{cum}) is used and this is calculated as $SEL_{cum} = SEL + 10 \log(n)$, where n = the number of strikes or duration of vibration in seconds.

In order to assess the likely hydroacoustic impacts of the construction of the proposed development on fish, this subsection:

1. Examines the ambient noise levels in the River Barrow at this location;
2. Predicts the noise levels associated with the proposed piling operations;
3. Calculates the precautionary distances from these piling operations at which fish are likely to be impacted;
4. Considers the likely effects on fish species of concern in this case, namely Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon, but focussing on Twaite Shad as by far the most sensitive to hydroacoustic impacts; and,
5. Determines the risk of adverse effects on these species in the case of deviation from the piling methodology proposed.

Ambient Noise Levels

No empirical data is available on ambient noise levels in the River Barrow. An ambient SPL_{RMS} of 125 dB re 1 µPa was used in the assessment of the hydroacoustic impacts of piling for the River Suir Sustainable Transport Bridge (An Bord Pleanála Planning Ref. ABP-303274-18). This was carried forward to the assessment of the Waterford North Quays Development (WCCC Planning Ref. 19/928), where underwater noise specialists Subacoustech Environmental Ltd agreed with the precautionary estimate (Mason, 2020). Based on the examples provided in Caltrans (2020), it is considered that the narrow width of the River Barrow and the presence of some recreational boat traffic would likely increase this estimate towards 135 dB re 1 µPa. Therefore, the ambient SPL_{RMS} is taken to be in the range of 115-135 dB re 1 µPa.[13]

[13] In the River Tay in Scotland, Subacoustech Environmental Ltd measured an average ambient SPL_{RMS} of 135 dB re 1 µPa mid-river over a stony substrate, and 127 dB re 1 µPa in quieter waters near the bank (Mason, 2020).

Underwater Noise from Piling

There are a number of factors which need to be considered when attempting to predict the likely noise levels produced from piling in water. These include:

- The type of pile driver or piling method – For the proposed development, almost all pile driving will be by vibratory hammer. This is generally quieter than impact piling. Noise levels from vibratory piling rise slowly, and for this reason vibratory piling is frequently employed as a mitigation measure where impact piling was originally proposed. In this case, while almost all piling is expected to be vibratory piling, some piles may require a number of strikes (maximum 200 strikes) from an impact hammer to drive them to the desired depth below ground.
- Type and size of piles – The proposed extension of the quay wall requires the use of sheet piles. The exact pile type that will be used will depend on the results of the ground investigations. For the purposes of this assessment, standard 24-inch steel sheet piles are assumed to be used. It is envisaged that piles will be embedded into the upper layer of weathered rock or dense gravels anticipated at *c.* 15-20 m below ground level (to be confirmed by the ground investigation).
- All riverside piling will take place during the day at high tide with the exception of the final sheet pile which will be installed at low tide to allow for any trapped fish to escape the area as the tide recedes.
- All piling will take place in the intertidal zone. All but the final sheet pile will be installed at high tide will be driven in the water. The hydroacoustic impacts from these piles will be higher compared to the final pile which will be installed directly into the mud at low tide.
- The construction is assumed to be carried out during normal working hours (daytime), 6 days a week. The estimated timeframe for 20-25m sheet pile driving is approximately 4 weeks. This excludes set up and other activities on site, either prior to, or after pile driving. The piling will occur intermittently throughout the day, with the remainder of the time spent on ancillary processes such as setting up the barge, positioning the piles, checking tolerances, delivering material and personnel, and similar.

Based on the information and examples provided in Caltrans (2020), the precautionary noise levels from vibratory and impact piling for the new quay wall are as set out in Table 4-1 below.

Table 4-1 Precautionary noise levels from sheet piling for the sheet pile wall. Based on 24-inch steel sheet piles, 15 m depth of water, and a D_1 of 10 m.

Piling method	SPL_{peak} dB re 1 µPa	SPL_{RMS} dB re 1 µPa	$SEL_{n=1}$ dB re 1 µPa^2 s
Vibratory	177	163	162
Impact	205	189	179

As the propagation of sound in water is complex and dependent on a large number of unknowns, a simplified spreading model is typically used to estimate the attenuation of underwater sound over a given distance. This model is represented by the following equation $TL = F \log(D_2/D_1)$. To solve for D2 where a target TL is known, this equation can be modified to $D_2 = D_1 \times 10\text{^}(TL/F)$.

The attenuation coefficient (*F*) can be expressed as a transmission loss per doubling in distance, e.g., an *F* of 15 is equivalent to a loss of 4.5 dB every doubling in distance from the sound source. *F* is dependent on a large number of factors, notably depth, with larger *F* values (i.e., greater attenuation of sound) in shallower water. The National Marine Fisheries Service (NMFS) (part of the Unites States Department of Commerce) recommends that an *F* of 15 is applied where location-specific data is lacking. The examples provided in Caltrans (2020) indicate that this value is very conservative, even where water depth exceeds 15m, which is the case for most examples and forms the basis for the noise levels predicted in Table 4-1 above. Furthermore, given the very shallow water depths in the intertidal zone of the River Barrow, the local *F* value is likely to be much higher. Nonetheless, in accordance with the Precautionary Principle, an *F* of 15 is applied in this assessment.

Predicting Effects on Fish

Hydroacoustic impacts on individual fish range from provoking a behavioural response, through *TTS*, sub-lethal injury (including *PTS*) and delayed mortality, to immediate mortality. For the purposes of assessing impacts from piling noise, it is most useful to establish the distances from the piling activity at which behavioural responses and *TTS* could be expected.

Behavioural Response

The NMFS and the United States Fish and Wildlife Service (USFWS) generally use an SPL_{RMS} of 150 dB re 1 µPa as a precautionary threshold for temporary behavioural changes (startle and stress). Figure 4-1 below illustrates the modelled attenuation of SPL_{RMS} in the River Barrow.

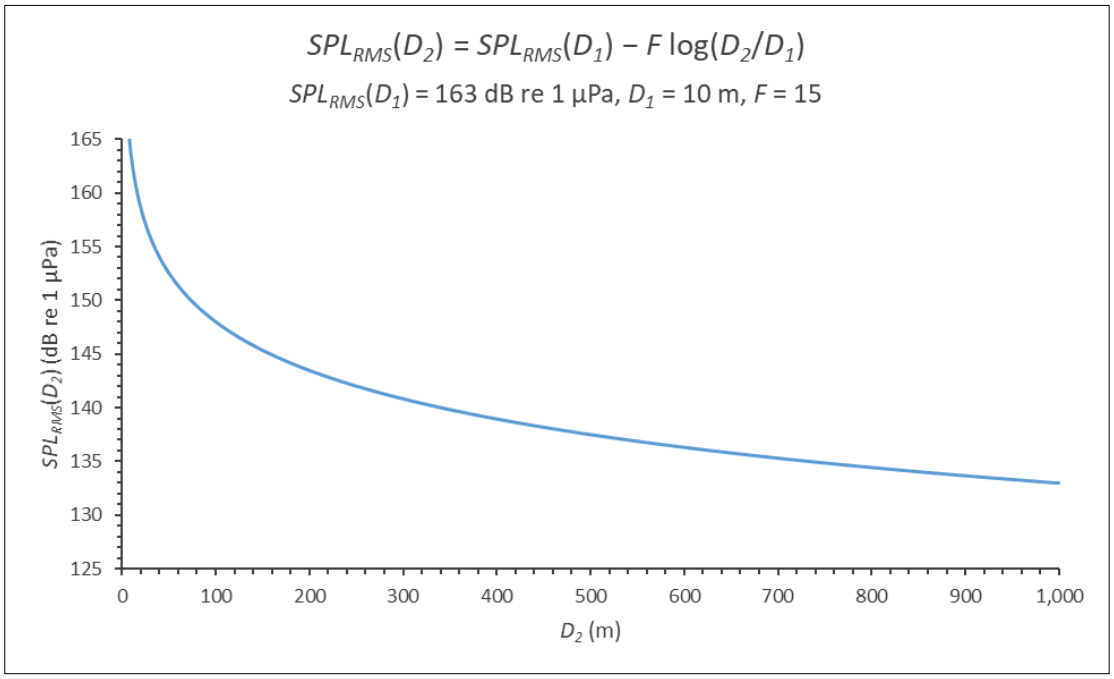


Figure 4-1 Attenuation of root mean square sound pressure level with increasing distance from vibratory piling, assuming a root mean square sound pressure level of 163 dB re 1 µPa at 10 m from pile.

As illustrated in Figure 4-1 above, an output SPL_{RMS} of 163 dB re 1 µPa at 10 m from vibratory piling would attenuate to the threshold SPL_{RMS} for behavioural response of 150 dB re 1 µPa within 100 m of the piling activity. The shortest distance between the proposed sheet pile wall and the opposite bank of the River Barrow (at high tide) is *c*.

195m. Therefore, at least 95 m of the channel width would remain unaffected. The same output would attenuate to the upper boundary of the ambient SPL_{RMS} range of 125-135 dB re 1 µPa within *c.* 700m (beyond this distance it would be inaudible).

In respect of impact piling, the precautionary output SPL_{RMS} of 189 dB re 1 µPa at 10m from the pile would take more than 1km to attenuate to the behavioural response threshold of 150 dB re 1 µPa. However, the duration of any impact piling which might be necessary will be short and any negative behavioural effect on fish will be almost immediately recoverable.

Temporary Threshold Shift

Based on data in the literature, as synthesised in Caltrans (2020), regarding the relative sensitivity of fish of different species and sizes to underwater noise, it was determined that juvenile Twaite Shad fell into the most sensitive category. As juvenile Twaite Shad are present in the River Barrow at all times of the year, the threshold values for this most sensitive category are used in this assessment. Therefore, the *TTS* threshold is set at 206 dB re 1 µPa for SPL_{peak} and 183 dB re 1 µPa^2 s for SEL_{cum}. As, the *TTS* threshold for SPL_{peak} is above the predicted SPL_{peak} for all pile driving in this case, there is not predicted to be any effect in terms of this criterion. Thus, the remainder of this assessment focusses on SEL_{cum} only.

It should be noted that SEL_{cum} is not used by many authorities as it is recognised that fish are not stationary and as there is little to no evidence of any *TTS* or other injury occurring in fish exposed to the prescribed threshold values. In fact, there is ample evidence of fish being injured by mitigation measures which have been employed to protect them from exposure to those SEL_{cum} levels. Furthermore, it is important to note that these criteria were developed for impact pile driving only and it is advised in Caltrans (2020) that they should not be used to assess sound from vibratory pile driving because the injury thresholds for vibratory piling are likely to be much higher for the non-impulsive, continuous sounds emitted by vibratory drivers. Popper et al. (2019) also highlighted that the simplified spreading model generally leads to overestimation of the size of the affected area. Therefore, use of this model and these thresholds is extremely precautionary.

The cumulation of SEL from continuous vibratory piling emitting 162 dB re 1 µPa^2 s for each second is illustrated in Figure 4-2 below.

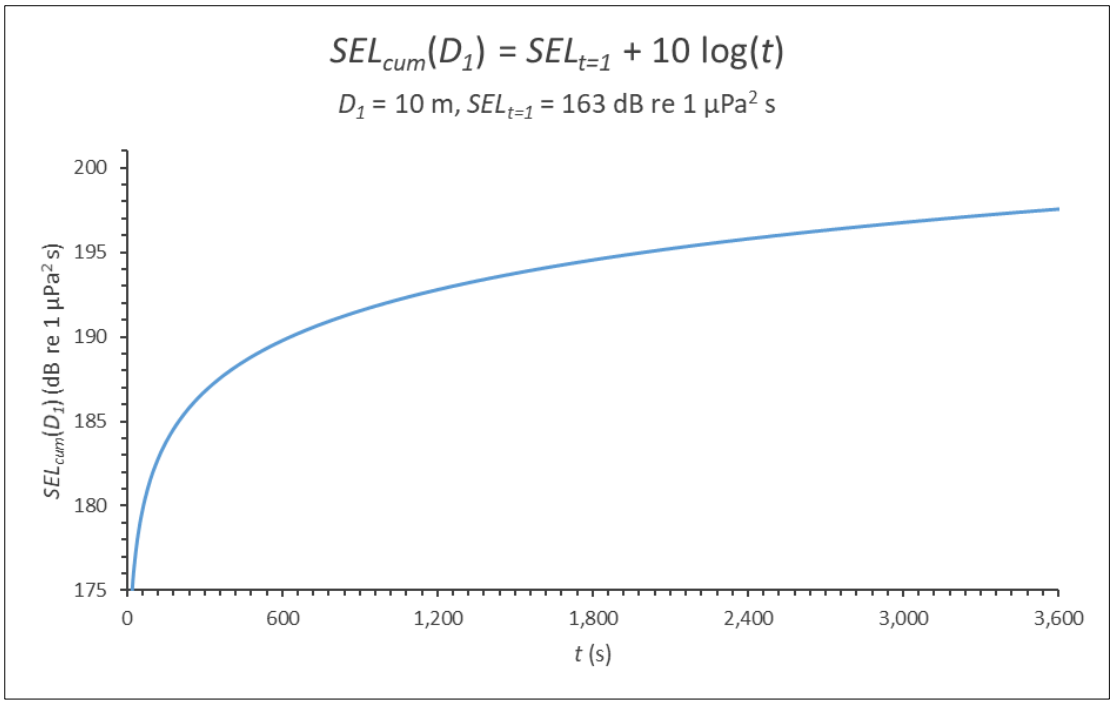


Figure 4-2 Cumulation over time of sound exposure level.

As shown in Figure 4.2 above, based on an *SEL* of 162 dB re 1 µPa for 1 s of vibratory piling, a 10-minute (600 s) pile drive would have an SEL_{cum} of 190 dB re 1 µPa² s, a 17-minute (1,020 s) drive would have an SEL_{cum} of 192 dB re 1 µPa² s, and a 20-minute (1,200 s) drive would have an SEL_{cum} of 193 dB re 1 µPa² s.

Figure 4.3 below illustrates how SEL_{cum} (or other measure of noise levels) attenuates with increasing distance from the source, as per the simplified spreading model. This is based on 20 minutes of continuous vibratory piling from a single piling rig.

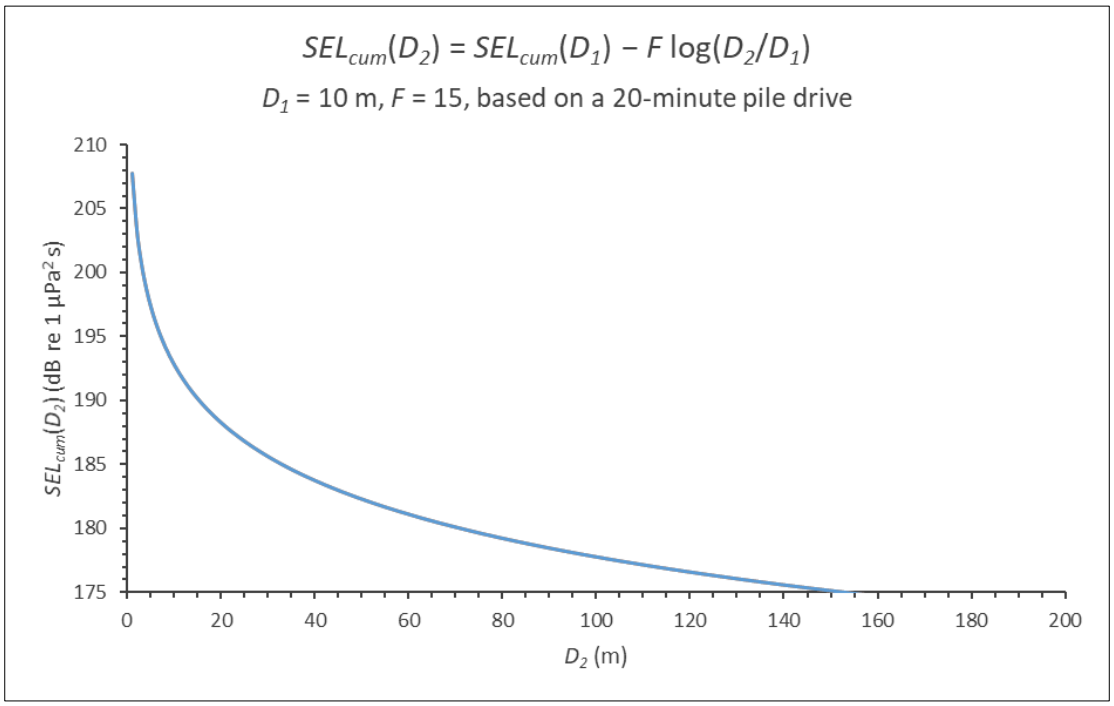


Figure 4-3 Attenuation of sound exposure level with increasing distance from vibratory piling following 20 minutes of continuous piling.

As shown in Figure 4-3 above, an output $SEL_{cum}(D_1)$ of 193 dB re 1 µPa^2 s at 10m from the pile (produced by a 20-minute pile drive) would attenuate to the precautionary *TTS* threshold of 183 dB re 1 µPa^2 s within 44m of the pile. In this case, more than half of the channel width would remain unaffected.

For any impact piling which might be necessary to drive a pile to the required depth below ground, a single-strike *SEL* of 179 dB re 1 µPa equates to a 200-strike SEL_{cum} of 202 dB re 1 µPa^2 s (equivalent to 10 minutes of impact piling at a rate of 1 strike every 3 seconds). This SEL_{cum} would attenuate to the precautionary *TTS* of 183 dB re 1 µPa^2 s within 172m of the pile.

Figure 4-4 below illustrates how the radius (D_2) of the *TTS* impact area increases in size with longer periods of continuous vibratory piling (based on a single pile).

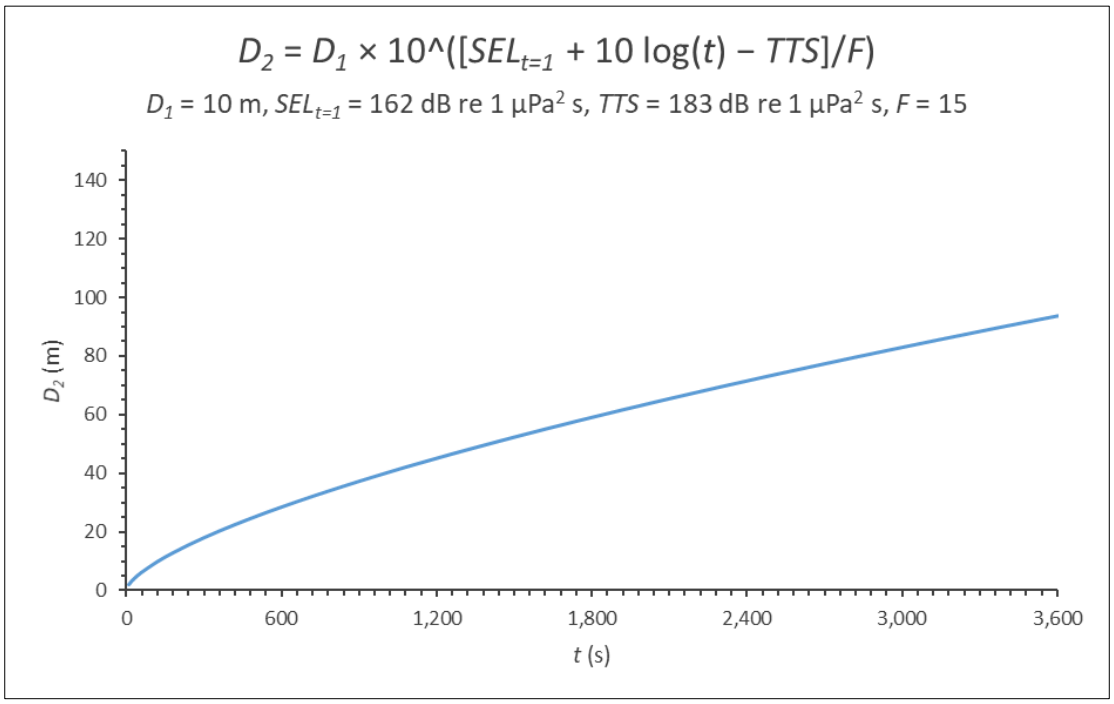


Figure 4-4 **Increase over time of the distance from continuous vibratory piling at which the sound exposure level exceeds the recoverable injury threshold.**

As shown in Figure 4-4 above, based on the channel width of 195m, it would take a continuous vibratory pile drive of at least 180 minutes to extend the *TTS* impact area across the full width of channel.

Based on the above analysis, the principal risk to fish species from piling activities is from continuous vibratory piling for more than 3 hours for a single piling rig, and from impact piling for more 200 strikes.

Effects on Species of Concern

This NIS is concerned with the fish species which are listed as Qualifying Interests of the River Barrow and River Nore SAC and which occur at the location of the proposed development, namely Sea Lamprey, River Lamprey, Twaite Shad, and Atlantic Salmon. As a hearing-specialist species and due to the importance of the Barrow Estuary to juvenile fish, Twaite Shad is by far the most sensitive of these species in terms of hydroacoustic impacts.

Twaite Shad is predominantly a diurnal species and most of its activity during the day is concentrated in deeper water in the centre of the channel. Based on the analysis above, the installation of individual piles poses almost zero risk to shad moving up and down the river mid-channel during the day. Only continuous piling for extending periods could cause a significant risk.

The other species are all mostly hearing-generalist and nocturnal species and are not present in the Barrow Estuary during their larval or very early life stages. As such, they are very unlikely to be negatively affected by the hydroacoustic impacts analysed above. The only exception to this may be where prolonged continuous piling creates an effective barrier to migration during specific periods. Table 2-5 in Section 2.5.3 illustrates the migration patterns of these species through the Barrow Estuary.

On examination of Table 2-5, at least one of these species is likely to be present in the vicinity in significant numbers at any time of the year. As outlined above, the periods of upstream migration by lamprey species and salmon may be slightly more sensitive due to the possibility of disturbance to resting fish by riverside piling during the day (if piling is undertaken during these periods). However, given the slow build-up of sound exposure from vibratory piling, the small area affected and the fact that these fish are larger and hearing-generalist, the risk of disturbance to more than a very small numbers of individuals is negligible. Considering this, there is no necessity for seasonal restrictions on piling activity in order to avoid adverse effects on migratory fish species listed as Qualifying Interests of the River Barrow and River Nore SAC. Nevertheless, the period between April and May is a sensitive time for migrating European Eel and piling should be avoided during this period.

Considering the analysis carried out in this section so far, the only mitigation which will be necessary to avoid or reduce the hydroacoustic impacts of riverside piling on fish species will be to set a maximum duration of continuous piling activity and a minimum duration of effective quiet between pile drives.

Total Duration of Piling Activities

The total duration of all piling activities is estimated to take approximately 4 weeks, excluding set up and other activities on site, either prior to, or after pile driving. Considering this, the risk of any adverse effects on fish populations, including Twaite Shad, from piling impacts of this magnitude over such a short period (1 month) is negligible.

Underwater Noise from Ground Investigations

The Ground Investigations will involve rotary drilling boreholes in the mudflats at two locations (see Drawing No. WBRC-ROD-ENV-S101-DR-CB-30012 in Appendix A). These works will take place at low tide, in the absence of water. The same principles as detailed above apply to drilling on land. However, modelling of the spread of sound through land is much more difficult due to the different degrees of attenuation through different materials. In all cases, *F* through land is greater than in water, ranging from 20 (equivalent to a *TL* of 6 dB per doubling in distance) through rock, to 28 (equivalent to a *TL* >8 dB per doubling in distance) through mud. As such, any land between the pile and the water will provide significant attenuation of noise and reduce the hydroacoustic impact.

Due to the shorter duration of these works compared with the pile driving and the fact that the method of rotary drilling will be used over percussion drilling, the area which will be subject to hydroacoustic impacts (in terms of SEL_{cum}) as a result of the borehole

drilling will be smaller still. Therefore, the ground investigations are extremely unlikely to negatively impact any fish species.

Operational phase

There are no noise-generating activities associated with the operation of the proposed development. Therefore, there will be no noise-related sources of disturbance, delayed migration injury or mortality as a result of the operation of the proposed development.

Artificial Lighting

Construction phase

Artificial lighting during construction, particularly during nightworks, would negatively impact on migrating fish through disruption of circadian rhythms and normal patterns of upstream and downstream migrations. In particular, species such as Sea Lamprey, River Lamprey and Atlantic Salmon, which generally migrate nocturnally, may halt their migrations should they encounter elevated light levels in the river. Artificial lighting of the river channel at night would, thus, form an effective barrier to the migration of such species. Therefore, mitigation is required to ensure that lighting impacts are minimised.

With regard to Twaite Shad, this species generally migrates during daylight hours and, therefore, will not be halted in its migration by lighting impacts. There is potential for lighting impacts on juvenile Twaite Shad during their residence in the estuary. These are discussed under juvenile habitat and population structure below.

Operational phase

A new lighting design will be provided by the proposed development and has potential to increase the level and intensity of light spill onto the River Barrow. This could potentially lead to the effects described above. Therefore, mitigation is required to ensure that lighting impacts are minimised.

Spawning Habitat and Redds

There are no suitable spawning habitats for lampreys, shad or salmon within the zone of influence of the proposed development. Thus, there are no pathways for impacts from the proposed development to such habitats. It can be concluded, therefore, that the proposed development will not have any effect on the distribution, quantity or quality of spawning habitats for these species. Nor will it cause any change the number and distribution of redds.

Juvenile Habitat

Juveniles (ammocoetes) of the three lamprey species are restricted to fresh waters. As no habitat for lamprey ammocoetes is present within the zone of influence of the proposed development, the availability of this habitat will not be affected.

Owing to scale of the proposed development, it will not significantly reduce the quantity of juvenile habitat available to Twaite Shad in the River Barrow and River Nore SAC. However, in the event of accidental pollution during construction, water quality impacts (detailed in Section 4.2.1) would reduce the quality of the habitat for juvenile Twaite Shad in the short term. In particular, water quality impacts may affect the availability of the mysids and other zooplankton on which juvenile shad prey. In addition, artificial lighting during construction and operation has the potential to reduce the suitability of the channel edge for juvenile Twaite Shad sheltering at night. Therefore, appropriate mitigation is required to prevent water quality and lighting impacts.

The early juvenile life stages of Atlantic Salmon, i.e., alevin, fry and parr, occur only in fresh water, generally higher up in the catchment. As no habitat suitable for these life stages occurs within the zone of influence of the proposed development, the availability of the same will not be affected by the proposed development. The final juvenile life stage of Atlantic Salmon, i.e., smolts, will be present within the vicinity of the proposed development during their migration from fresh water to the sea. While the proposed development does not provide for a significant reduction in the quantity of habitat available for salmon smolts in the River Barrow and River Nore SAC, it does provide for a potential reduction in habitat quality, particularly in terms of the availability of prey species, through water quality impacts. Therefore, the same requirement for mitigation applies in the case of Atlantic Salmon.

Population Structure

Water Quality

Water quality impacts likely to arise from the construction of the proposed development are detailed in Section 4.2.1 above. These impacts are of short duration and restricted extent and are considered to have potential to affect the population structure of species which have prolonged residence times in the estuary, namely River Lamprey and Twaite Shad. Water quality impacts may have direct effects on these species or indirect effects via food availability or oxygen depletion. Ultimately, this may result in lower survival rates among adult River Lamprey and juvenile Twaite Shad, reducing the proportion of individuals of those life stages in their local populations. Therefore, mitigation is required to avoid significant water quality impacts.

Sea Lamprey and Atlantic Salmon, however, spend only a short time in the estuary (during their migrations) and generally do not feed there.[14] Therefore, these species are unlikely to be affected by any water quality impacts which might arise during the construction of the proposed development.

Hydroacoustic Impacts

Construction phase

The effects of hydroacoustic impacts on Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon are discussed in relation to barriers to migration (above). Owing to the migration patterns and predominantly nocturnal nature of lamprey species and Atlantic Salmon and the proposed scheduling of construction works, any effects of noise and vibration on these species will be slight to imperceptible and not significant in terms of population structure.

In the case of Twaite Shad, however, the diurnal nature of this species, its auditory sensitivity and the fact that juveniles are present in the estuary year-round mean that the project has the potential to negatively impact both upstream-migrating adults and resident juveniles. Owing to the potential for impacts at these critical life-stages, hydroacoustic impacts have the potential to significantly affect the survival of juvenile shad and, if this impact is sustained over a prolonged period, the overall population structure of this species in the River Barrow and River Nore SAC. Therefore, mitigation is required to minimise the effects of piling on juvenile and migrating Twaite Shad.

[14] Atlantic Salmon kelts occasionally spend longer periods (up to several weeks) in estuaries on their post-spawning migration to the sea (Lindberg, 2011). However, as these individuals are very unlikely to contribute to future spawning, any effects of water quality impacts on kelts will be imperceptible in terms of the overall population structure of salmon in the River Barrow and River Nore SAC.

Operational phase

The operational phase of the proposed development does not provide for any increase in underwater noise. Therefore, there will be no effect on the population structure of fish species as a result of noise and hydroacoustic impacts arising from the operation of the proposed development.

Artificial Lighting

Inappropriate artificial lighting of the construction area during hours of darkness and during the operation of the proposed development have the potential to spill onto the river channel, causing elevated light levels in the water column. During construction, any effect of lighting on the survival rates of Sea Lamprey, River Lamprey and Atlantic Salmon are considered to be imperceptible as these species prefer to migrate at night and so are unlikely to be present at the side of the channel where any light spill would be concentrated. However, lighting of the river channel has the potential to negatively affect the survival rate of juvenile Twaite Shad by causing these fish to become more active at night and, consequently, subject to higher predation pressure by nocturnal predators. This may result in an adverse effect on the population structure of this species, as the proportion of 0+ and 1+ fish in the population would be reduced. Therefore, mitigation is required during construction to eliminate adverse effects of artificial lighting on the river channel.

As noted previously, a new lighting design will be provided by the proposed development and has potential to increase the level and intensity of light spill onto the River Barrow. This could potentially lead to negative impacts on migrating fish through disruption of circadian rhythms and normal patterns of upstream and downstream migrations. In particular, species such as Sea Lamprey, River Lamprey and Atlantic Salmon, which generally migrate nocturnally, may halt their migrations should they encounter elevated light levels in the river. Artificial lighting of the river channel at night would, thus, form an effective barrier to the migration and have a negative effect on the population structure of these species. Therefore, mitigation is required to ensure that lighting impacts are minimised.

Owing to the scale of the proposed development, neither its construction nor its operation has the potential to give rise to significant shading impacts on the River Barrow and the migratory fish species present. Therefore, no mitigation is required with respect to shading.

Water quality

All of the water quality impacts potentially arising from both the construction and the operation of the proposed development have been assessed and evaluated in terms of their effects on the relevant Attributes of the Conservation Objectives for the migratory fish species listed as Qualifying Interests of the River Barrow and River Nore SAC (see the discussion under the preceding sub-headings). There are not considered to be any additional water quality impacts with potential to adversely affect those Conservation Objectives.

Conclusion

In the absence of appropriate mitigation, the proposed development has the potential to adversely affect the Conservation Objective for Sea Lamprey, River Lamprey, Twaite Shad, Atlantic Salmon and other fish species in the River Barrow and River Nore SAC through water quality, hydroacoustic arising from construction activities, particularly from piling and lighting impacts arising from both the construction and operational phases of the proposed development. Therefore, mitigation is required to

eliminate or minimise these impacts such that they would not constitute adverse effects on the relevant Conservation Objectives.

4.2.5 European Otter

The Conservation Objective for European Otter in the Lower River Barrow and River Nore SAC is shown in Table 3-2 above. The Attributes of this Conservation Objective are summarised as follows:

- Distribution;
- Extent of terrestrial, marine and freshwater habitats;
- Couching sites and holts;
- Fish biomass available; and,
- Barriers to connectivity.

Distribution, Habitats, and Couching Sites and Holts

Owing to the location and scale of the proposed development, neither its construction nor its operation has the potential to cause a significant decline in the distribution of otters or the extent of terrestrial, marine and freshwater habitats for this species across the River Barrow and River Nore SAC. Similarly, no potential or confirmed couching sites and holts were recorded during the surveys carried out to inform the assessments of the proposed development and the habitats in the vicinity of the proposed development are not considered to provide good opportunities for couches or holts. Therefore, it can be concluded that the proposed development will not adversely affect the integrity of the River Barrow and River Nore SAC with regard to its Conservation Objective for European Otter.

Fish Biomass Available

Fish species, particularly salmonids and eels, form the majority of the diet of European Otter in Ireland (Chanin, 2003; Bailey & Rochford, 2006; Reid et al., 2013). The diet of otters is, however, highly adaptable and varies considerably between habitats (Reid et al., 2013). The diets of otters in both freshwater and coastal habitats have been studied extensively (Chanin, 2003). While the feeding habits of otters in estuaries are less well-known, the importance of salmonids, eels and crustaceans, e.g., White-clawed Crayfish (*Austropotamobius pallipes*), in freshwater habitats suggests that migratory fishes, i.e., Atlantic Salmon, European Eel, Sea Lamprey, River Lamprey and Twaite Shad, when available, are important for otters in estuarine habitats. Other fish species found in estuaries, e.g., European Smelt (*Osmerus eperlanus*), rocklings (*Lotidae*) and wrasses (*Lubrus* spp.), and invertebrates, e.g., Shore Crab (*Carcinus maenas*), are likely to be of importance outside of these periods.

The effects of the proposed development on fish species for which the River Barrow and River Nore SAC is selected are assessed in Section 4.2.5 above and the effects on other fish species which form part of the diet of European Otter, e.g., European Smelt, rocklings and wrasses, are similar in nature and scale. While the effects of the proposed development are considered unlikely to significantly reduce the total fish biomass available to otters, the scale of this effect cannot be quantified and, thus, in accordance with the Precautionary Principle, it is considered to be potentially significant. Mitigation is, therefore, required to prevent any adverse effect on prey availability for otters.

Barriers to Connectivity

During the surveys carried out to inform this assessment, there was no evidence of Otter recorded within 150 m of the proposed development. Nevertheless, the desk

study results indicate that Otter are frequently present at this location along the River Barrow. The proposed development has the potential to form a barrier to connectivity between different areas of Otter habitat by creating a physical obstruction to Otter movements or by disturbance, i.e., by emitting noise and light such as to deter otters from passing the proposed development area.

Physical Obstruction

As explained in Section 2.5.8, neither the construction nor the operation of the proposed development will lead to a significant obstruction of the river channel. As shown in Drawing No. WBRC-ROD-SBR-S101-DR-CB-30007 & 30008 in Appendix A of this NIS, the majority of the surface of the river will also remain unobstructed for Otters moving at this level. Therefore, neither the construction nor the operation of the proposed development will result in any new physical barrier to aquatic connectivity for European Otter.
Otters likely commute along the intertidal corridor in the proposed development site. The width of this corridor varies from 0m at high tide to a maximum of *c*. 15m at low tide at the eastern bank and *c.* 30m at low tide at the western bank. The width of this corridor will be reduced by *c*. 2 m along the length of the proposed sheet pile walls. Given the lower half of this corridor will remain unaffected over the length of the proposed sheet pile wall, it is concluded that otters will continue to be able to move past this area unimpeded.

Due to the highly fragmented nature of the terrestrial or riparian habitats which will be affected by the proposed development, as well as their isolation from the river channel within the proposed development extents, these do not currently provide suitable commuting habitat for otter. Therefore, the loss of these habitats or access to them does not represent a significant effect on connectivity for otters.

Based on the analysis above, any physical obstruction of terrestrial/riparian, intertidal or aquatic commuting corridors associated with the construction or operation of the proposed development will not give rise to barriers to connectivity for European Otter.

Disturbance

European Otter is generally considered to be a nocturnal or crepuscular species, i.e., individuals are predominantly active at night, with peaks in activity shortly after dusk at just before dawn (Chanin, 2003; OPW, 2006; Garcia de Leaniz, 2006). Therefore, apart from at their breeding and resting sites, otters are not considered to be sensitive to noise and light impacts during daylight hours. Furthermore, the occurrence of otters in towns and cities suggests that this species is able to habituate to human activities.

Noise and lighting from construction, especially pile driving and floodlighting, have the potential to cause disturbance to otters, leading to reduced connectivity between areas upstream and downstream of the proposed development for the duration of the construction phase. Given the nocturnal or crepuscular nature of this species, the significance of any effects resulting from noise and lighting impacts depends on the daily programming and total duration of the construction activities and lighting of the construction area. As construction of the proposed development may require nightworks, which will involve artificial lighting of the works area and noise from construction activities, including piling, there is potential for these works to form a barrier to connectivity for Otters during construction. Therefore, mitigation is required to minimise these impacts and thereby avoid adverse effects on European Otter in terms of barriers to connectivity as a result of disturbance.

During its operation, as noted previously, a new artificial lighting plan will be provided by the proposed development and has potential to increase the level and intensity of light spill onto the River Barrow leading to the effects described above. Therefore, mitigation is required to minimise these impacts and thereby avoid adverse effects on European Otter in terms of barriers to connectivity as a result of disturbance.

Conclusion

In the absence of appropriate mitigation, the proposed development has the potential to adversely affect the Conservation Objective for European Otter in the River Barrow and River Nore SAC. Specifically, effects on fish species during construction have the potential to reduce the total biomass available to otters as food and poor management of night-time construction may cause an effective barrier to connectivity. Therefore, appropriate mitigation is required to prevent such adverse effects.

4.2.6 Freshwater Pearl Mussel and Nore Pearl Mussel

The Conservation Objectives for Freshwater Pearl Mussel and Nore Pearl Mussel given in Table 3-2 above. As mentioned in Section 3.3, there is currently no site-specific Conservation Objective set for Freshwater Pearl Mussel in the River Barrow and River Nore SAC. For the purpose of this report, the Conservation Objectives set for Freshwater Pearl Mussel in the Lower River Suir SAC [002137] (NPWS, 2017). The Attributes of these Conservation Objectives can be summarised as follows:

- Distribution
- Population size and structure: recruitment, adult mortality
- Suitable habitat: extent, condition
- Water quality: macroinvertebrate and phytobenthos (diatoms)
- Substratum quality: filamentous algae (macroalgae) and macrophytes (rooted higher plants), sediment, oxygen availability
- Hydrological regime: flow variability
- Host fish
- Fringing habitat: area and condition

Distribution, Suitable Habitat, Water Quality, Substratum Quality, Hydrological Regime and Fringing Habitat

Freshwater Pearl Mussel and Nore Freshwater Pearl Mussel are limited to the freshwater stretches of the river and any suitable habitat for these species is out of reach of water quality impacts as these impacts cannot be carried beyond transitional waters. Therefore, there are no pathways for impacts to occur on the habitat extent or distribution, the quality of suitable habitat whether physical, chemical or biotic, or any adult pearl mussels as a result of the proposed development at this location.

Hydrological regime: flow variability

As stated in the Section 2.5.8, changes to the tidal/flow regime resulting from the proposed development are imperceptible to not significant and limited to vicinity of the proposed development, for all conditions of fluvial and tidal flow. Considering this, and the distance between any suitable habitat for Freshwater Pearl Mussel and Nore Freshwater Pearl Mussel and the proposed development, it can be concluded that the proposed development will not significantly affect the Conservation Objective for these species in the River Barrow and River Nore SAC in terms of these Attributes.

Population Size and Structure

The proposed development could give rise to water quality impacts in the event of a spillage of pollutants such as wet concrete or fuel into the river. These pollutants can have toxic effects on aquatic life, including fish, depending on the concentration and type of pollutant that is spilled. Therefore, mitigation is required to minimise impacts on host fish and thereby avoid adverse effects on Freshwater Pearl Mussel and Nore Freshwater Pearl Mussel in the River Barrow and River Nore SAC.

Conclusion

While Freshwater Pearl Mussel and Nore Freshwater Pearl Mussel are considered to be absent at the location of the proposed development, these species are present further upstream in the freshwater stretches of the River Barrow and the River Nore. Accidental sedimentation and/or pollution of watercourses during the construction and operation/maintenance of the proposed development poses a risk of adverse effects on the host fish of pearl mussel populations. Therefore, mitigation is required to control this risk and minimise any impacts.

4.2.7 Desmoulin's Whorl Snail

The Conservation Objective for Desmoulin's Whorl Snail in the River Barrow and River Nore SAC is shown in Table 3-2 above. The Attributes of this Conservation Objective are summarised as follows:

- Distribution: occupied sites
- Population size (adults) and density;
- Area of occupancy
- Habitat quality: vegetation and soil moisture levels.

As there is no suitable habitat for Desmoulin's Whorl Snail in close proximity to the proposed development, there will be no direct impacts on this species or its habitats. However, there is potential for the proposed development to cause a reduction in the quality of habitats occupied by this species in the wider area through impacts on water quality or invasive alien species. The effects of water quality impacts and invasive alien species associated with the proposed development on saltmarsh habitats are assessed in Section 4.2.2. Due to the similar pathways for impacts and degree of connectivity between the proposed development and saltmarsh habitats and the proposed development and habitats for Desmoulin's Whorl Snail, it is considered that effects on any habitats for this species which may be present within the zone of influence are the same as those discussed in Section 4.2.2.

Therefore, the only potential impacts from the proposed development with the potential to give rise to adverse effects on the Conservation Objective for Desmoulin's Whorl Snail in the River Barrow and River Nore SAC are an impact on water quality or invasive alien species affecting the vegetation composition in this species' habitats. As mitigation will be necessary to manage the risk of water quality impacts and invasive alien species in any case, no additional or specific mitigation is required in respect of Desmoulin's Whorl Snail.

4.3 Lower River Suir SAC

4.3.1 Freshwater Pearl Mussel

The effects of the proposed development on Freshwater Pearl Mussel in the River Barrow and River Nore SAC are analysed and evaluated in Section 4.2.6 of this NIS. The effects on this Qualifying Interest in the Lower River Suir SAC are considered to

be the same as those for the River Barrow and River Nore SAC. Therefore, any mitigation which is effective in terms of avoiding adverse effects on Freshwater Pearl Mussel in the River Barrow and River Nore SAC will be more than adequate to eliminate such effects in the Lower River Suir SAC.

4.3.2 Fish Species

The migratory fish species listed as Qualifying Interests of the Lower River Suir SAC which are potentially present within the zone of influence of the proposed development are Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon. The effects of the proposed development on individuals and populations of these species in the vicinity of the proposed development are assessed and evaluated, in view of the Conservation Objectives of the River Barrow and River Nore SAC, in Section 4.2.4 above.

The Lower River Suir SAC is located *c*. 17.2 km downstream of the proposed development and the proposed development does not provide for any barrier to migratory fish moving between the sea and the freshwater stretches of the Rivers Suir. Furthermore, underwater noise or artificial lighting from the proposed development will not directly affect fish in the Lower River Suir SAC. Therefore, the only impacts from the proposed development with potential to affect migratory fish species in this European site are water quality impacts.

Owing to the distance between the proposed development and the Lower River Suir SAC, any water quality impacts from the proposed development will be of a significantly lower magnitude at this site than in the immediate vicinity of the proposed development. Therefore, any mitigation which is effective in terms of avoiding adverse effects on migratory fish species in the River Barrow and River Nore SAC will be more than adequate to eliminate such effects in the Lower River Suir SAC.

4.3.3 European Otter

The effects of the proposed development on European Otter in the River Barrow and River Nore SAC are analysed and evaluated in Section 4.2.5 of this NIS. The effects on this Qualifying Interest in the Lower River Suir SAC are considered to be the same as those for the River Barrow and River Nore SAC, except that there will be no barrier to connectivity and no direct impacts on individuals. Therefore, any mitigation which is effective in terms of avoiding adverse effects on European Otter in the River Barrow and River Nore SAC will be more than adequate to eliminate such effects in the Lower River Suir SAC.

4.4 River Nore SPA

4.4.1 Kingfisher

The generic Conservation Objective for Kingfisher in the River Nore SPA is "*To maintain or restore favourable conservation condition of the bird species listed as Special Conservation Interests of this SPA*" (NPWS, 2022a). Favourable conservation status of a species is achieved when:

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

As the proposed development is located *c.* 12.8 km downstream of the River Nore SPA and that no suitable nesting habitat for this species was recorded within the vicinity of the bridge during the field survey, it can be concluded that the proposed development will not result in any direct or indirect loss of suitable nesting habitat for this species. However, Kingfisher is dependent on a healthy supply of fish in the river as a food source in order to survive. The construction phase of the proposed development has potential to give rise to water quality impacts (as described in Section 4.2.1) which may result in the direct loss of fish, as well as interrupting reproductive strategies of local populations of fish species in the River Barrow and River Nore, thus reducing food availability for Kingfisher.

Conclusion

Considering the above, mitigation is required in order to minimise adverse effects on Kingfisher within the River Nore SPA through a reduction in food availability as a result of the water quality impacts arising from the construction of the proposed development.

5. MITIGATION

5.1 Principles and Approach

Section 4 of this NIS assessed the adverse effects likely to arise from the proposed development on the specific Attributes and Targets which define the Conservation Objectives for a number of Qualifying Interests of the River Barrow and River Nore SAC, Lower River Suir SAC and the River Nore SPA. This section prescribes mitigation measures to ensure their full and proper implementation aimed at mitigating these adverse effects, thereby protecting the integrity of these European sites during the construction and operation of the proposed development.

The mitigation measures prescribed in this NIS have been designed according to the principle of a mitigation hierarchy, as outlined in the European Commission's guidance document *Assessment of plans and projects in relation to Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (EC, 2021). According to this hierarchy, mitigation measures first suggest *avoidance* (i.e. preventing significant impacts from happening in the first place) and then *reduction* of impact (i.e. reducing the magnitude and/or likelihood of an impact).

As mitigation measures are related directly to impacts and only indirectly to receptors and as, in this case, all of the affected receptors have been identified as being affected the same set of impacts, to describe mitigation measures under the headings of the relevant receptors would lead to undue repetition. Therefore, the measures prescribed in this NIS are described under the headings of the types of impacts which they are intended to mitigate.

The mitigation measures are prescribed in Section 5.2 and a protocol to ensure their full and proper implementation is prescribed in Section 5.3. The significance of any residual effects following the inclusion of mitigation measures is evaluated in Section 5.4. As per the assessment of adverse effects in Section 4, this evaluation is made in view of the relevant Conservation Objectives.

5.2 Mitigation Measures

5.2.1 Water Quality

As is normal practice with infrastructure projects, a Construction Environmental Management Plan (CEMP) has been prepared for the proposed development and is included in Appendix D of this NIS. This will be updated and finalised by the selected contractor to suit the detailed construction methodology and allocate responsibilities to individuals in the construction team. In doing so, the measures detailed in the appended reports will be considered minimum requirements to be considered and improved upon. The level of detail provided within the Plans is sufficient to allow an assessment of the anticipated impacts including residual impacts.

The following will be implemented as part of this plan:

- An Environmental Operating Plan (EOP) (Appendix C of Appendix D) outlines procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of developments.
- An Incident Response Plan (Appendix D of Appendix D) detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.

- All necessary permits and licenses for in-stream construction work for provision of the proposed development will be obtained prior to the commencement of construction.
- Inform and consult with the National Parks and Wildlife Service and Inland Fisheries Ireland.

During construction, cognisance will have to be taken of the following guidance documents for construction work on, over or near water.

- *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016)*
- *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (Eastern Regional Fisheries Board)*
- *Central Fisheries Board Channels and Challenges – The enhancement of Salmonid Rivers.*
- *C532 Control of water pollution from construction sites: guidance for consultants and contractors (CIRIA, 2001)*
- *CIRIA C648 Control of water pollution from linear construction projects: technical guidance (CIRIA, 2006)*
- *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (TII, 2006)*

Based on the above guidance documents, the following principal mitigation measures will be adhered to for the construction phase:

Sedimentation and surface water run-off

- Sheet piling for the new site boundary shall be installed prior to any excavation on the landward side and demolition of the existing quay wall boundary. This will form an effective barrier to run-off from the site during construction.
- Any material stockpiled shall be located a minimum of 30 m from the edge of the river and shall also be covered and remain stockpiled for as short a time as possible.
- The Contractors shall provide method statements for weather and tide/storm surge forecasting and continuous monitoring of water levels in Waterford Harbour and the removal of site materials, fuels, tools, vehicles and persons from flood zones in order to minimise the risk of input of sediment or construction materials into the river during flood events.
- The works area (including site compounds) will be limited to the minimum required to undertake the necessary elements of the project.
- Surface water flowing onto the construction area will be minimised through the provision of berms, diversion channels or cut-off ditches.
- Protection of waterbodies from silt load will be carried out through the use of gully silt/sediment filters and shallow berms in hardstanding areas to provide adequate treatment of runoff to watercourses.
- Settlement tanks/ponds, silt traps/bags and bunds will be used. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap.
- The anticipated site compound/storage facility will be fenced off at a minimum distance of 5 m from the top of the edge of the watercourse bank. Any works within the 10 m buffer zone will require measures to be implemented to ensure

that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse. CEMP has been drafted and will need to be finalised by the appointed Contactor. See the CEMP in Appendix D for further detail.

- Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with the TII document "*Guidelines for the crossing of watercourses during the construction of National Road Schemes*". All chemical and fuel filling locations will be contained within bunded areas.
- Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner, off site, to prevent pollution.
- The construction discharge will be treated such that it will not reduce the environmental quality standard of the receiving watercourses.
- Water quality monitoring will be undertaken in the River Barrow, with weekly samples being taken from at least 2 months prior to commencement of construction until at least 4 months post-completion. Water samples will be taken from at least two locations. The final number and location of sampling points will be determined by the Site Environmental Manager. The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager on an ongoing basis during construction. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation will be undertaken to identify the source of this non-compliance and corrective action will be taken where the this is deemed to be associated with the proposed development.

Concrete Works

The use and management of concrete in or close to watercourses must be carefully controlled to avoid spillage which has a deleterious effect on water chemistry and aquatic habitats and species. As the use of concrete cannot be avoided, the following control measures will be employed:

- Hydrophilic grout and quick-setting mixes or rapid hardener additives shall be used to promote the early set of concrete surfaces exposed to water;
- When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used;
- Any plant operating close to the water will require special consideration on the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters;
- Placing of concrete in or near watercourses will be carried out only under the supervision of the Ecological Clerk of Works (ECoW);
- The weather forecast will be consulted prior to commencing concrete pours. No such works will be undertaken if inclement weather is forecast such that precipitation may make it difficult to maintain a dry working area.
- There will be no spills of concrete, cement, grout or similar materials hosed into surface water drains. Such spills shall be contained immediately, and runoff prevented from entering the watercourse;
- Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses;

- On-site concrete batching and mixing activities will only be allowed at the identified construction compound areas;
- Washout from concrete lorries, with the exception of the chute, will not be permitted on site and will only take place at the construction compound (or other appropriate facility designated by the manufacturer);
- Chute washout will be carried out at designated locations only. These locations will be signposted. The Concrete Plant and all Delivery Drivers will be informed of their location with the order information and on arrival to site; and
- Chute washout locations will be provided with an appropriate designated, contained impermeable area and treatment facilities including adequately sized settlement tanks. The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the construction stage settlement facilities) or alternatively disposed of as waste in accordance with the Contractor's Waste Management Plan.

Hydrocarbons and other chemicals

- Land-based vehicles and plant shall be refuelled off-site, where possible.
- All land-based fuelling of machinery shall be undertaken on an impermeable base in bunded areas at least 50 m from the edge of the river.
- Marine based fuelling will only be undertaken using specifically designed nozzles to prevent spillages and spill kits will be available.
- All fuelling equipment shall be regularly inspected and serviced.
- Any petrol- or diesel-fuelled pumps or other machinery shall be located within temporary bunded units.
- All fuel, oils, chemicals, hydraulic fluids, on-site toilets etc. shall be stored in the construction site compound, on an impermeable base which shall be bunded to 110% capacity and appropriately secured.
- All plant and construction vehicles shall be inspected daily for oil leaks and a full-service record shall be kept for all plant and machinery.
- Spill kits shall be available on-site during construction, including on the jack-up barge during pile driving.
- All waste oils, empty oil containers and hazardous wastes shall be disposed of in accordance with the Waste Management Act, 1996 (as amended).
- Owing to the presence of contaminants within the construction site, excavation shall be limited to the absolute minimum necessary.

Flooding

The Contractor will provide method statements for weather forecasting and continuous monitoring of water levels in the River Barrow. The Contractor will also provide method statements for the removal of site materials, fuels, tools, vehicles and persons from flood zones in order to minimise the risk to persons working on the site as well as potential input of sediment or construction materials into the river during flood events.

Operational Phase

No water quality impacts are predicted to arise during the operation of the proposed development.

5.2.2 Hydroacoustic Impacts

Hydroacoustic Impacts

The mitigation for hydroacoustic impacts is as follows ("piling event" means any period of continuous piling by one or two rigs; "quiet period" means any period in which there is no piling by any rig):

- Piling works shall not be undertaken between the 1st April and the 31st May as advised by IFI during consultation.
- There shall be no piling between sunset and sunrise.
- Vibratory piling shall be the standard method for the installation of all piles. Impact piling shall only be employed where the required pile toe level cannot be achieved by vibratory piling.
- The duration of any vibratory piling event shall not exceed 180 piling minutes.
- The length of any impact piling event shall not exceed 200 strikes.
- An appropriate soft-start/ramp-up procedure shall be used for all impact piling events. Where it is possible according to the operational parameters of the equipment and materials concerned, the underwater acoustic energy output shall commence from a lower energy start-up (i.e., a peak sound pressure level not exceeding 170 dB re: 1µPa @1m) and, thereafter, be allowed to gradually build up to the necessary maximum output over a period of 20 – 40 mins.
- Following every piling event, there shall be a quiet period of at least 30 minutes. Only following 30 minutes of no piling whatsoever can the cumulation of piling minutes be re-zeroed.
- Rotary drilling will be the method used to drill the boreholes over other methods such as percussion drilling which give rise to higher levels of noise. Furthermore, these works will take place at low tide to allow for greater attenuation of noise within the mud in the absence of water. This mitigation will ensure that any hydroacoustic impacts will not give rise to a significant barrier to the movements of Twaite Shad or other species, or other significant effects on such species, in the Barrow Estuary as a result of the ground investigations.

5.2.3 Lighting

In summary, light spill onto the river channel during hours of darkness has the potential to form a barrier to the migration of nocturnal species and to encourage night-time activity of diurnal species, causing them to become more vulnerable to nocturnal predators.

Therefore, the following limits on construction lighting is proposed:

- Subject to any Health & Safety and/or navigational requirements, construction lighting over the river channel shall be turned off outside of working hours.
- Construction lighting shall be limited to the minimum area required to be lit and minimise light spill to areas not required for construction.
- In order to further limit any light spill, solid hoarding shall be erected around areas which will be subject to night-time construction activities.

Given the implementation of the above measures and the short duration of night-time construction activities, these works are unlikely to give rise to any impacts beyond the duration of the works and, therefore, no additional mitigation is proposed in relation to these works.

During the operation of the proposed development, lighting columns will be of a similar height and spacing to the existing and will utilise the existing lighting duct in the footpath. The following mitigation measures will be integrated into the lighting design:

- Lighting outside the intended area of illumination will be minimised. Where light spill cannot be avoided, louvres, cowls or shields will be fitted to the columns.
- Lighting will be LED and have no upward light spill (apart from intentional up-lighting) and a sharp horizontal cut off.
- Lighting will be a warm-white colour of 2700K or less.

5.2.4 Invasive Alien Species

In order to minimise the risk of the introduction or spread of invasive species during construction, all land-based works shall be executed in accordance with best practice for biosecurity in construction. In particular, prior to commencement, the Contractor shall prepare a detailed Biosecurity Protocol describing his/her proposed approach to ensuring that invasive species are not imported or spread during the construction of the proposed development.

Terrestrial Plant Species

In order to minimise the risk of the introduction or spread of invasive alien plant species (IAPS) during construction, all land-based works shall be executed in accordance with best practice for biosecurity in construction. In particular, prior to commencement, the Contractor shall prepare a detailed Biosecurity Protocol describing his/her proposed approach to ensuring that IAPS are not imported or spread during the construction of the proposed development. The Contractor's Biosecurity Protocol shall be in accordance with *The Management of Invasive Alien Plant Species on National Roads – Standard* (TII, 2020a) and *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance* (TII, 2020b). The Biosecurity Protocol shall include, as a minimum, the following measures to prevent the spread of invasive species:

- Good construction site hygiene will be employed to prevent the introduction and spread of problematic IAPS (i.e., Himalayan Balsam and Common Cord-grass) by thoroughly washing vehicles prior to leaving any site.
- All plant and equipment employed on the construction site (e.g., excavators, piling equipment etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of IAPS.
- All washing must be undertaken in areas with no potential to result in the spread of IAPS, as detailed in the Construction Environmental Management Plan.
- Any soil and topsoil required on the site will be sourced from a stock that has been screened for the presence of any IAPS and where it is confirmed that none are present.

Aquatic Species

The use of barges during the construction of the proposed development poses the risk of the introduction of invasive alien species to the aquatic environment both in the vicinity of the works and in the wider Barrow-Nore-Suir Estuary. This has the potential to significantly affect the integrity of aquatic and intertidal habitats in the zone of influence. In order to minimise the risk of either the introduction or spread of aquatic invasive alien species and thereby avoid negative impacts on these habitats, the owner or operator of the barge shall provide documentary evidence (in the form of a completed and signed Marine Institute "*Cleaning and Disinfection Declaration Form*")

that the vessel was fully de-fouled within the 6 months immediately preceding its engagement in the construction of the proposed development.

In relation to other construction activities, including pre-construction surveys and any other site inspections, the principles and appropriate measures in the IFI guidance document *Biosecurity Protocol for Field Survey Work* (IFI, 2010a) shall be followed and shall form part of the Contractor's Biosecurity protocol.

5.2.5 Fish Rescue

As the sheet piling will be installed at high tide, there is a risk that fish could become trapped once the wall is closed off. In order to avoid this, the final sheet pile will be installed at low tide so that any fish that might have become trapped behind sheet piling will be able to escape with the receding tide before the area behind the new quay wall is closed off and filled in.

5.2.6 Monitoring

Water Quality

Monitoring of water quality shall be undertaken in the River Barrow, with samples taken, weekly for at least 2 months prior to commencement of construction, for the entire duration of construction and for at least 4 months post-completion. The parameters which shall be monitored include, but are not limited to:

- Suspended solids and turbidity;
- Total hydrocarbons;
- Ammonia, nitrates, nitrites and total nitrogen;
- Phosphates and total phosphorus;
- Dissolved oxygen and biological oxygen demand; and,
- Temperature and salinity.

Samples shall be taken from at least two different locations, including at least one location at an appropriate distance upstream of the proposed development and at least one other at an appropriate distance downstream of the proposed development. The final number and location of sampling points will be determined by the Site Environmental Manager. Given the strong tidal influence at the location of the proposed development, the date and exact time at which each sample is taken, as well as the water level and direction of flow, must be recorded in order to ensure that comparative analysis of samples can control for tidal influence, as well as other variables, e.g., fluvial conditions.

The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager on an ongoing basis during construction. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation shall be undertaken to identify the source of this non-compliance and corrective action will be taken where this is deemed to be associated with the proposed development.

Record of Habitats

In order to maintain an accurate and precise record of changes to intertidal and fringing habitats, particularly mudflats, a photographic record shall be made of these habitats. This record shall cover both sides of the river from 50m upstream of the sheet pile wall to 50m downstream. All photographs shall be taken at low tide, every 2 months, beginning 6 months prior to commencement of construction and finishing 12 months after completion.

In addition, in order to accurately and precisely record any change in the structure and composition of biological communities of hard and soft intertidal substrates, sampling and analysis of these habitats shall be carried out at 6 months, 1 year, 2 years and 5 years post-construction. To facilitate meaningful comparative analysis and evaluation of the impacts of the proposed development, the sampling and analysis should follow the methodology employed by UCC Aquatic Services Unit in carrying out the pre-planning benthic surveys on 14th January and 21st September 2022 (in Appendix C).

Hydroacoustic Impacts

In order to allow for greater accuracy in the assessment of future plans and projects, it is recommended that hydroacoustic monitoring be undertaken for the duration of the proposed development's construction during which piling activities will take place. This monitoring shall establish the ambient underwater noise levels in the estuary (and the rate of sound attenuation) prior to and after construction and more accurately characterise the sound outputs in terms of SPL_{peak}, SPL_{RMS} and *SEL* at different frequencies arising from the different methods of pile driving and different types and sizes of piles. This monitoring shall be carried out by specialist underwater noise surveyors.

5.3 Implementation

In order to give effect to the mitigation prescribed in this NIS, it should be a condition of any consent granted in respect of the proposed development that all of the mitigation, including monitoring and enforcement, prescribed in this NIS be binding, during the construction phase, on the Contractor and, during operational phase, on Wexford County Council. Accordingly, all of the mitigation prescribed herein shall be transposed into the Contract Documents for the construction of the proposed development.

During construction, all works must comply with relevant legislation and guidelines in order to reduce and minimise environmental impacts and to protect all ecological receptors. In particular, there must be full compliance with the following:

- The CEMP
- The Schedule of Commitments.
- The mitigation prescribed in the Ecological Impact Assessment (EcIA) (submitted as part of the Planning Report) and in this NIS.
- Any conditions which might be attached to the proposed development's planning consent.
- Any requirements of stakeholders and statutory bodies, e.g., the NPWS and IFI, including:
    - *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016).
    - *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters* (NPWS, 2014).
    - *Bats and artificial lighting in the UK* (BCT, 2018).
- All applicable legislative requirements in relation to environmental protection.
- All relevant construction industry guidelines, including:
    - *C532 Control of water pollution from construction sites: guidance for consultants and contractors* (CIRIA, 2001).
- Any biosecurity requirements arising from the preceding points.

- The Transport Infrastructure Ireland (TII) Environmental Assessment and Construction Guidelines, specifically:
    - *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.*
    - *Guidelines for the Testing and Mitigation of the Wetland Archaeological Heritage for National Road Schemes.*
    - *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*
    - *The Management of Invasive Alien Plant Species on National Roads – Standard.*
    - *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance.*
    - *Guidelines for the Treatment of Noise and Vibration in National Road Schemes.*
    - *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.*
    - *Management of Waste from National Road Construction Projects.*
    - *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.*

This list is non-exhaustive. All environmental commitments/requirements and relevant legislation and guidelines which are current at the time of construction will be followed.

5.3.1 Construction Environmental Management Plan

Appendix E contains the Construction and Environmental Management Plan (CEMP) which shall be finalised by the Contractor, in agreement with Kildare County Council, prior to the commencement of the construction phase.

A CEMP deals with the Contractor's overall management and administration of a construction project in addition to any environmental control measures required during construction. A CEMP is prepared by the Contractor during the pre-construction phase, to ensure that the project is completed on-time and within budget. The CEMP will include a detailed programme of works. The CEMP is also developed to ensure that all construction activities are undertaken in a satisfactory and safe manner, to a delivery program meeting the Clients requirements. The Contractor will be required to include details under the following headings;

- Details of working hours and days;
- Details of emergency plan - in the event of fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incident within an area of traffic management. The plan must include contact names and telephone numbers for: Local Authority (all sections/departments); Ambulance; Gardaí and Fire Services;
- Details of chemical/fuel storage areas, (including location and bunding to contain runoff of spillages and leakages);
- Details regarding refuelling areas for machinery and vehicles.
- Details of construction plant storage, temporary offices;
- Traffic management plan (to be developed in conjunction with the Local Authority – Roads Section) including details of routing of network traffic; temporary road closures; temporary signal strategy; routing of construction traffic; programme of

vehicular arrivals; on-site parking for vehicles and workers; road cleaning; other traffic management requirements such as traffic calming where necessary;

- Truck wheel wash details (including measures to reduce and treat runoff);
- Dust management to prevent nuisance and harmful effects (demolition & construction);
- Site run-off and drainage management plan;
- Noise and vibration management to prevent nuisance (demolition & construction);
- Landscape management;
- Soil management plan
- Management of contaminated land and assessment of risk for same by suitably qualified, trained and licenced personnel;
- Management of demolition of all structures and assessment of risks for same;
- Stockpiles;
- Project procedures & method statements for:
    - Site clearance, site investigations, excavations and working with asbestos containing materials (ACMS);
    - Management and removal of ACMs;
    - Demolition & removal of buildings, services, pipelines (including risk assessment and disposal);
    - Diversion of services;
    - Excavation;
    - Piling;
    - Construction of pipelines;
    - Temporary hoarding & lighting;
    - Disposal of surplus geological material (peat, soils, rock etc.);
    - Protection of watercourses from contamination and silting during construction;
- Site Compounds.
    - Temporary car parks for staff and site workers
    - Material processing areas / Material storage areas / plant storage

The production of the CEMP will also detail areas of concern with regard to Health and Safety and any environmental issues that require attention during the construction phase. Adoption of good management practices on site during the construction and operation phases will also contribute to reducing environmental impacts.

The CEMP has been appended (Appendix E). This is a preliminary document, which will be updated and finalised by the successful Contractor. Appended to the CEMP are the following constituent plans, also to be finalised by the Contractor:

- **Appendix C:** Environmental Operating Plan (EOP)
- **Appendix D:** Incident Response Plan (IRP)

Each of these plans is discussed in the following sections. The obligation to develop, maintain and implement the CEMP and all of the above-listed plans will form part of the contract documents for the construction phase.

Environmental Operating Plan

The EOP is a document that outlines procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of developments. Essentially the EOP is a project management tool. It is prepared, developed and updated by the Contractor during the construction stage and will be limited to setting out the detailed procedures by which the mitigation measures proposed as part of this NIS and the Planning Report and NIS and arising out of Wexford County Council's decision (if approving the proposed development) will be achieved. The EOP will not give rise to any reduction of mitigation measures or measures to protect the environment.

Before any works commence on site, the Contractor will be required to prepare an Environmental Operating Plan (EOP) in accordance with the TII *Guidelines for the Creation and Maintenance of an Environmental Operating Plan*. The EOP will set out the Contractors approach to managing environmental issues associated with the construction of the road and provide a documented account to the implementation of the environmental commitments set out in the EIAR and measures stipulated in the planning conditions. Details within the plan will include, as a minimum:

- All environmental commitments and mitigation stipulated in the planning documentation in respect of the proposed development, including sediment controls and other measures to ensure that water quality in the River Barrow is not degraded.
- Any requirements of statutory bodies such as the NPWS and IFI, including adherence to *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016).
- A detailed Biosecurity Protocol.
- A list of all applicable legislative requirements in relation to environmental protection and a method of documenting compliance with these requirements.
- Outline methods by which construction activities will be managed in such a manner as to avoid, reduce or remedy potential negative impacts on the environment.

To oversee the implementation of the EOP, the Contractors will be required to appoint a person to ensure that the mitigation measures included in this NIS and the Planning Report, the EOP and the statutory approvals are executed in the construction of the works and to monitor that those mitigation measures employed are functioning properly.

Incident Response Plan

The Incident Response Plan (IRP) describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts during the construction stage of the proposed development are prompt, efficient, and appropriate to particular circumstances.

The Contractor will finalise the IRP prior to the commencement of the proposed works to include the following information, at a minimum:

- Contact names and telephone numbers for the local authority, i.e., Wexford County Council (all sections and departments), An Garda Síochána and ambulance and fire services; and,
- Method statements for weather forecasting and continuous monitoring of water levels in the River Barrow. The plan must outline how the Contractor will respond

to forecasted flood events, including but not limited to, details of removal of site materials, fuels, tools, vehicles and persons from flood zones.

- The measures to be taken to avoid or reduce the incident risk potential;
- Reference to the method statement and management plans for construction activities, insofar as they are relevant for the purposes of mitigating against health and safety and pollution incidents;
- Procedures to be adopted to contain, limit and mitigate any adverse effects, as far as reasonably practicable, in the event of a health and safety or pollution incident;
- Persons responsible for dealing with incidents and their contact details;
- Procedures for alerting key staff, appropriate emergency services, authorities, the Employer's Representative and clean-up companies, where required, and contact details of same;
- Procedures for notifying relevant statutory bodies, environmental regulatory bodies, local authorities and local water and sewer providers of pollution incidents, where required, and contact details of same;
- Standby / rota systems; and
- The types and location of emergency response equipment available and appropriate personal protective equipment to be worn.

An IRP has been appended to the CEMP (i.e., Appendix D of Appendix D). The document in its current form will be finalised by the successful Contractor prior to the commencement of the construction phase of the proposed development.

Implementation of the EOP

It will be a condition of the Contract for the construction of the proposed development that the successful Contractor fully implement the EOP throughout the works. To oversee the implementation of the EOP, the Contractor will be required to appoint a responsible Site Environmental Manager (SEM) to ensure that the environmental commitments (as described above) and the EOP are fully executed for the duration of works, and to monitor whether the mitigation measures employed are functioning properly (i.e., are effectively addressing the environmental impact(s) which they were prescribed for).

5.3.2 Site Environmental Manager

To ensure the successful development, implementation and maintenance of the EOP, the Contractor will appoint an independent Site Environmental Manager (SEM). He/she must possess training, experience and knowledge appropriate to the role, including a National Framework of Qualifications (NFQ) Level 8 qualification (or equivalent) or other acceptable qualification in environmental science, environmental management, hydrology or engineering. The principal functions of the SEM will be to ensure that the mitigation prescribed in this NIS, the Planning Report, the EOP and the CEMP, is fully and properly implemented and to monitor the construction stage from an environmental perspective. The SEM will also provide independently verifiable audit reports.

Separate from the on-going and detailed monitoring carried out by the Contractor as part of the EOP, the SEM will carry out the inspection and monitoring described below on behalf of NRDO. The results will be stored in the SEM's monitoring file and will be available for inspection or audit by NRDO, the NPWS or IFI.

- Daily reporting on weather and flood forecasting and daily reporting on the monitoring of peak water levels in the River Barrow.
- Weekly inspections of the principal control measures described in the CEMP and reporting of findings to the Contractor.
- Daily inspections of surface water treatment measures.
- Daily inspections of all outfalls to watercourses.
- Daily visual inspections of watercourse to which there are discharges from the works and those in the vicinity of construction works.
- Weekly inspections of wheel-wash facilities.
- Daily monitoring of any stockpiles.
- Auditing at least six times per quarter of the Contractor's EOP monitoring results.

5.4 Residual Effects

5.4.1 Annex I Estuaries and Mudflats

Following the inclusion of the mitigation measures in Section 5.2 above, the probability of impacts on water quality arising from the construction of the proposed development are very low and the significance of any such impacts, if they were to occur, would be slight to imperceptible. The probability and significance of any such impacts arising from the operation of the proposed development are lower still. Thus, it can be concluded beyond reasonable scientific doubt that any residual impacts on water quality arising from the proposed development will not constitute adverse effects on any of the Annex I habitats.

It is considered that the mitigation prescribed in Section 5.2 and the implementation and compliance measures prescribed in Section 5.3 will reduce all negative impacts on Annex I habitats, apart from habitat loss, to imperceptible levels. The maximum loss of "Estuaries" and "Mudflats and sandflats not covered by seawater at low tide" within the River Barrow and River Nore SAC is *c.* 82 m^2 and *c.* 32 m^2 respectively. This loss of habitat will not significantly affect the overall structure and function of these habitats within the SAC and will be accurately quantified in order to inform the NPWS's Article 17 reporting.

Therefore, given the full and proper implementation of the mitigation prescribed in this NIS, it can be concluded beyond all reasonable scientific doubt that construction and operation of the proposed development will not adversely affect the integrity of either the River Barrow and River Nore SAC, in view of the Conservation Objectives for 'Estuaries' and 'Mudflats and sandflats not covered by seawater at low tide'.

5.4.2 Fish Species

Following the inclusion of the mitigation measures in Section 5.2 above, the probability of impacts on water quality arising from the construction of the proposed development are very low and the significance of any such impacts, if they were to occur, would be slight to imperceptible. The probability and significance of any such impacts arising from the operation of the proposed development are lower still. Thus, it can be concluded beyond reasonable scientific doubt that any residual impacts on water quality arising from the proposed development will not constitute adverse effects on fish species.

The mitigation prescribed in Section 5.2 above in respect of hydroacoustic impacts will ensure that any residual hydroacoustic impacts on Sea Lamprey, River Lamprey, Twaite Shad, Atlantic Salmon and other fish species are slight to imperceptible and

temporary. Therefore, it can be concluded that these residual impacts do not constitute adverse effects on these species.

Any residual impacts of artificial lighting arising from the proposed during the construction stage will occur over a small extent and minimal duration. During the operational phase of the proposed development, disturbance from artificial lighting will be ongoing, however there will be no net-deterioration in terms of light spill onto the River Barrow. Owing to the mitigation prescribed, these impacts are characterised as an imperceptible impact on the movement of nocturnal species, i.e., Sea Lamprey, River Lamprey and Atlantic Salmon, and a slight to imperceptible impact of increased predation risk on juvenile Twaite Shad. Therefore, it can be concluded that these residual impacts will not constitute adverse effects on these species.

Therefore, given the full and proper implementation of the mitigation prescribed in this NIS, it can be concluded beyond all reasonable scientific doubt that construction and operation of the proposed development will not adversely affect the integrity of the River Barrow and River Nore SAC, in view of their Conservation Objectives for Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon.

5.4.3 European Otter

As stated in Sections 5.2.2 and 5.2.3 above, the mitigation prescribed in relation to the impacts of piling noise and artificial light on fish species are considered more than adequate to address disturbance impacts on European Otter. Thus, it can be concluded that any residual impacts of disturbance to otters do not constitute adverse effects on this species.

Similarly, as explained in Section 4.2.6 above, the impact of the proposed development on fish biomass available to otters was treated as a potentially significant impact on this species. However, as the residual impacts on fish species have been shown to be slight to imperceptible, it can now be concluded that there will not be a significant reduction in the fish biomass available to otters. Thus, any residual impact in terms of fish biomass will not constitute an adverse effect on this species.

Therefore, given the full and proper implementation of the mitigation prescribed in this NIS, it can be concluded beyond all reasonable scientific doubt that the construction and operation of the proposed development will not adversely affect the integrity of either the River Barrow and River Nore SAC, in view of their Conservation Objectives for European Otter.

6. IN-COMBINATION EFFECTS

6.1 Introduction

Article 6(3) of the Habitats Directive requires that AA be carried out in respect of plans and projects that are likely to have significant effects on European sites, "either individually or in combination with other plans or projects". Therefore, the combined effects of the plan or project under assessment and other past, present or foreseeable future plans or projects must also be examined, analysed and evaluated.

6.2 Methodology

A geographical boundary of 1km was selected for the assessment of in-combination effects. This comprises a viable study area with reasonable potential for cumulative impacts whilst excluding those areas which are non-viable because of issues such as topography and distance.

In-combination or cumulative effects result from incremental changes caused by other past, present or reasonably foreseeable projects together with the proposed widening works at O'Hanrahan Bridge. Such effects were assessed by examining previous plans and projects, current plans and projects in planning and proposed future plans and projects 1 km of the proposed development from 2018 to the present. There is too much uncertainty associated with proposals beyond 5 years into the future and this NIS must be based on data that is readily available. The assessment in this NIS has considered in-combination effects that are:

(a) Likely;

(b) Significant; and,

(c) Relating to a future event which is reasonably foreseeable.

The following data sources have been consulted to identify the plans and projects within the 1 km boundary:

- Proposed developments and developments that have been granted planning permission within the preceding five years in the immediate vicinity of the proposed development, as recorded in the Wexford County Council Planning Portal and Kilkenny County Council Planning Portal (checked on 9th of December 2022);
- An Bord Pleanála Website;
- Projects listed on the EIA Portal;
- Wexford County Development Plan 2022-2028;
- New Ross Town and Environs Development Plan 2011-2017 (extended).

6.3 Assessment of Effects

Table 6-1 below details the assessment of the likelihood of significant effects arising from the proposed development in combination with other plans or projects. This assessment was undertaken in view of the Conservation Objectives of the relevant European sites and found that, given the implementation of the mitigation measures in Section 5 of this NIS, the proposed development does not have the potential to significantly affect any European site in combination with other plans or projects.

Table 6-1 Assessment of adverse effects arising from the proposed development in combination with other plans or projects.

Existing Project/ Plan	Description of project/ plan	Likely In-combination Effects
Draft Wexford County Development Plan (2022-2028)	The Draft Wexford County Development Plan 2022-2028 will be adopted by Wexford County Council which outlines the intentions for the future development of land, including measures for the improvement of the natural and physical environment and the provision of infrastructure. The Plan builds on the strategies, policies and objectives of the previous County Development Plan 2013-2019. The core strategies of the plan include: • To support and develop our town and villages and rural heritage sites for tourism purposes through the facilitation of links by public transport. • To plan for the appropriate development of all aspects of the transport network for all modes and to ensure that the design and investment decisions prioritise sustainable transport modes. • To encourage walking and cycling by all sections of the community through: o Promoting walking and cycling as sustainable transport modes and healthy recreation activities throughout the County; o Promoting cycling and pedestrian friendly development layouts, provide facilities at public transport nodes, towns and villages, plan for and make provision for the integration of cyclist and pedestrian needs when considering new development proposals; o Promoting cycling and walking facilities as integral to the provision of vehicular traffic facilities; o Supporting the installation of infrastructure measures (for example new/wider pavements, road crossings and cycle parking facilities), retrofitted, if necessary, which facilitates and encourages safe walking and cycling; • To promote sustainable outdoor recreation in the form of walking and cycling and exploit the recreational and tourist potential of walking and cycling routes in the County whilst ensuring the protection of the environment. A Natura Impact Report was produced for this plan, concluding that "*It has been objectively concluded […] following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted impacts associated with the draft plan, that the draft plan will not adversely affect (either directly or indirectly) the integrity of any European site, either alone or in combination with other plans or projects*."	This is a high-level strategic plan which sets out policies and objectives. Considering the nature of the plan and the conclusion of its biodiversity assessment and that any future projects stemming from the plan will be subjected to their own AA, if necessary, there is no potential for adverse effects on any European site in combination with the proposed development.

Existing Project/ Plan	Description of project/ plan	Likely In-combination Effects
New Ross Town and Environs Development Plan 2011-2017 (as extended)	The New Ross Town and Environs Development Plan 2011-2017 (as extended) was adopted by New Ross Town Council in order to develop and improve in a sustainable manner the social, economic, cultural and environmental assets of the town and environs. The plan's objectives are as follows: • Develop a pedestrian and cycle friendly environment which will achieve a reduction in CO2 emissions. • Encourage a modal shift from private modes of transport to cycling and walking. • To provide for and encourage high levels of access and good quality pedestrian facilities to connect neighbourhood centres to their surrounding neighbourshoods. Facilities for cycling shall also be provided. • To improve cycling facilities in the town to enable New Ross to be linked to the National Cycle Network. • To improve the attractiveness of the riverside area in accordance with the New Ross Urban Design Waterfront Study 2006 and to carry out other environmental improvements to the town centre The New Ross Urban Design Waterfront Study 2006 seeks to develop a woodland walk in this area which would be connected to the town centre by a linear walkway/boardwalk along the riverfront. • To facilitate the continued enhancement of the quayside and riverfront areas in accordance with the New Ross Urban Design Waterfront Study 2006 adopted by New Ross Town Council, subject to the findings of an Appropriate Assessment in compliance with Article 6 of the Habitats Directive, where appropriate. An Appropriate Assessment was carried out for this plan, which concluded that "*once the mitigation measures […] have been incorporated into the Draft Plan, no significant negative effects on the River Barrow and River Nore SAC are likely to arise as a result of the implementation of the New Ross Town and Environs Development Plan 2011-2017*."	This is a high-level strategic plan which sets out policies and objectives. Considering the nature of the plan and the conclusion of its biodiversity assessment and that any future projects stemming from the plan will be subjected to their own AA, if necessary, there is no potential for adverse effects on any European site in combination with the proposed development.
South East Greenway, New Ross to Waterford (Planning Refs: 19928) **Distance: 40m west from the proposed development**	The South East Greenway is being jointly developed by Kilkenny County Council, Wexford County Council and Waterford City and County Council. The greenway will run for 24km from the Quays in Waterford to the banks of River Barrow in New Ross, ending in Rosbercon. The development is currently under construction and is projected to be completed in Autumn 2023. The proposed development of widening of O'Hanrahan Bridge will provide pedestrian and cyclist connection to and from the South East Greenway across the River Barrow. A Part 8 report, Environmental Impact Assessment Screening report, Appropriate Assessment Screening report, and a Ecological Impact Assessment (EcIA) have been developed for this project. The Appropriate Assessment Screening Report concluded that '*in view of best scientific knowledge and in view of the Conservation Objectives of the Lower River Suir SAC and the River Barrow and River Nore SAC, that the construction and operation of the proposed Greenway, either on its own or in combination with other plans or projects, would not be likely to give rise to significant effects on the Qualifying Interests of either of those sites or any other European site for nature conservation*.'	Considering the nature, scale and location of the greenway, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.

Existing Project/ Plan	Description of project/ plan	Likely In-combination Effects
Shielbaggan OETC, Ramsgrange, New Ross **(WCC Planning Ref: 20191427)** **Distance: 160m north west of the proposed development**	Planning permission was granted for the project on 29/11/2019 with 4 no. conditions. The development will involve demolition of the existing boat club and construction of a new 2 storey boat club (70 sq. m.). The boat club will comprise boat storage, changing rooms, plant room, kitchen and ancillary accommodation. Additionally, the development includes parking and alterations to existing road junction, as well as a 28m diameter roundabout adjacent to the building. The Planner Report identified that an Appropriate Assessment screening accompanied the Planning Application. The Appropriate Assessment screening exersise concluded that '*the development would not have a significant effect either individually or in combination with other plans or projects on the conservation objectives of the River Barrow and River Nore SAC.'*	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.
Five-storey development (WCC Planning Ref: 20190473) **Distance: 35m west from the proposed development**	Planning permission was granted on 23/05/2019 for a development comprising the erection of a five-storey development comprising 97 apartments and ancillary accommodation in 4 blocks, shop units, takeaway restaurant, an office and a 125-space car park. The floor area of the new development is 28 sq. m. This development is located on the Rosbercon side of the River Barrow by the Rosbercon Quay. It was determined that Appriopriate Assessment was not required.	Considering the nature, scale and location of the development, as well as the fact that AA was not required, there will be no adverse effects in combination with the proposed development.
Construction of a Berthing Facility, The Quay, New Ross (WCC Planning Ref: LAC2003) **Distance: 300m south of the Project**	Application was registered on 15/09/2020 for a development comprising a new berth with the following specifications: four 508 x 16mm steel tubular piles 30m long driven into the river bed each to secure an 18m-long pre-fabricated pontoon, 4m wide and 800mm freeboard, four 10t mooring bollards, GRP mesh decking and 200 x 200mm rubber 'D' fendering. The pontoon is proposed to be connected to the quayside by a 25-32m long and 1.5m wide galvanised steel gangway. The preferred location is the eastern bank of the river and three locations are considered: Town Quay, between Town Quay and Dunbrody, and Graves Jetty. An Appripriate Assessment Screening Report was submitted with the planning application. The report concluded that *'the project is not likely to have a significant effect, either individually or in combination with other plans, on any of the qualifying interests, structure, function, integrity, conservation objectives or long-term survival of any Natura 2000 sites.'* Additionally, it was determined that *'no part of any Natura 2000 site will be fundamentally and irreversibly compromised as a result of the advancement of the project*.'	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.

Existing Project/ Plan	Description of project/ plan	Likely In-combination Effects
Mountelliot Greenway (WCC Planning Ref: LAC1611) **Distance: adjacent to the proposed development**	The development of the disused railway line, railway bridge and railway tunnel extending from Rosbercon, New Ross to Mountelliot as a cycle and pedestrian route. The route will form part of the planned National Greenway network link, connecting Waterford, Wexford, Kilkenny and Carlow to Dublin and beyond. This section also forms part of the looped walk returning to New Ross along the Craywell road/footpath. O'Hanrahan Bridge forms part of the greenway route across the River Barrow. The works will include the following: the clearance of vegetation on the rail line corridor, retaining boundary hedgerows and boundary vegetation; the laying of a 3 metre wide bituminous surface on a crushed stone base to form the cycle and footpath track; repair and upgrade of existing drains; the upgrade and repair of existing bridges so as to accommodate the cycle/pedestrian route; the installation of barriers for the safety of greenway users; stock proof fencing where required; provision of agricultural crossings and security fencing; screen fencing and/or screen planting. An Appropriate Assessment Screening Report accompanied the Planning Application. It concluded that '*subject to the set out conditions, the project is is not likely to have a significant effect on any of the qualifying interests, structure, function, integrity, conservation objectives or long-term survival of the Natura 2000 site'*. The report also determined that subject to the set out conditions, '*no part of the Natura 2000 site will be fundamentally and irreversibly compromised as a result of the advancement of the project*.'	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.
Eddie Mernagh and Pierce Handrick T/A Hanmer Properties (WCC Planning Ref: 20191332) **Distance: 780m east of the Proposed Development**	The development comprises construction of seven ground floor mixed use commercial units, three facing Bosheen road, one large three sided pizza restaurant and take away end unit and three units facing the rear parking area, along with eight terraced dwellings above, along side two number, two storey office/mixed use commercial units. This is, overall, a three storey proposal, all with a landscaped open space terrace between same. Includes all associated site works, external tables and chairs, awnings, waste yards and parking at Verosland, Bosheen Road, New Ross, Co. Wexford. An Appropriate Assessment Screening Report accompanied the Planning Application. It concluded that "*Having regard to the precautionary principle, it is considered that: Significant impacts can be ruled out and stage 2 AA is not required."*	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.

Existing Project/ Plan	Description of project/ plan	Likely In-combination Effects
Renewal works to 38kV overhead line, New Ross (KCC Planning Ref: 15825) **Distance: 520m north of the Proposed Development**	Conditional permission was granted on 31/03/2016 for renewal works to the existing 38kV overhead line spanning the River Barrow to the north of O'Hanrahan Bridge in New Ross, County Wexford. The overhead line runs through the townlands of Rosbercon and Annefield on the west bank of the river and the townlands of Craywell, Ardross and Castlemoyle on the east bank of the river. On the west bank it is proposed to replace two steel towers with one steel tower and one double wooden poleset both of lower height than the existing structures and to replace an existing double wooden poleset with a new double wooden poleset of the same dimensions. On the east bank of the river, it is proposed to replace the existing steel tower with a smaller steel tower and to replace an existing double wooden poleset with a new triple wooden poleset of similar dimensions. It is also proposed to underground the existing overhead line between these two structures by drilling under Mountgarrett Road and running a cable underground between these structures. In total five structures will be replaced as part of the proposed works. The overhead line falls within the administrative areas of County Kilkenny and County Wexford. An Appropriate Assessment Screening Report has been submitted as part of the application. The report concluded that *'no significant impacts on any Natura 2000 site will occur in respect of the development and that a Stage 2 Appropriate Assessment is not required in this instance.'*	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.
Albatross Limited, New Ross (KCC Planning Ref: 17788) **Distance: 860m south west of the Proposed Development**	Conditional permission was granted on 26/03/2018 to demolish all buildings on the Albatross factory site. Building materials will be segregated and steel frames will be removed from site and recycled. Concrete materials will be crushed and retained on site. The Planners Report identified that an Approproate AssessmentScreening excersise was completed for this project and it was concluded that '*no significant environmental impact is likely having regard to the distance of the subject site from any Natura 2000 site*.'	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.
Pallas Foods Unlimited Company (KCC Planning Ref: 21357) **Distance: 935m south west of the Proposed Development**	Conditional permission was granted on 18/10/2021 for (i) proposed change of use of part of the existing site from truck parking (which was granted permission under Planning reg no 94311) to form a Cold Storage Depot, Hard Standing and yard area together with all associated site works and ancillary services, (ii) the proposed installlation of a ESB Substation with Switch Room on site, (iii) the propsed demolition of an existing building on site and (iv) the proposed relocation of the existing Truck Wash Bay area on site. The Planners Report identified that an Appropriate Assessment Screening excersise was completed as part of the planning application, which concluded that '*no significant environmental impact is likely having regard to the development proposed and distance of the subject site from any Natura 2000 site*.'	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.

Existing Project/ Plan	Description of project/ plan	Likely In-combination Effects
St Joseph's Athletics Club, New Ross, Co. Kilkenny (KCC Planning Ref: 21123) **Distance: 1km south west of the Proposed Development**	Conditional permission was granted on 14/12/2021 for development to construct a walking track to perimeter of the grounds with associated street lighting and floodlighting to existing pitches. The project also comprises retention of existing floodlighting with replacement to LED light fittings, and 3 no. storage containers, as well as retention of roadside signpost and placing of new advertisement. An Appropriate Assessment Screening Report has been submitted as part of the application. The report concluded that *'Significant impacts can be ruled out"* and that *"AA is not required".*	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.
Ard Services Limited, New Ross, Co. Wexford (WCC Planning Ref: 20221259) **Distance: 485m south of the Proposed Development**	Permission for development which will consist of (i) car wash, (ii) car wash plant room with water recycling system, (iii) relocation of the launderette unit, (iv) relocation of storage container and (v) all associated structures, drainage and site development works. An Appropriate Assessment Screening Report has been submitted as part of the application. The report concluded that "*Significant impacts can be ruled out and stage 2 AA is not required*".	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.
CBS Secondary School, New Ross, Co. Wexford (WCC Planning Ref: 20221575 **Distance: 435m north of the Proposed Development**	Permission for the construction of a new two storey extension to Block 1 (783.4m^2) including: accommodation of a home economics room, technical graphics room, SET room, 4 no. classrooms and ancillary spaces, alterations to the existing car park, a new access bridge from the car park, alterations to the existing building including demolition of external walls and 4 no. new rooflights, new signage to the east facade of the proposed extension, provision of a 25m^2 array of PV panels to west facing roof of the proposed extension and associated site works. It was determined that Stage 2 AA was not required for this development.	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.

Existing Project/ Plan	Description of project/ plan	Likely In-combination Effects
John F. Kennedy Trust, New Ross, Co. Wexford (WCC Planning Ref: 20220219 **Distance: 295m South of the Proposed Development**	Permission to erect an extension consisting of additional toilet facilities, staff facilities, roof terrace area, stores and offices. An Appropriate Assessment Screening Report has been submitted as part of the application. The report concluded that "Significant impacts can be ruled out and stage 2 AA is not required".	Considering the nature, scale and location of the development, as well as the conclusion of the AA Screening report, there will be no adverse effects in combination with the proposed development.

7. CONCLUSION

This NIS has been prepared in accordance with the relevant provisions of the Habitats Directive, the Habitats Regulations and the Planning and Development Act, as well as the relevant case law and current guidance. It has demonstrated that, in the absence of appropriate mitigation, the proposed widening of O'Hanrahan Bridge, individually or in combination with other plans or projects, would adversely affect the integrity of three European sites, namely the River Barrow and River Nore SAC, the Lower River Suir SAC, and the River Nore SPA. In light of this finding, this NIS has prescribed appropriate mitigation to eliminate or minimise such effects. Any residual effects, either individually or in combination with other plans or projects, have been assessed as not constituting adverse effects on the integrity of any European site. This assessment has been undertaken on the basis of the best scientific knowledge in the field and the Precautionary Principle and no reasonable scientific doubt remains as to the absence of such effects.

It is the considered opinion of ROD, as the author of this NIS, that, in making its AA in respect of the proposed widening of O'Hanrahan Bridge, Wexford County Council, as the Competent Authority in this case, should determine that, given the full and proper implementation of the mitigation prescribed in this NIS, the proposed development, either individually or in combination with other plans or projects, will not adversely affect the integrity of the River Barrow and River Nore SAC, the Lower River Suir SAC, the River Nore SPA or any other European site.

8. REFERENCES

ABP (2022) *An Bord Pleanála Website* <https://www.pleanala.ie/en-ie/home> [Accessed 22/03/2022]. An Bord Pleanála, Dublin.

Andrade, N.O., Quintella, B.R., Ferreira, J., Pinela, S., Póvoa, I. Pedro, S. and Almeida, P.R. (2007) Sea lamprey (*Petromyzon marinus* L.) spawning migration in the Vouga river basin (Portugal): poaching impact, preferential resting sites and spawning grounds. *Hydrobiologia* 582:121-132.

Aquatic Services Unit (2022a) *Benthic Survey. O'Hanrahan Bridge survey New Ross.* Aquatic Services Unit, Cork.

Aquatic Services Unit (2022b) *Benthic Survey. O'Hanrahan Bridge survey New Ross.* Aquatic Services Unit, Cork.

Bailey, M. and Rochford, J. (2006) Otter Survey of Ireland 2004/2005. *Irish Wildlife Manuals* 23. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

BCT (2018) *Bats and artificial lighting in the UK.* Bat Conservation Trust, Ireland.

Brophy, J. T., Perrin, P. M., Penk, M. R., Devaney, F. M. and Leyden, K. J. 2019. Saltmarsh Monitoring Project 2017-2018. *Irish Wildlife Manuals*, No 108. Dublin: National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

BTO (2011) *Bird Atlas 2007 – 2011*. British Trust for Ornithology, The Nunnery, Thetford, Norfolk, United Kingdom.

Caltrans (2020) *Technical Guidance for the Assessment of Hydroacoustic Effects of Pile Driving on Fish.* California Department of Transportation, Sacramento.

Chanin, P. (2003) Ecology of the European Otter. *Conserving Natura 2000 Rivers Ecology Series* 10. English Nature, Peterborough.

CIRIA (2001) *C532 Control of water pollution from construction sites: guidance for consultants and contractors*. Griffin Court,15 Long Lane, London, EC1A9PN, UK

CIRIA (2006) *C648 Control of water pollution from linear construction projects: technical guidance.* Construction Industry Research and Information Association.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). Official Journal of the European Communities, L206/7.

Dawson, H., Quintella, B., Almeida, P., Treble, A. and Jolley, J. (2015) *The Ecology of Larval and Metamorphosing Lampreys.* In: Docker, M. (eds) Lampreys: Biology, Conservation and Control. *Fish & Fisheries Series* 37. Springer, Dordrecht.

DEHLG (2010) *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government, Dublin.

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive). Official Journal of the European Union, L20/7.

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 on establishing a framework for the community action in the field of water policy (Water Framework Directive). Official Journal of the European Union, L327.

Doherty, D., O'Maoiléidigh, N. and McCarthy, T.K. (2004) The Biology, Ecology and Future Conservation of Twaite Shad (*Alosa fallax* Lacépède), Allis Shad (*Alosa* L.) and Killarney Shad (*Alosa fallax killarnensis* Tate Regan) in Ireland. *Biology and Environment: Proceedings of the Royal Irish Academy* 104B(3), 93-102.

EC (2001) *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. Environment Directorate-General of the European Commission.

EC (2007) *Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Clarification of the Concepts of Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence*. Opinion of the European Commission.

EC (2013) *Interpretation Manual of European Union Habitats – EUR28*. Environment Directorate-General of the European Commission.

EC (2018) *Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Commission, Brussels.

EC (2021) *Assessment of plans and Projects in relation to Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. Environment Directorate-General of the European Commission.

Eionet (2018) *Population status and trends at the EU and Member State levels: 2013-2018*. Article 17 Assessments. <http://bd.eionet.europa.eu/article17/> [Accessed: 11/01/2022]. European Topic Centre on Biological Diversity.

EPA (2022) *Unified GIS Application* <https://gis.epa.ie/EPAMaps> [Accessed 27/01/2022]. Environmental Protection Agency, Wexford.

European Communities (Birds and Natural Habitats) Regulations, 2011. SI No. 477/2011.

European Communities (Birds and Natural Habitats) (Amendment) Regulations, 2013. SI No. 499/2013.

European Communities (Birds and Natural Habitats) (Amendment) Regulations, 2015. SI No. 355/2015.

Esteves, E. and Andrade, J.P. (2008) Diel and seasonal distribution patterns of eggs, embryos and larvae of Twaite shad *Alosa fallax* (Lacépède, 1803) in a lowland tidal river. *Acta Oecologica* 34(2):172-185.

Flora (Protection) Order, 2015. *SI No. 356/2015.*

Fossitt, J. (2000) *A Guide to Habitats in Ireland*. The Heritage Council, Kilkenny.

Freyhof, J. and Kottelat, M. (2008) *The IUCN Red List of Threatened Species 2008:* Alosa fallax *e.T904A13092303.* International Union for Conservation of Nature and Natural Resources, Cambridge.

Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coughlan, B., and King, J.J. (2016) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2015.* Inland Fisheries Ireland, Dublin.

Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coghlan, B., and King, J.J. (2017) *National Programme: Habitats Directive and Red Data Book Species Summary Report 2016*. Inland Fisheries Ireland, Dublin.

Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coghlan, B., and King, J.J. (2019) *National Programme: Habitats Directive and Red Data Book Species Summary Report 2017*. Inland Fisheries Ireland, Dublin.

Gallagher, T., O'Gorman, N.M., Rooney, S.M. and King, J.J. (2020) *National Programme: Habitats Directive and Red Data Book Species Summary Report 2018.* Inland Fisheries Ireland, Dublin.

Garcia de Leaniz, C., Forman, W.D., Davies, S. and Thomson, A. (2006) Non-intrusive monitoring of otters (*Lutra lutra*) using infrared technology. *Journal of Zoology* 270(4):577-584.

Gilbert, G., Stanbury, A. and Lewis, L. (2021) Birds of Conservation Concern in Ireland 2020-2026. *Irish Birds* 9:523-544.

GoI (2022) *EIA Portal* <https://www.gov.ie/en/publication/9f9e7-eia-portal/> [Accessed 22/03/2022]. Government of Ireland, Dublin.

Gregory, J. and Clabburn, P. (2003) Avoidance behaviour of *Alosa fallax* to pulsed ultrasound and its potential as a technique for monitoring clupeid spawning migration in a shallow river. *Aquatic Living Resources* 16:313-316.

Haraldstad, T., Kroglund, F., Kristensen, T., Jonsson, B. and Haugen, T.O. (2017) Diel migration pattern of Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*) smolts: an assessment of environmental cues. *Ecology of Freshwater Fish* 26(4):541-551.

Hendry, K. and Cragg-Hine, D. (2003) Ecology of the Atlantic Salmon. *Conserving Natura 2000 Rivers Ecology Series* 7. English Nature, Peterborough.

Hillman, R. (2003) *The Distribution, Biology and Ecology of Shad in South-West England. R&D Technical Report W1-047/TR.* The Environment Agency, Bristol.

Hubley, P.B., Amiro, P.G., Gibson, A.J.F., Lacroix, G.L. and Redden, A.M. (2008) Survival and behaviour of migrating Atlantic salmon (*Salmo salar* L.) kelts in river, estuarine, and coastal habitat. *ICES Journal of Marine Science* 65:1626-1634.

Ibbotson, A.T., Beaumont, W. R. C., Pinder, A., Welton, S. and Ladle, M. (2006) Diel migration patterns of Atlantic salmon smolts with particular reference to the absence of crepuscular migration. *Ecology of Freshwater Fish* 15(4):544-551.

Ibbotson, A.T., Beaumont, W.R.C. and Pinder, A.C. (2011) A size-dependent migration strategy in Atlantic salmon smolts: Small smolts favour nocturnal migration. *Environmental Biology of Fishes* 92(2):151-157.

IFI (2010a) *Biosecurity Protocol for Field Survey Work.* Inland Fisheries Ireland, Dublin.

IFI (2010b) *Sampling Fish for the Water Framework Directive: Barrow, Nore and Suir Estuaries*. Inland Fisheries Ireland, Dublin.

IFI (2011) *Sampling Fish for the Water Framework Directive – Transitional Waters 2010: Barrow, Nore and Suir Estuaries.* Inland Fisheries Ireland, Dublin.

IFI (2012a) *National Programme: Habitats Directive and Red Data Book Fish species. Executive Report 2011. IFI Report Number: IFI/2012/1-4103*. Inland Fisheries Ireland, Dublin.

IFI (2012b) *Sampling Fish for the Water Framework Directive: Summary Report 2012*. Inland Fisheries Ireland, Dublin.

IFI (2016) *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland, Dublin.

IFI (2022a) *Twaite Shad* <https://www.fisheriesireland.ie/fish-species/twaite-shad .html> [Accessed: 28/01/2022]. Inland Fisheries Ireland, Dublin.

IFI (2022b) *Juvenile Shad Monitoring* <https://www.fisheriesireland.ie/Habitats-and-Red-Data-Book/juvenile-shad-monitoring.html> [Accessed: 28/01/2022]. Inland Fisheries Ireland, Dublin.

IFI (2022c) *Adult Shad Monitoring* <https://www.fisheriesireland.ie/Habitats-and-Red-Data-Book/adult-shad-monitoring.html> [Accessed: 28/01/2022]. Inland Fisheries Ireland, Dublin.

Invasive Species Ireland (2022) *Species Accounts: Chinese mitten crab* <https://invasivespeciesireland.com/.../chinese-mitten-crab> [Accessed: 28/01/2022]. Invasive Species Ireland.

JNCC (2015) *Common Standards Monitoring Guidance for Freshwater Fauna – ISSN 1743-8160.* Joint Nature Conservation Committee, Unites Kingdom.

KCC (2022) *Kilkenny County Council Planning Portal* <https://www.eplanning.ie/KilkennyCC/searchexact> [Accessed 22/03/2022]. Kilkenny County Council, Kilkenny.

Kelly, F., Harrison, A., Connor, L., Matson, R., Morrissey, E., Feeney, R., Wogerbauer, C., O'Callaghan, R. and Rocks, K. (2011) *Sampling Fish for the Water Framework Directive – Summary Report 2010*. Inland Fisheries Ireland, Dublin.

King, J.J. and Linnane, S.M. (2004) The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. *Irish Wildlife Manuals 14*. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

King, J.J. and Roche, W.K. (2008) Aspects of anadromous Allis shad (*Alosa* Linnaeus) and Twaite shad (*Alosa fallax* Lacépède) biology in four Irish Special Areas of Conservation (SACs): status, spawning indications and implications for conservation designation. *Hydrobiologia* 602, 145-154.

King, J.J., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D.

(2011) *Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish.* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

Lindberg, D., Leonardsson, K., Landqvist, H., Ferguson, J. (2011) *Atlantic salmon (Salmo salar) migration behaviour and preferences in smolts, spawners and kelts.* Department of Wildlife, Fish, and Environmental Studies. Swedish University of Agricultural Sciences, Umea.

Lucas, M. and Bracken, F. (2010) *Potential impacts of hydroelectric power generation on downstream-moving lampreys at Howsham, Yorkshire Derwent.* School of Biological and Biomedical Sciences, Durham University.

Maitland, P.S. (2003) Ecology of the River, Brook and Sea Lamprey. *Conserving Natura 2000 Rivers Ecology Series* 5. English Nature, Peterborough.

Maitland, P.S. and Hatton-Ellis, T.W. (2003) Ecology of the Allis and Twaite Shad. *Conserving Natura 2000 Rivers Ecology Series* 3. English Nature, Peterborough.

Mason, T. (2020) *Waterford North Quays Development – Hydroacoustic Assessment (Report No. P258R0204).* Subacoustech Environmental Ltd, Southampton.

McCorry, M. and Ryle, T. (2009) *Saltmarsh Monitoring 2007-2008*. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

Mills, D.H. (1989) *Ecology and Management of Atlantic Salmon.* Chapman and Hall, London.

Moore, A., Potter, E.C.E., Milner, N.J. and Bamber, S. (1995) The migratory behaviour of wild Atlantic salmon (*Salmo salar*) smolts in the estuary of the River Conwy, North Wales. *Canadian Journal of Fisheries and Aquatic Sciences* 52:1923-1935.

MOR (2010) *Grattan Quay, Bilberry Road & Quarry Road Improvement Works, Waterford City. Environmental Impact Report.* Report by Malone O'Regan for Waterford City Council.

Moser, M.L., Jackson, A.D., Lucas, M.C. and Mueller, R.P. (2014) Behavior and potential threats to survival of migrating lamprey ammocoetes and macrophthalmia. *Reviews in Fish Biology and Fisheries* 25(1):103-116.

Murphy, D. F. & Eastern Regional Fisheries Board (2003) *Requirements for the protection of fisheries habitat during construction and development works at river sites.* Eastern Regional Fisheries Board, Dublin.

NBDC (2022) *Biodiversity Maps* <https://maps.biodiversityireland.ie> [Accessed 10/01/2022]. National Biodiversity Data Centre, Waterford.

NIEA (2020) *ID Guide: Chinese Mitten Crab.* Northern Ireland Environment Agency.

NPWS (2009) *Threat Response Plan: Otter (2009-2011)*. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2010) *Circular NPW 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities*. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2011a) *Conservation Objectives for the River Barrow and River Nore SAC [002162].* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2011b) *River Barrow and River Nore SAC [002162] Conservation objectives supporting document – woodland habitats* [Version 1]. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2011c) *River Barrow and River Nore SAC [002162] Conservation objectives supporting document – marine habitats* [Version 1]. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2011d) *River Barrow and River Nore SAC [002162] Conservation objectives supporting document – coastal habitats* [Version 1]. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2011e) *Site synopsis for the River Nore SPA* [004233]. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2014) *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters.* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2016) *Site Synopsis for the River Barrow and River Nore SAC* [002162]. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2017) *Conservation Objectives for the Lower River Suir SAC [002137].* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2019a) *The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview.* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2019b) *The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessment.* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2019c) *The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessment.* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2020a) *Natura 2000 Standard Data Form for the River Barrow and River Nore SAC [002162].* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2020b) *Natura 2000 Standard Data Form for the River Nore SPA [004233].* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2022a) *Conservation Objectives for River Nore SPA [004233].* Generic Version. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

NPWS (2022b) *Online Map Viewer* <http://webgis.npws.ie/npwsviewer/> [Accessed 10/01/2022]. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

O'Gorman, N.M., Rooney, S.M., Cierpial, D. and King, J.J. (2015) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2014.* Inland Fisheries Ireland, Dublin.

O'Grady, M.F. (2006) *Channels & Challenges. Enhancing Salmonid Rivers.* Central Fisheries Board, Dublin.

OPR (2021) *Practice Note PN01: Appropriate Assessment Screening for Development Management*. Office of the Planning Regulator, Dublin.

OPW (2006) *Ecological Impact Assessment (EcIA) of the Effects of Statutory Arterial Drainage Maintenance Activities on the Otter (Lutra lutra)*. Office of Public Works, Galway.

OSI (2022) *Geohive map viewer* < https://webapps.geohive.ie/mapviewer/index.html> [Accessed 27/01/2022]. Ordinance Survey Ireland, Dublin.

People Over Wind and Peter Sweetman *v*. Coillte Teoranta [2018] C-323/17.

Planning and Development Act, 2000. *No. 30 of 2000*.

Planning and Development (Amendment) Act, 2002. *No. 32 of 2002*.

Planning and Development (Strategic Infrastructure) Act, 2006. *No. 27 of 2006*.

Planning and Development (Amendment) Act, 2010. *No. 30 of 2010*.

Popper A.N., Hawkins, A.D. and Halvorsen, M.B. (2019) *Anthropogenic Sound and Fishes.* Washington Department of Transportation, Olympia.

Potter, I.C. (1980) Ecology of Larval and Metamorphosing Lampreys. *Canadian Journal of Fisheries and Aquatic Sciences* 37(11):1641-1657.

Quintella, B.R., Póvoa, I. and Almeida, P.R. (2009) Swimming behaviour of upriver migrating sea lamprey assessed by electromyogram telemetry. *Journal of Applied Ichthyology* 25(1):46-54.

Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. and Montgomery, W.I. (2013) National Otter Survey of Ireland 2010/12. *Irish Wildlife Manuals* 76. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

ROD (2018a) *River Suir Sustainable Transport Bridge – Environmental Impact Assessment Report.* Report by Roughan & O'Donovan Consulting Engineers for Waterford City and County Council.

ROD (2018b) *River Suir Sustainable Transport Bridge – Natura Impact Statement.* Report by Roughan & O'Donovan Consulting Engineers for Waterford City and County Council.

ROD (2021) *Waterford Flood Defences West – Natura Impact Statement.* Report by Roughan & O'Donovan Consulting Engineers for Waterford City and County Council.

Rooney, S.M., O'Gorman, N.M., King, J.J. (2013) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2012*. Inland Fisheries Ireland, Dublin.

Rooney, S.M., O'Gorman, N.M., Cierpial, D. and King, J.J. (2014) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2013*. Inland Fisheries Ireland, Dublin.

Rooney, S. and King, J.J. (2015) *A poster on acoustic tracking of twaite shad by the Habitats Directive and Red Data Book Species team presented at the 3rd International Conference on Fish Telemetry (ICFT) in Halifax, Nova Scotia in 2015*. Inland Fisheries Ireland, Dublin.

Rossmore v. An Bord Pleanála [2014] IEHC 557.

Silva, S., Servia, M.J., Vieira-Lanero, R. and Cobo, F. (2013) Downstream migration and hematophagous feeding of newly metamorphosed sea lampreys (*Petromyzon marinus* Linnaeus, 1758). *Hydrobiologia* 700:277-286
.
Smith, I.P. and Smith, G.W. (1997) Tidal and diel timing of river entry by adult Atlantic salmon returning to the Aberdeenshire Dee, Scotland. *Journal of Fish Biology* 50(3):463-474.

Smith, G.F., O'Donoghue, P., O'Hora, K. and Delaney, E. (2011) *Best Practice Guidance for Habitat Survey and Mapping*. The Heritage Council, Kilkenny.

Sweetman & Others *v*. An Bord Pleanála [2013] C-258/11.

Teague, N. and Clough, S.C. (2011) *Investigations into the response of 0+ twaite shad (*Alosa fallax*) to ultrasound and its potential as an entrainment deterrent.* In: Turnpenny, A.W.H. and Horsfield, R.A. (2014) International Fish Screening Techniques. *WIT Transactions on State of the Art in Science and Engineering* 71. WIT Press, Southampton.

Thorpe, J.E., Metcalfe, N.B and Fraser, N.H.C. (1994) *Temperature dependence of switch between nocturnal and diurnal smolt migration in Atlantic salmon.* In: MacKinlay, D.D. (ed.) *High Performance Fish.* International Fish Physiology Symposium, Vancouver, pp. 83-86.

TII (2004) *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*. Transport Infrastructure Ireland, Dublin.

TII (2005) *Guidelines for the Testing and Mitigation of the Wetland Archaeological Heritage for National Road Schemes*. Transport Infrastructure Ireland, Dublin.

TII (2007) *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan*. Transport Infrastructure Ireland, Dublin.

TII (2008a) *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. Transport Infrastructure Ireland, Dublin.

TII (2008b) *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes*. Transport Infrastructure Ireland, Dublin.

TII (2008c) *Ecological Survey Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*. Transport Infrastructure Ireland, Dublin.

TII (2009) *Guidelines for Assessment of Ecological Impacts of National Road Schemes*. Transport Infrastructure Ireland, Dublin.

TII (2011) *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes.* Transport Infrastructure Ireland, Dublin.

TII (2017) *Management of Waste from National Road Construction Projects*. Transport Infrastructure Ireland, Dublin.

TII (2020a) *The Management of Invasive Alien Plant Species on National Roads – Standard*. Transport Infrastructure Ireland, Dublin.

TII (2020b) *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance*. Transport Infrastructure Ireland, Dublin.

TII (2006) *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. Transport Infrastructure Ireland, Dublin.

TII (2007) *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan*. Transport Infrastructure Ireland, Dublin.

TII (2008) *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*. Transport Infrastructure Ireland, Dublin.

Vrieze, L.A., Bergstedt, R.A. and Sorensen, P.W. (2011) Olfactory-mediated stream-finding behavior of migratory adult sea lamprey (*Petromyzon marinus*). *Canadian Journal of Fisheries and Aquatic Sciences* 68(3):523-533.

WCC (2022) *Wexford County Council Planning Portal* <https://www.wexfordcoco.ie/planning/search-planning-applications> [Accessed 22/03/2022]. Wexford County Council, Wexford.

WCC (2022) *Wexford County Development Plan 2022-2028*. Wexford County Council, Wexford.

WCC (2011) *New Ross Town & Environs Development Plan (as extended)*. Wexford County Council, Wexford.

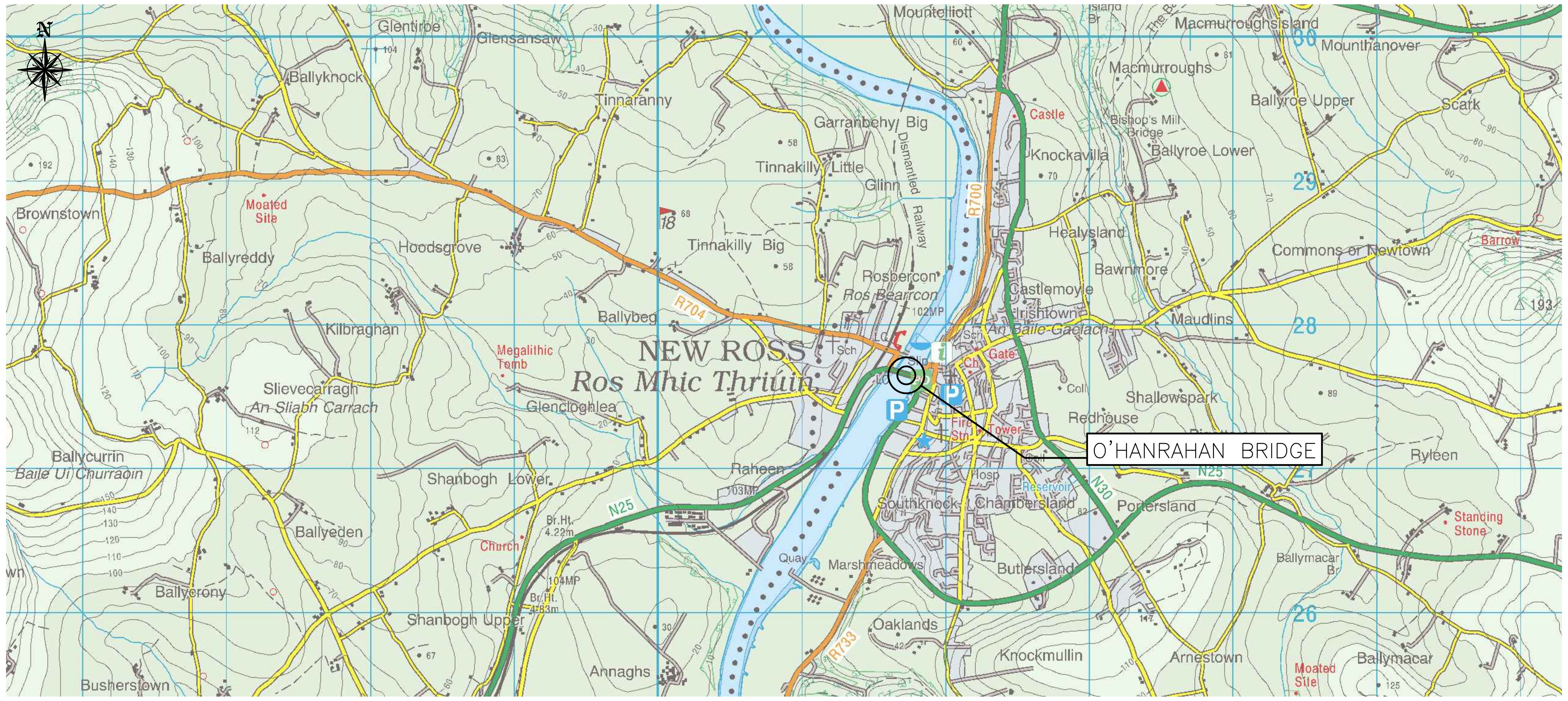
Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. and Wright, M. (2016) *Ireland Red List No. 10: Vascular Plants.* National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

Appendix A
Proposed Development Drawings

O'Hanrahan Bridge Widening
Natura Impact Statement – Appendix A

Drawing Index

Drawing Number	Drawing Title
WBRC-ROD-ENV-S101-DR-CB-30001	Location Plan of Proposed Development
WBRC-ROD-ENV-S101-DR-CB-30002	O'Hanrahan Bridge Southeast Corner - Option 1 Plan and Cross Section
WBRC-ROD-ENV-S101-DR-CB-30003	O'Hanrahan Bridge Southeast Corner - Option 2 Plan and Cross Section
WBRC-ROD-ENV-S101-DR-CB-30004	O'Hanrahan Bridge Southeast Corner - Option 3 Plan and Cross Section
WBRC-ROD-ENV-S101-DR-CB-30005	O'Hanrahan Bridge Widening Southwest Corner - Option 1 Plan and Cross Section
WBRC-ROD-ENV-S101-DR-CB-30006	O'Hanrahan Bridge Widening Southwest Corner - Option 2 Plan and Cross Section
WBRC-ROD-ENV-S101-DR-CB-30007	Proposed O'Hanrahan Bridge Plan & Elevation Sheet 01 of 02
WBRC-ROD-ENV-S101-DR-CB-30008	Proposed O'Hanrahan Bridge Plan & Elevation Sheet 02 of 02
WBRC-ROD-ENV-S101-DR-CB-30009	Proposed O'Hanrahan Bridge Road Cross Sections
WBRC-ROD-ENV-S101-DR-CB-30010	Proposed O'Hanrahan Bridge Deck Cross Sections
WBRC-ROD-ENV-S101-DR-CB-30011	Proposed Lighting Corbel Design
WBRC-ROD-ENV-S101-DR-CB-30012	Geotechnical Investigation Locations
WBRC-ROD-ENV-S101-DR-CB-30013	Remedial Works to Eastern Approach Quay Wall
WBRC-ROD-ENV-S101-DR-CB-30014	Remedial Works to Western Approach Quay Wall
WBRC-ROD-ENV-S101-DR-CB-30015	Proposed Bridge Parapets
WBRC-ROD-ENV-S101-DR-CB-30016	Location of Temporary Construction Compound Area
WBRC-ROD-ENV-S101-DR-CB-30017	Temporary Traffic Management Plan Stage 1 of 5
WBRC-ROD-ENV-S101-DR-CB-30018	Temporary Traffic Management Plan Stage 2 of 5
WBRC-ROD-ENV-S101-DR-CB-30019	Temporary Traffic Management Plan Stage 3 of 5
WBRC-ROD-ENV-S101-DR-CB-30020	Temporary Traffic Management Plan Stage 4 of 5
WBRC-ROD-ENV-S101-DR-CB-30021	Temporary Traffic Management Plan Stage 5 of 5



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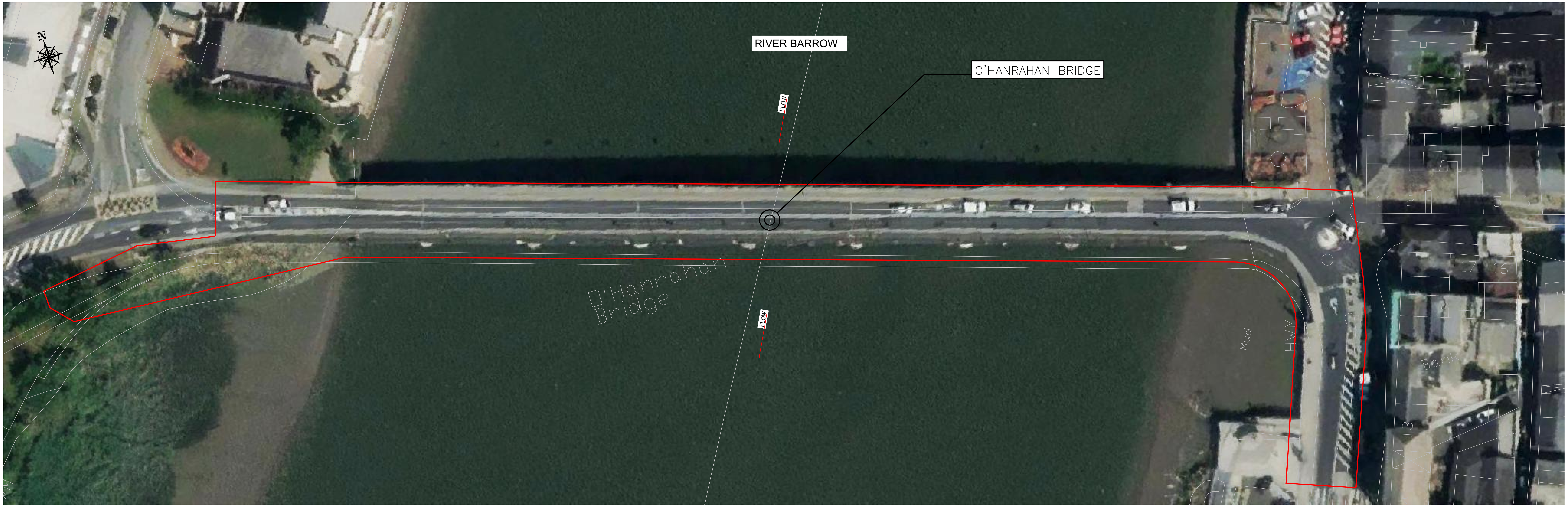

SITE LAYOUT

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A3 SCALE 1:800

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM AT MALIN HEAD.
3. ALL CO-ORDINATES ARE TO IRISH TRANSVERSE MERCATOR.
4. EXTENT OF SITE AREA PROVIDED BY THE EMPLOYER EXCLUDES AREA WHICH MAY BE TEMPORARY OCCUPIED SUBJECT TO TRAFFIC SAFETY AND MANAGEMENT AND DIVERSIONS.
5. THE CONTRACTOR IS REQUIRED TO PROVIDE ACCESS THROUGH THE EXTENT OF SITE AND AREA PROVIDED BY THE EMPLOYER IN ACCORDANCE WITH THE SPECIFICATION.
6. THE EXISTING POSITION AND LEVEL OF SERVICES SHOWN TO BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR SHALL PROVIDE PROTECTION TO EXISTING SERVICES

LEGEND:

DEVELOPMENT BOUNDARY

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Wexford County Council

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Drawn	Designed	Checked	Approved	Suitability Code - Description
ZZX	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Location Plan of Proposed Development

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
	WBRC	ROD	ENV	S101	DR	CB	30001

Scale (A1): As Shown | Date: MAY 2022 | Job No: 21.143 | Rev: P0

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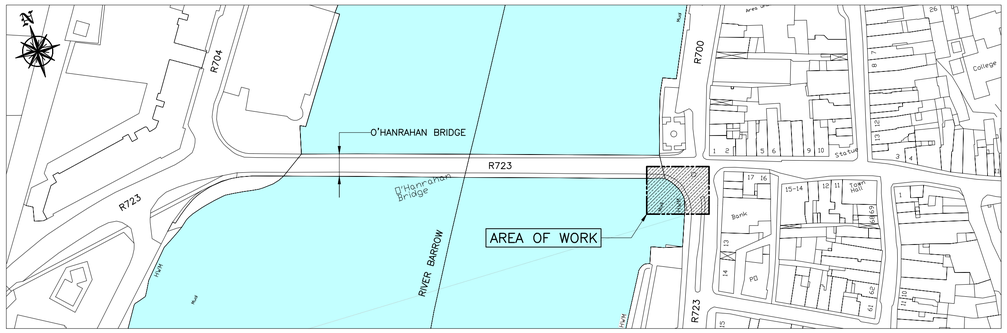

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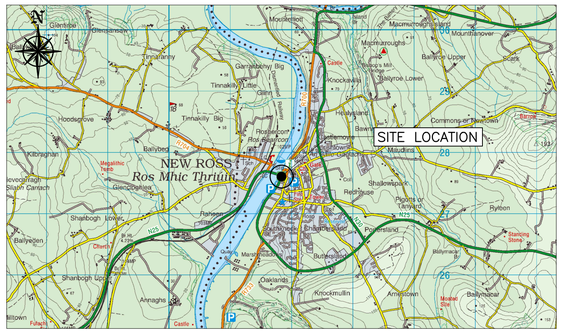

SITE LOCATION

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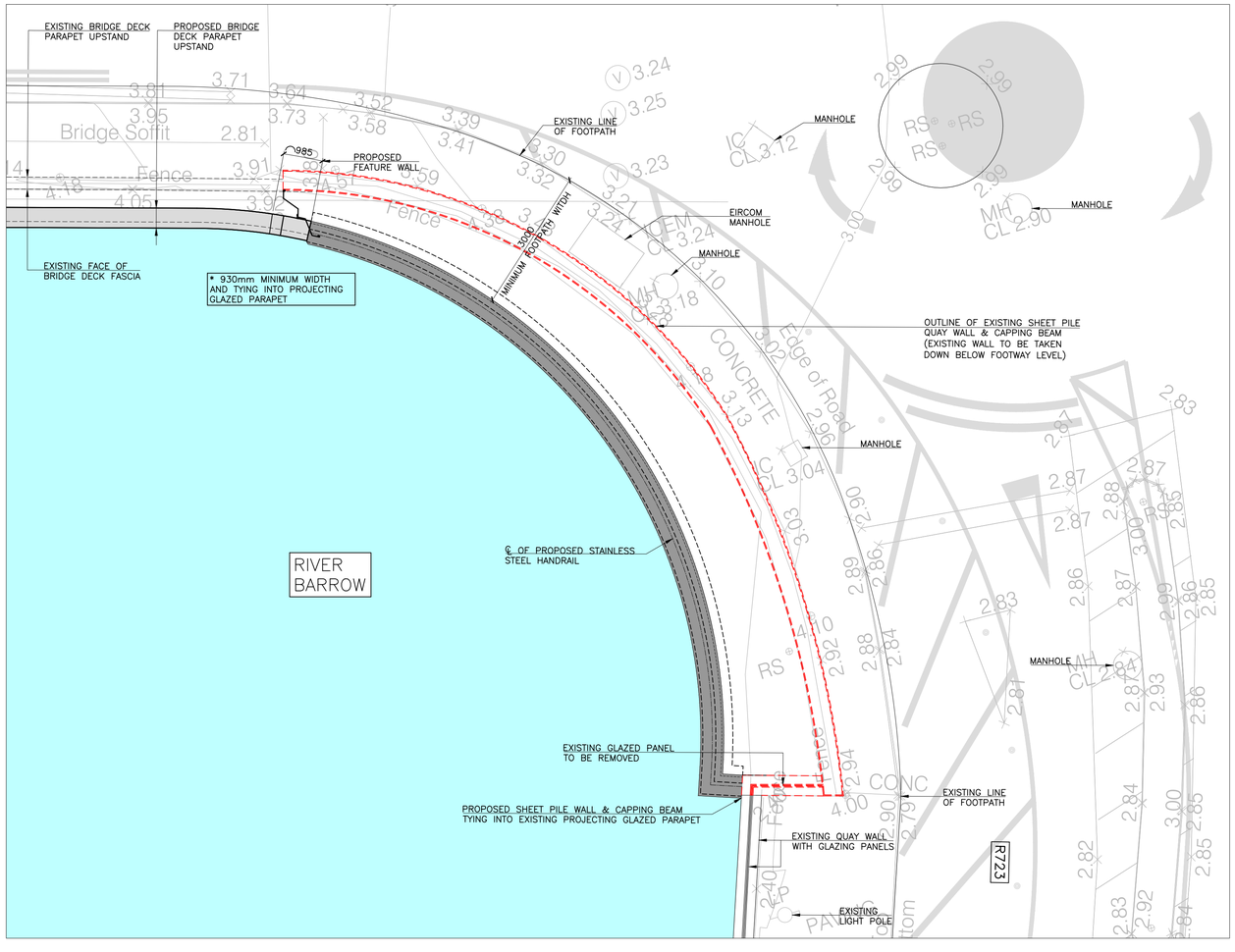
NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM MALIN HEAD.
3. ALL CO-ORDINATES ARE IN METRES TO IRISH TRANSVERSE MERCATOR (ITM).



(OPTION 1) PART PLAN – BRIDGE WIDENING & REMEDIAL WORKS TO QUAY WALL

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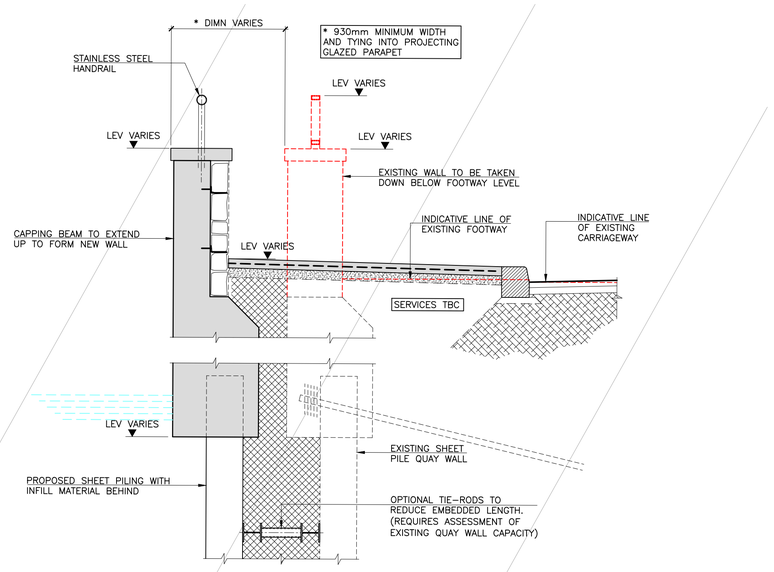

TYPICAL SOUTHEAST QUAY WALL CROSS SECTION

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Drawn	Designed	Checked	Approved	Suitability Code - Description
OB	CH	MR	JK	S4 - Stage Approval

Project Stage	PRELIMINARY
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	O'Hanrahan Bridge Southeast Corner - Option 1 Plan and Cross Section
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number: WBRC - ROD - ENV - S101 - DR - CB - 30002
Scale (A1)	as shown
Date:	MAY 2022
Job No:	19.145
Rev:	P0

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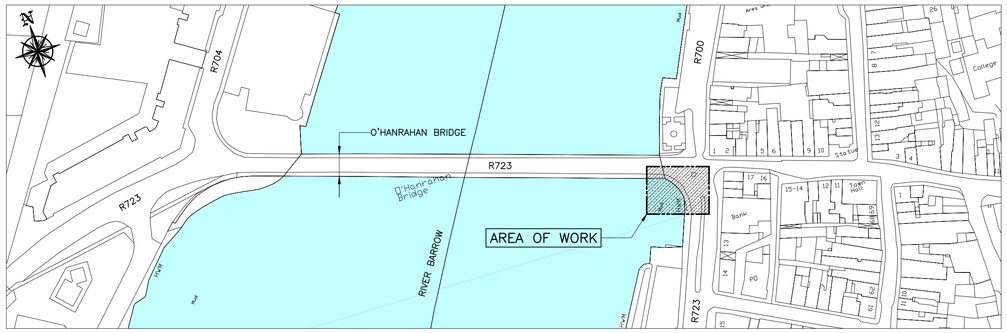

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM MALIN HEAD.
3. ALL CO-ORDINATES ARE IN METRES TO IRISH TRANSVERSE MERCATOR (ITM).

KEYPLAN

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A3 SCALE 1:3000

SITE LOCATION

A1 SCALE 1:50000
A3 SCALE 1:100000

(OPTION 2) PART PLAN – BRIDGE WIDENING & REMEDIAL WORKS TO QUAY WALL

A1 SCALE 1:75
A3 SCALE 1:150

TYPICAL QUAY WALL CROSS SECTION

A1 SCALE 1:25
A3 SCALE 1:50

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Drawn	Designed	Checked	Approved	Suitability Code - Description
OB	CH	MR	JK	S4 - Stage Approval

Project Stage: PRELIMINARY

Project Title: O'Hanrahan Bridge Widening Project

Drawing Title: O'Hanrahan Bridge Southeast Corner - Option 2 Plan and Cross Section

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
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Scale (A1): as shown
Date: MAY 2022
Job No: 19.145
Rev: P0

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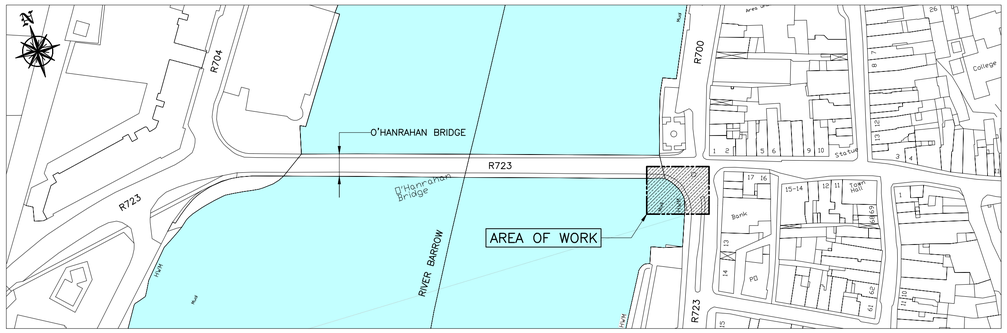

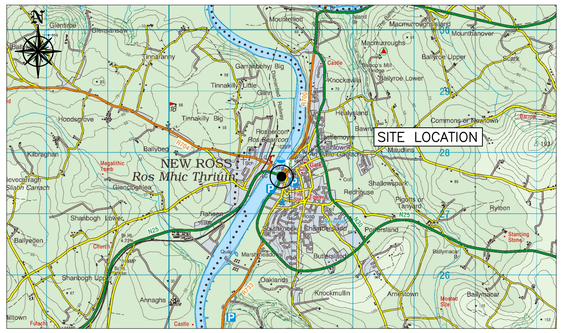

KEYPLAN

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SITE LOCATION

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NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM MALIN HEAD.
3. ALL CO-ORDINATES ARE IN METRES TO IRISH TRANSVERSE MERCATOR (ITM).

(OPTION 3) PART PLAN – BRIDGE WIDENING & REMEDIAL WORKS TO QUAY WALL

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A3 SCALE 1:150

TYPICAL QUAY WALL CROSS SECTION

A1 SCALE 1:25
A3 SCALE 1:50

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Drawn	Designed	Checked	Approved	Suitability Code - Description
OB	CH	MR	JK	S4 - Stage Approval

Project Stage: PRELIMINARY

Project Title: O'Hanrahan Bridge Widening Project

Drawing Title: O'Hanrahan Bridge Southeast Corner - Option 3 Plan and Cross Section

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
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NOTES:

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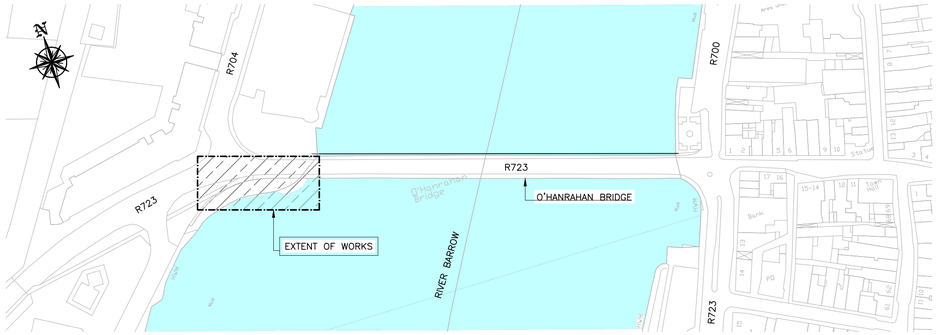

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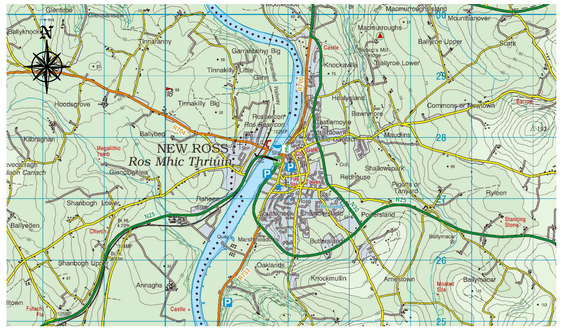

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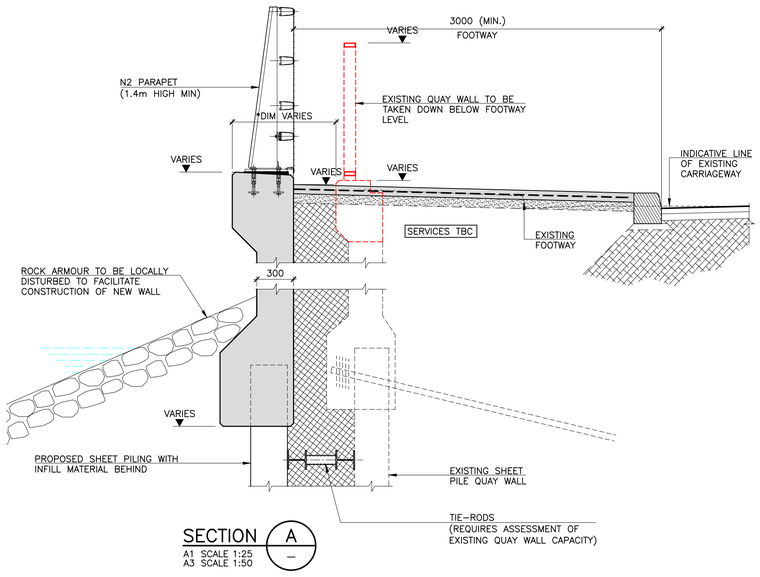

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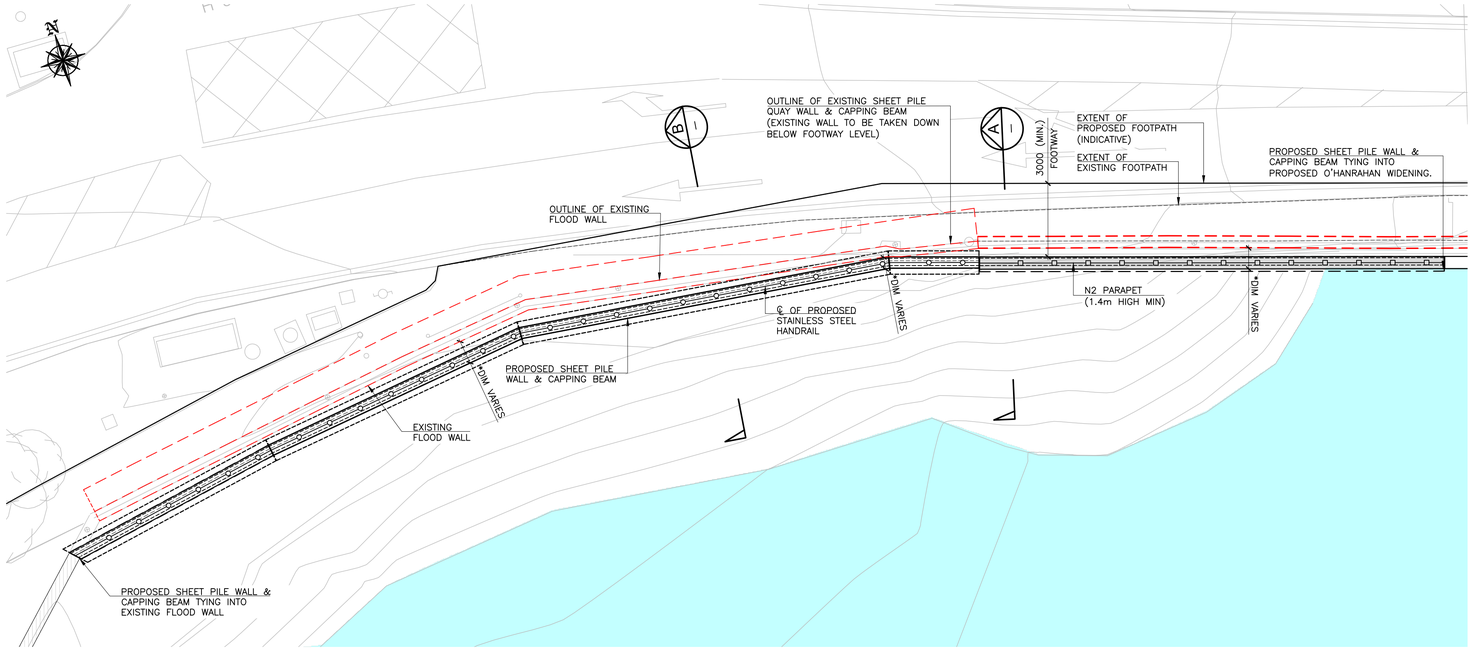

PLAN ON SOUTHWEST CORNER OPTION 1 – BRIDGE WIDENING & REMEDIAL WORKS TO QUAY WALL
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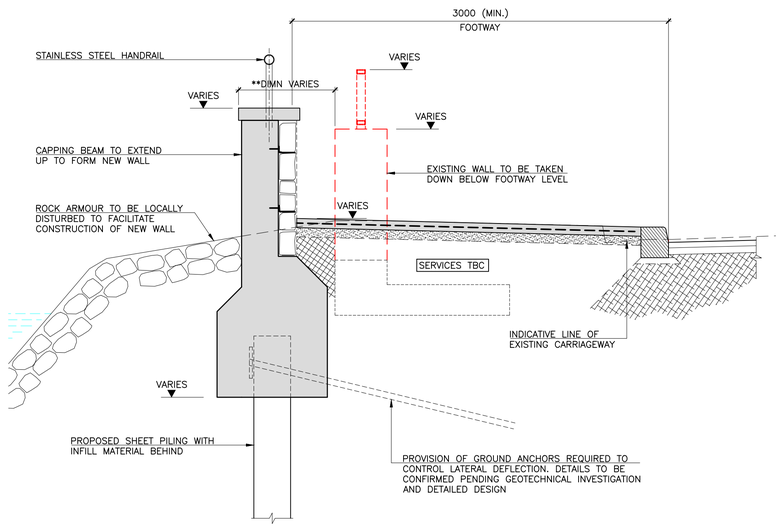

SECTION B
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Drawn	Designed	Checked	Approved	Suitability Code - Description
DS	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	O'Hanrahan Bridge Widening Southwest Corner - Option 1 Plan and Cross Section
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number WBRC - ROD - ENV - S101 - DR - CB - 30005
Scale (A1)	As Shown
Date:	Aug' 2022
Job No:	21.143
Rev:	P0

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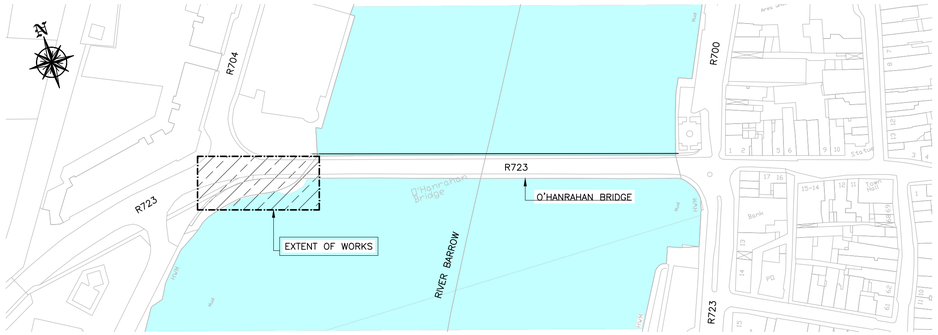
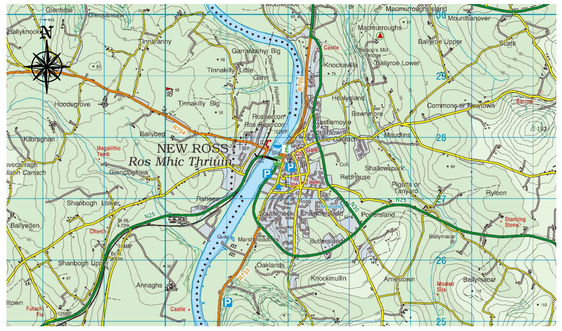
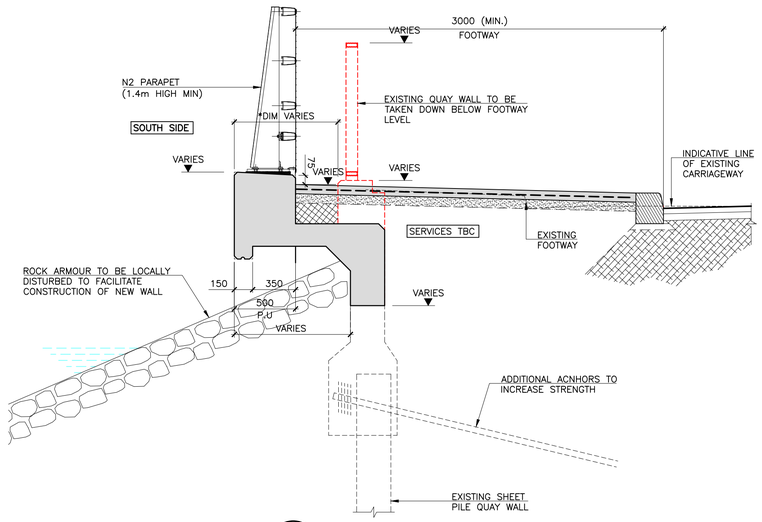
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM MALIN HEAD.
3. ALL CO-ORDINATES ARE IN METRES TO IRISH TRANSVERSE MERCATOR (ITM).



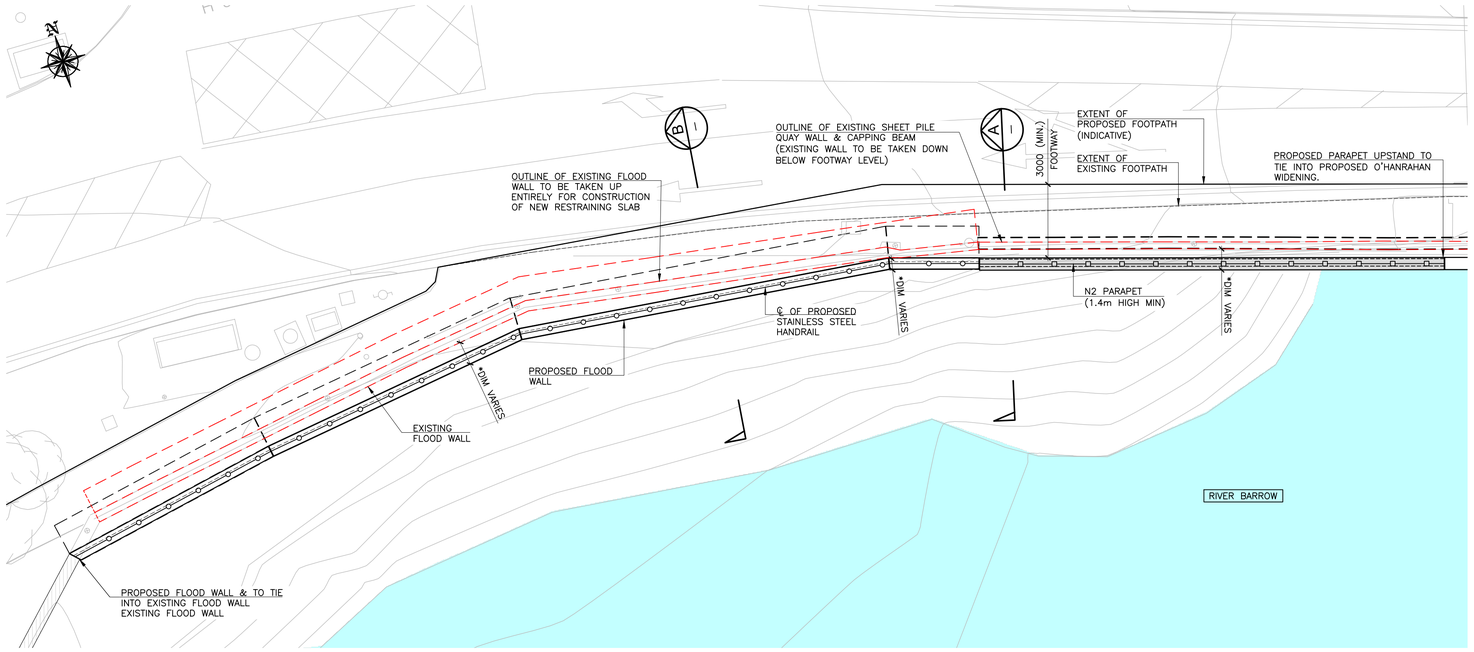
KEY PLAN
A1 SCALE 1:1500
A3 SCALE 1:3000



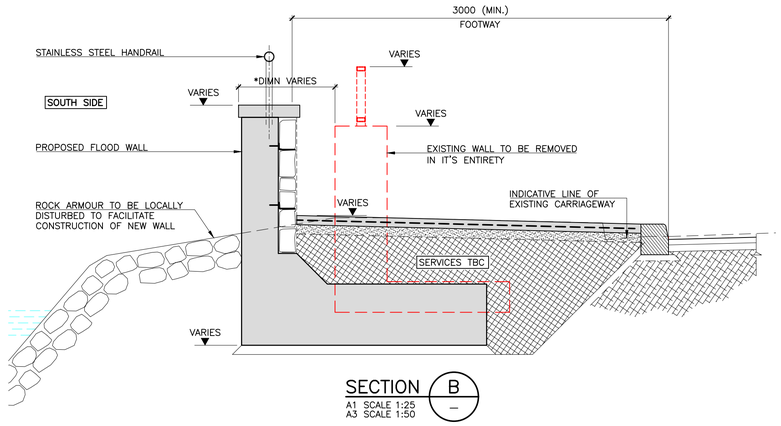
SITE LOCATION
A1 SCALE 1:50000
A3 SCALE 1:100000



SECTION A
A1 SCALE 1:25
A3 SCALE 1:50



PLAN ON SOUTHWEST CORNER OPTION 2 – BRIDGE WIDENING & REMEDIAL WORKS TO QUAY WALL
A1 SCALE 1:125
A3 SCALE 1:250



SECTION B
A1 SCALE 1:25
A3 SCALE 1:50

Comhairle Contae Loch Garman
Wexford County Council

Mianna agus Mianach

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No.	Revision	Date	By	Chk'd	App'd

ROD ROUGHAN & O'DONOVAN
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www.rod.ie

Drawn	Designed	Checked	Approved	Suitability Code - Description
DS	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	O'Hanrahan Bridge Widening Southwest Corner - Option 2 Plan and Cross Section
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number WBRC - ROD - ENV - S101 - DR - CB - 30006
Scale (A1)	As Shown
Date:	Aug' 2022
Job No:	21.143
Rev:	P0

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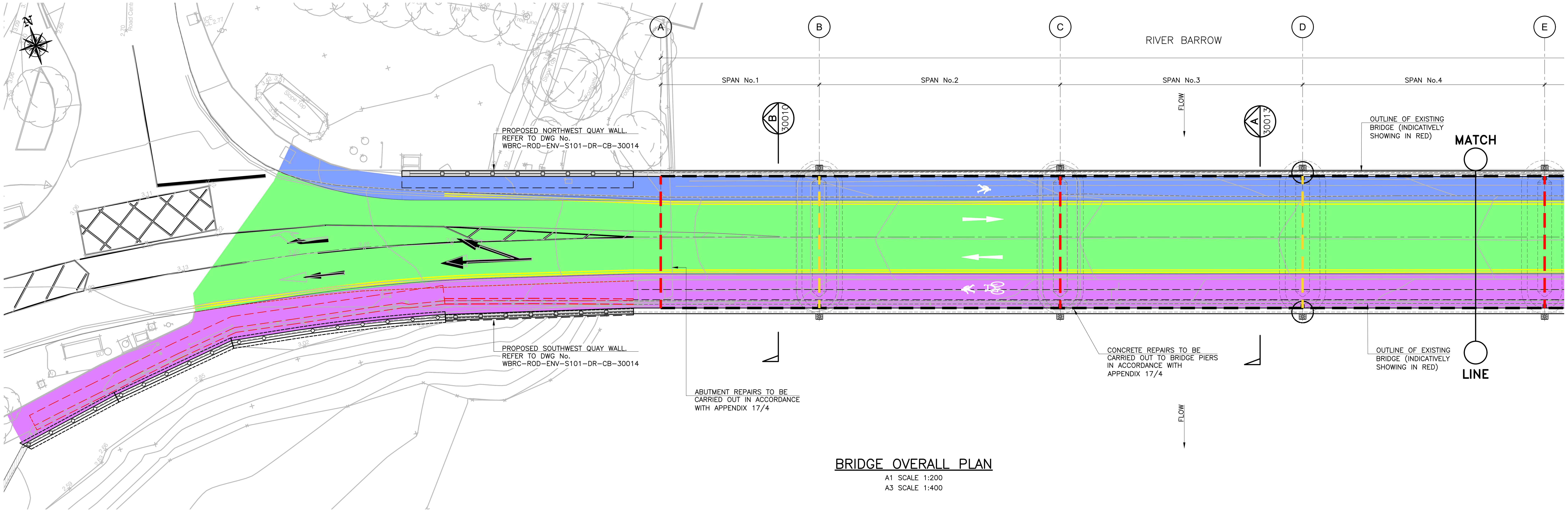
DO NOT SCALE USE FIGURED DIMENSIONS ONLY



BRIDGE OVERALL PLAN

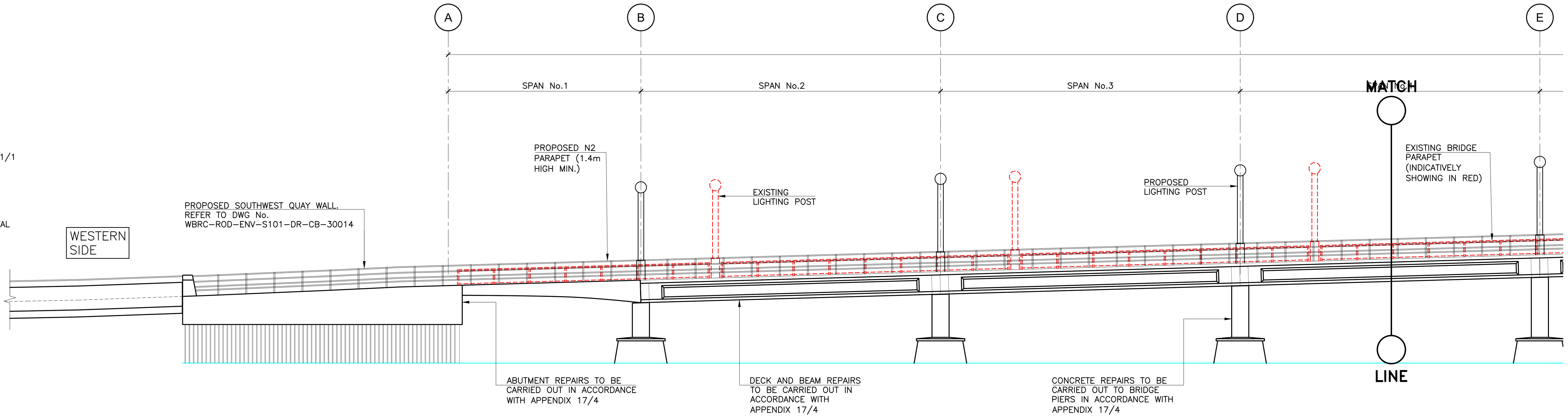
A1 SCALE 1:200
A3 SCALE 1:400

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM MALIN HEAD.
3. ALL CO-ORDINATES ARE IN METRES TO IRISH TRANSVERSE MERCATOR (ITM).
4. WHERE EXISTING BOUNDARY WALLS AND FENCES ARE TO BE TAKEN DOWN TO ALLOW CONSTRUCTION OF PERMANENT WORKS TEMPORARY FENCING TO BE PROVIDED TO PREVENT UNAUTHORIZED ACCESS TO SITE AREA AND PRIVATE LANDS.
5. THE CONTRACTOR IS REQUIRED TO PROVIDE ACCESS THROUGH THE EXTENT OF SITE IN ACCORDANCE WITH THE SPECIFICATION.
6. THE CONTRACTOR SHALL LIAISE WITH THE RELEVANT SERVICE PROVIDERS TO AGREE AND IMPLEMENT PROTECTION MEASURES AND DIVERSIONS.
7. WHERE EXISTING LIGHTING AND SIGNAGE IS TO BE TAKEN DOWN TO ALLOW CONSTRUCTION OF THE PERMANENT WORKS EQUIVALENT TEMPORARY LIGHTING AND SIGNAGE TO BE PROVIDED FOR THE DURATION OF THE WORKS UNTIL PERMANENT LIGHTING AND SIGNAGE IS REINSTATED OR IN PLACE.
8. GAPS IN PARAPET EDGE BEAMS EITHER SIDE OF MOVEMENT JOINTS TO BE REFILLED AND RESEALED IN ACCORDANCE WITH APPENDIX 23/2.
9. ALL FINISHES ON DRAWINGS ARE AS PER TII CORE SPECIFICATION.
10. ALL BURIED SURFACES NOT RECEIVING BRIDGEDECK WATERPROOFING TO BE WATERPROOFED WITH 2 LAYERS OF EPOXY RESIN WATERPROOFING.
11. ALL EXPOSED ARRISES OF STRUCTURAL CONCRETE SHALL BE FINISHED WITH A 25 x 25mm CHAMFER UNLESS NOTED OTHERWISE.
12. REFER TO APPENDIX 17/1 FOR CONCRETE MIXES.
13. EXPOSED CONCRETE TO BE IMPREGNATED WITH HYDROPHOBIC PORELINER IN ACCORDANCE WITH THE SPECIFICATION.
14. CONCRETE CLASS TO BE C40/50 (MIX I).
15. CONCRETE BLINDING TO BE MIX. ST1.
16. COLD MILLING TO BE PROVIDED OVER EXTENT OF NEW PAVEMENT WORKS.
17. ALL SURFACES OF THE PRECAST CONCRETE UNITS THAT INTERFACE WITH IN-SITU CONCRETE SHALL BE PREPARED IN ACCORDANCE WITH CLAUSE 1710.8 (iv) (a) OF THE TII SPW TO ENSURE THAT THE SURFACE FINISH IS CONSIDERED "ROUGH".

LEGEND:

- PROPOSED SURFACING. REFER TO APPENDIX 7/1
- PROPOSED FOOTPATH. REFER TO APPENDIX 11/1
- PROPOSED FOOTPATH/CYCLEWAY. REFER TO APPENDIX 11/1
- EXISTING STRUCTURE
- DENOTES PROPOSED TYPE 1 BURIED JOINT UNDER CONTINUOUS SURFACING. REFER TO APPENDIX 23/1
- DENOTES PROPOSED TYPE 6 ELASTOMERIC JOINT IN METAL RUNNERS. REFER TO APPENDIX 23/1
- DENOTES EXTENT OF PROPOSED WATERPROOFING. REFER TO APPENDIX 20/1
- F– – DENOTES CLASS OF FORMED CONCRETE FINISH
- U– – DENOTES CLASS OF UNFORMED CONCRETE FINISH



BRIDGE ELEVATION

A1 SCALE 1:200
A3 SCALE 1:400

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Wexford County Council

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www.rod.ie

Drawn	Designed	Checked	Approved	Suitability Code - Description
ZZX	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Proposed O'Hanrahan Bridge Plan & Elevation Sheet 01 of 02
Drawing Number	Project WBRC - Originator ROD - Volume ENV - Location S101 - Type DR - Role CB - Number 30007
Scale (A1)	As Shown
Date:	MAY 2022
Job No:	21.143
Rev:	P0

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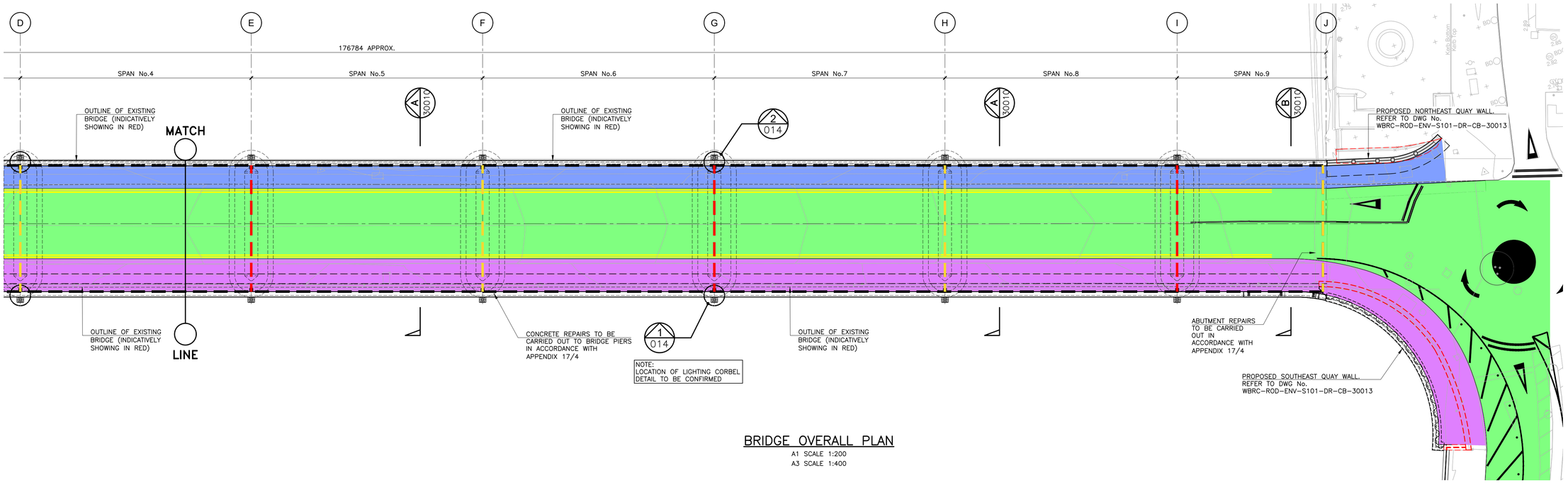
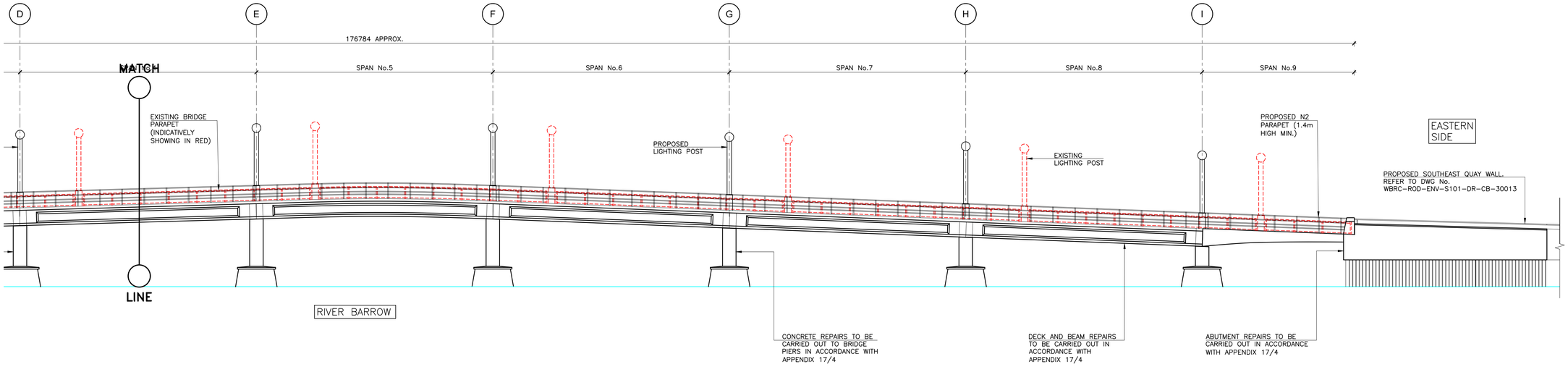
DO NOT SCALE USE FIGURED DIMENSIONS ONLY



BRIDGE OVERALL PLAN

A1 SCALE 1:200
A3 SCALE 1:400



BRIDGE ELEVATION

A1 SCALE 1:200
A3 SCALE 1:400

NOTES:

1. REFER TO DRAWING WBRC-ROD-SBR-S101-DR-CB-30011 FOR GENERAL NOTES.

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Drawn	Designed	Checked	Approved	Suitability Code - Description
ZZX	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Proposed O'Hanrahan Bridge Plan & Elevation Sheet 02 of 02
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number: WBRC - ROD - ENV - S101 - DR - CB - 30008
Scale (A1)	As Shown
Date:	MAY 2022
Job No:	21.143
Rev:	P0

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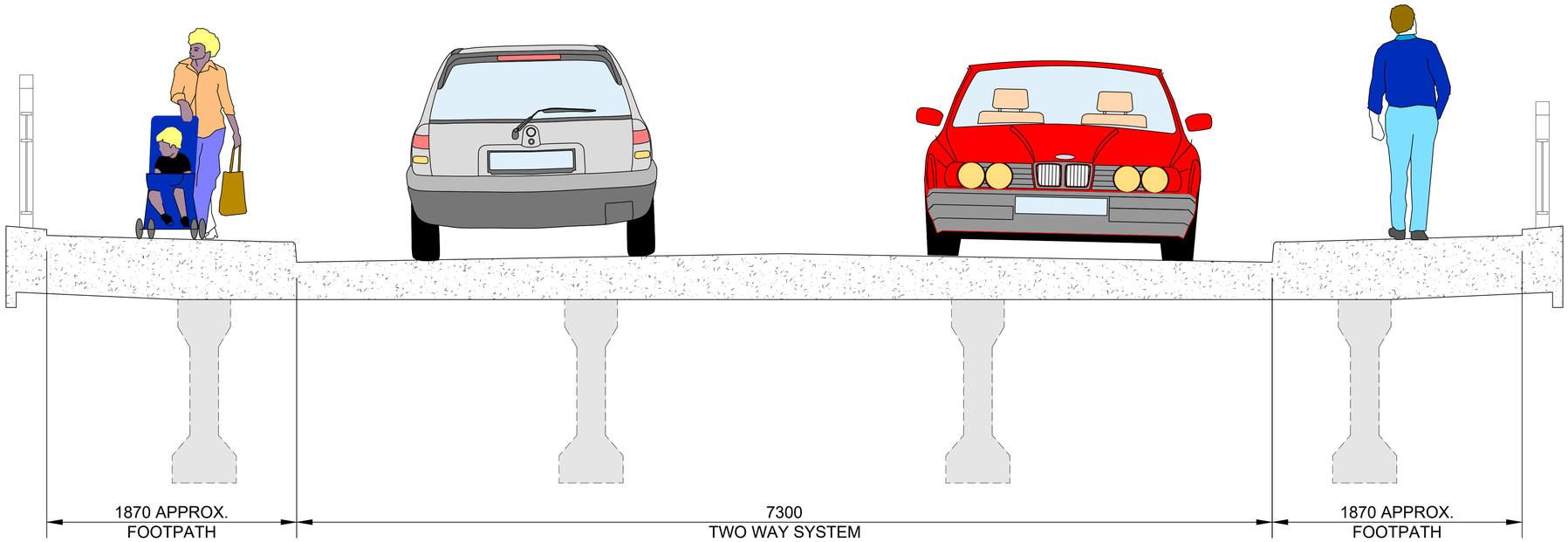
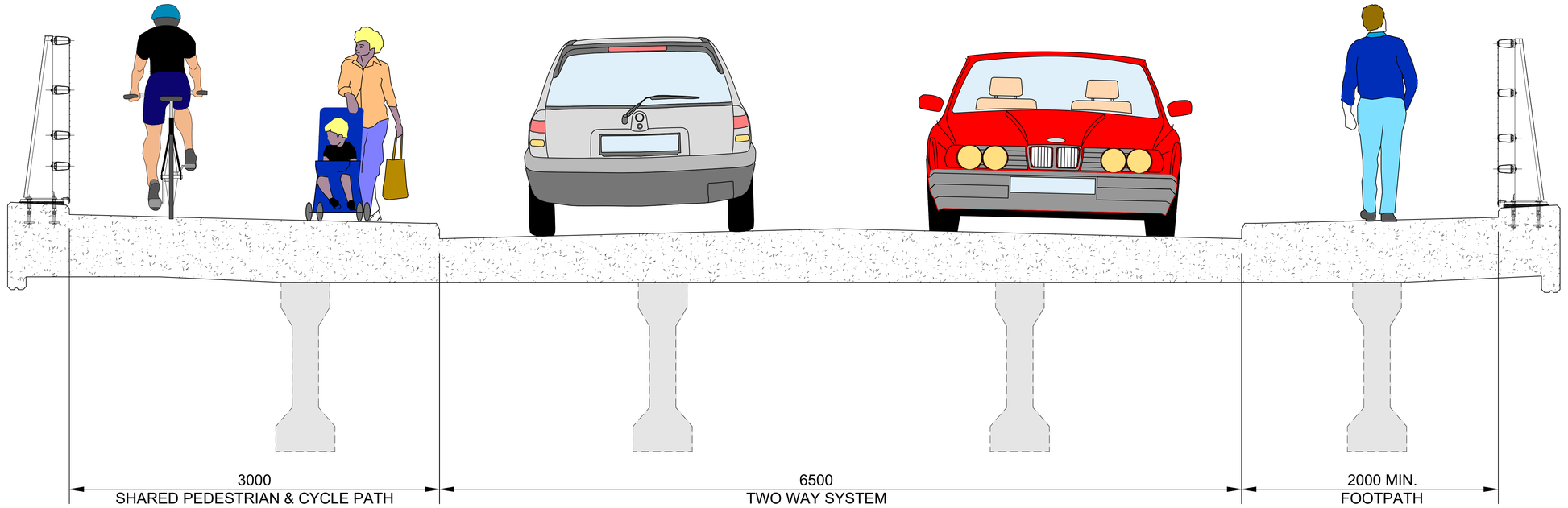
DO NOT SCALE USE FIGURED DIMENSIONS ONLY



TYPICAL EXISTING O'HANRAHAN BRIDGE DECK CROSS SECTION



TYPICAL PROPOSED O'HANRAHAN BRIDGE DECK CROSS SECTION

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.

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Drawn	Designed	Checked	Approved	Suitability Code - Description
ZZX	YB	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Proposed O'Hanrahan Bridge Road Cross Sections
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number: WBRC - ROD - ENV - S101 - DR - CB - 30009
Scale (A1)	As Shown
Date:	MAY 2022
Job No:	21.143
Rev:	P0

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DO NOT SCALE USE FIGURED DIMENSIONS ONLY

SECTION A 30012
A1 SCALE 1:20
A3 SCALE 1:40

SECTION B 30012
A1 SCALE 1:20
A3 SCALE 1:40

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM MALIN HEAD.
3. ALL CO-ORDINATES ARE IN METRES TO IRISH TRANSVERSE MERCATOR (ITM).

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Wexford County Council

Kildare NRO National Roads Office

No.	Revision	Date	By	Chk'd	App'd

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Drawn	Designed	Checked	Approved	Suitability Code - Description
OB	CH	MR	JK	S4 - Stage Approval

Project Stage: Preliminary

Project Title: O'Hanrahan Bridge Widening Project

Drawing Title: Proposed O'Hanrahan Bridge Deck Cross Sections

Drawing Number: Project WBRC - Originator ROD - Volume ENV - Location S101 - Type DR - Role CB - Number 30010

Scale (A1): As Shown | Date: MAY 2022 | Job No: 21.143 | Rev: P0

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

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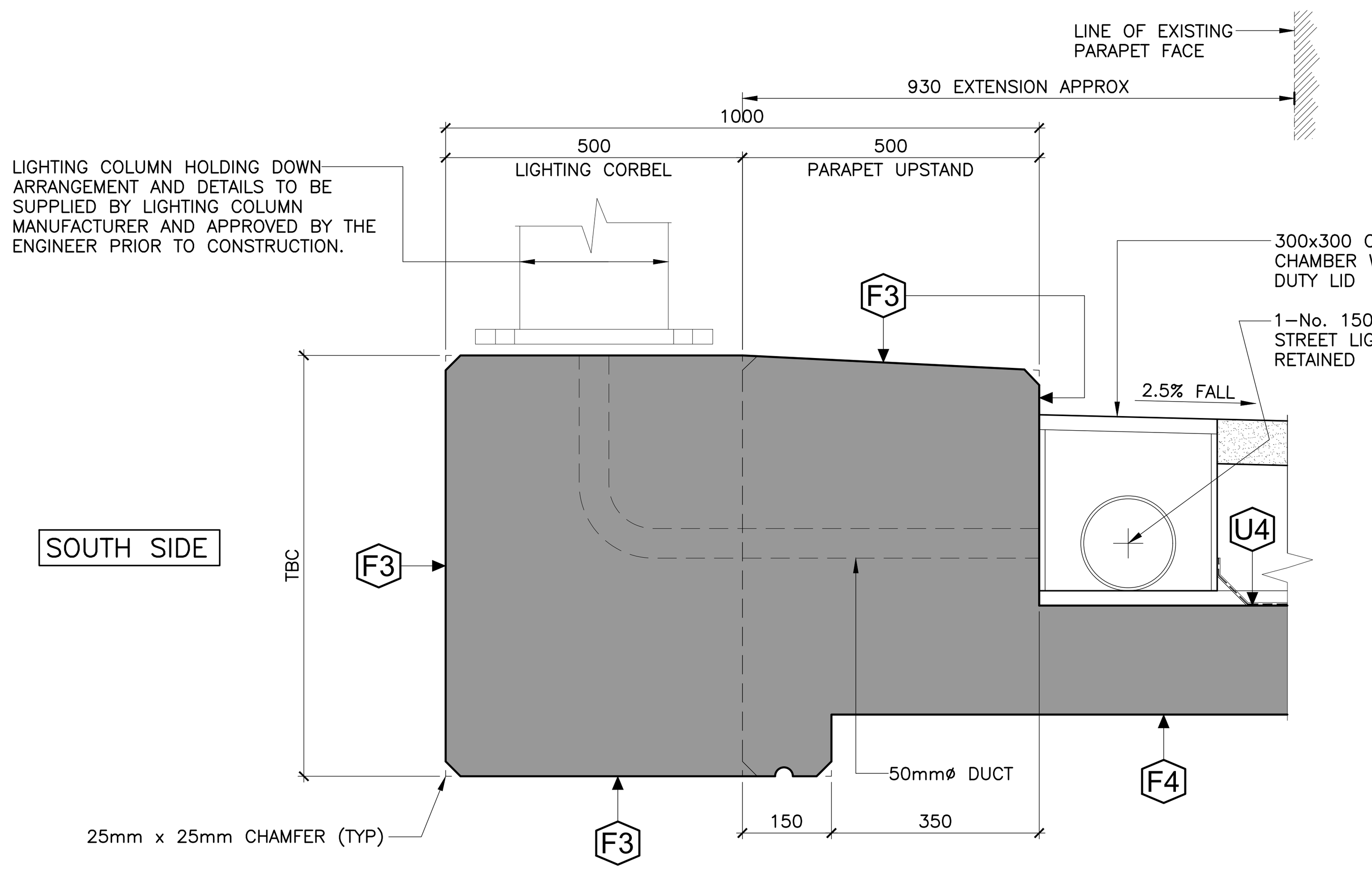
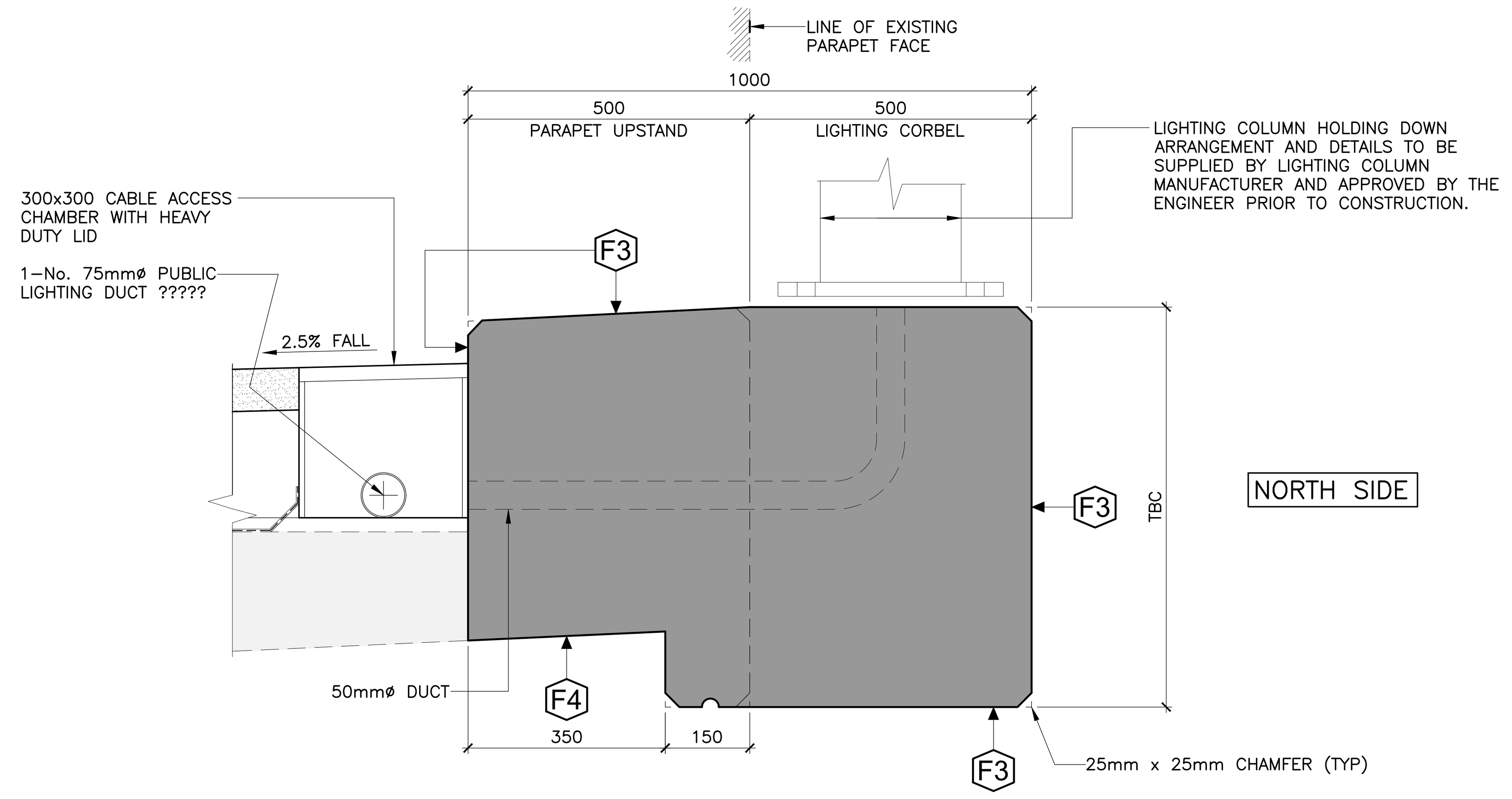
NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM MALIN HEAD.
3. ALL CO-ORDINATES ARE IN METRES TO IRISH TRANSVERSE MERCATOR (ITM).



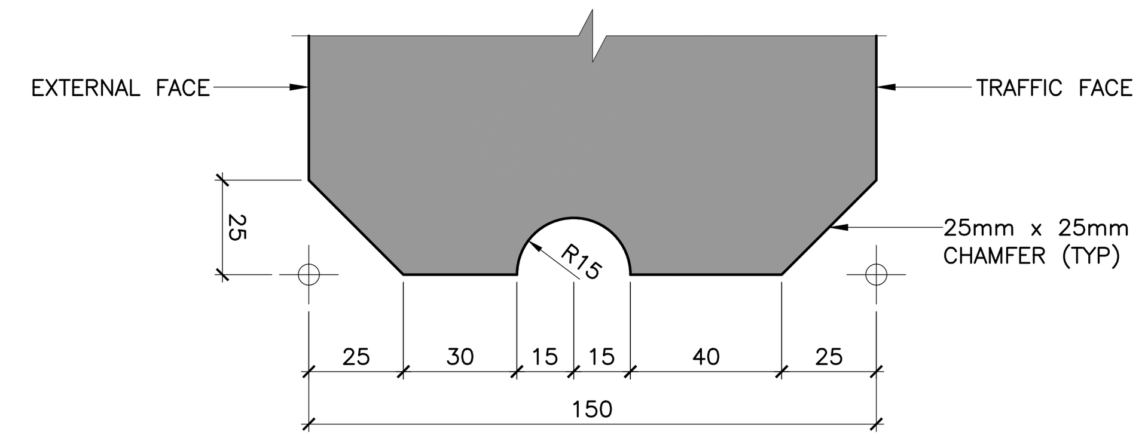
TYP LIGHTING CORBEL CROSS SECTION (SOUTH SIDE)

A1 SCALE 1:10
A3 SCALE 1:20



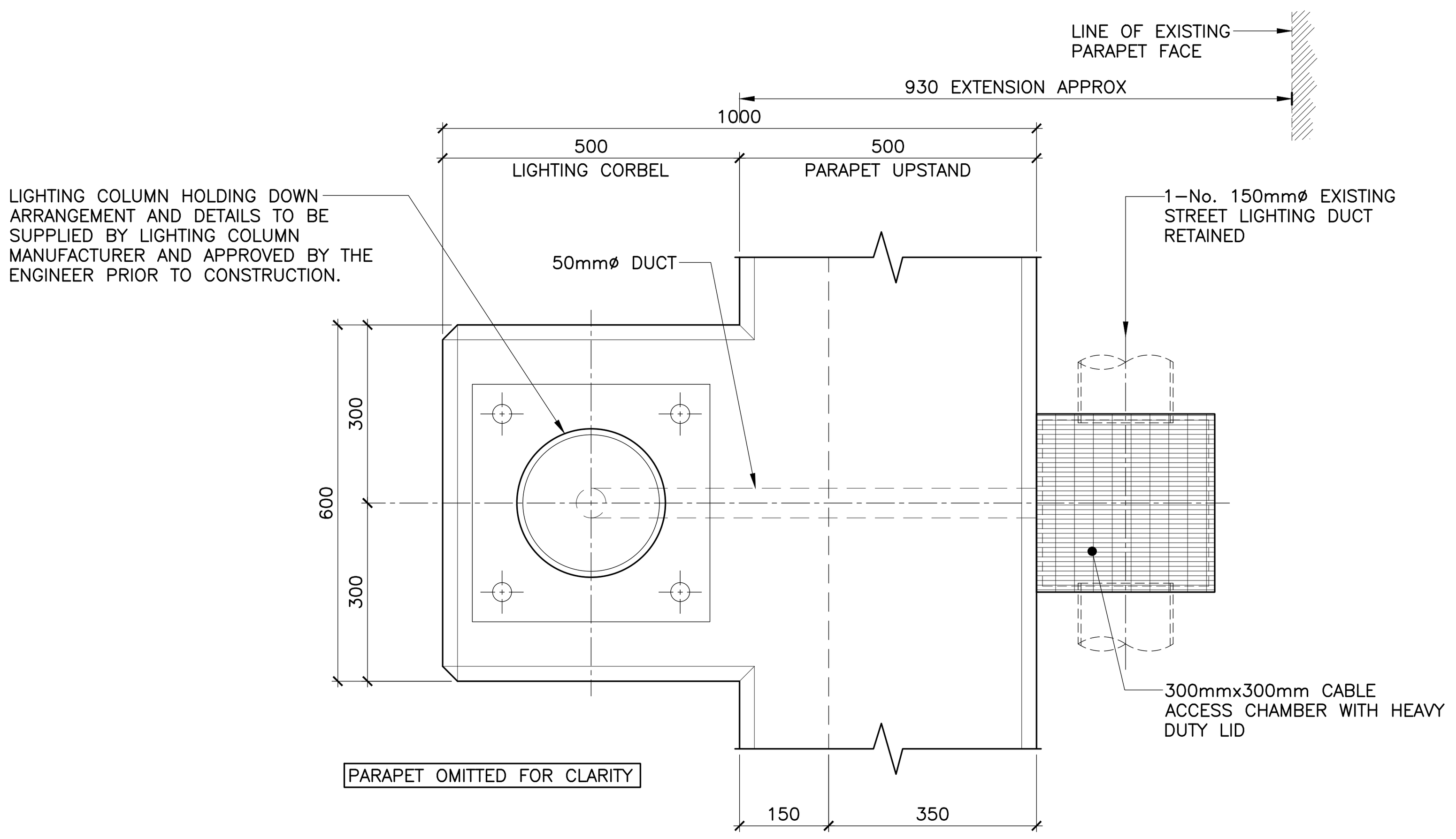
TYP LIGHTING CORBEL CROSS SECTION (NORTH SIDE)

A1 SCALE 1:10
A3 SCALE 1:20



DETAIL 1 / 30013

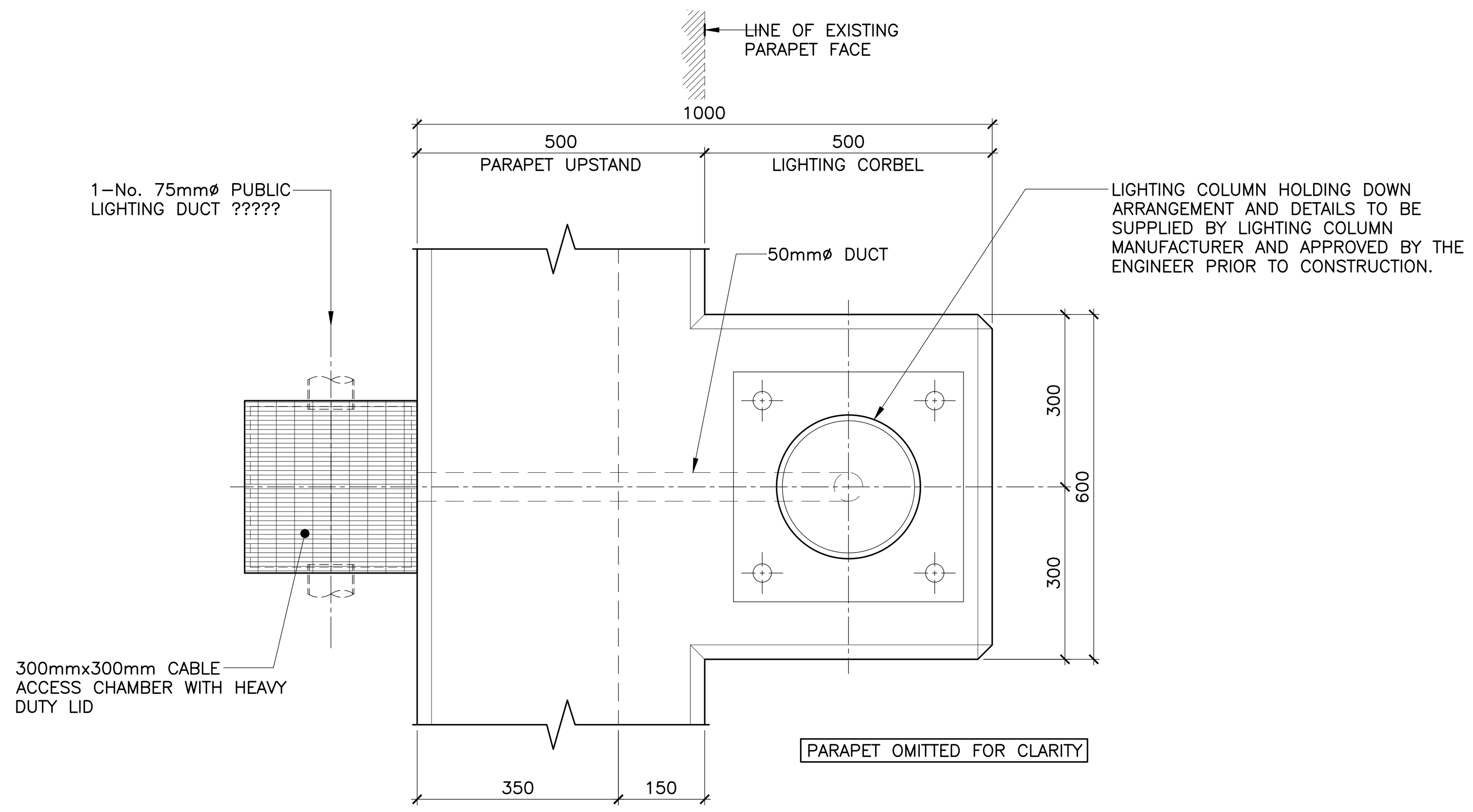
A1 SCALE 1:2
A3 SCALE 1:4



PLAN ON LIGHTING CORBEL (SOUTH SIDE)

DETAIL 1 / 30012

A1 SCALE 1:10
A3 SCALE 1:20



PLAN ON LIGHTING CORBEL (NORTH SIDE)

DETAIL 2 / 30012

A1 SCALE 1:10
A3 SCALE 1:20

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Wexford County Council

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Drawn	Designed	Checked	Approved	Suitability Code - Description
OB	CH	MR	JK	S4 - Stage Approval

Project Stage: Preliminary

Project Title: O'Hanrahan Bridge Widening Project

Drawing Title: Proposed Lighting Corbel Design

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
	WBRC	ROD	ENV	S101	DR	CB	30011

Scale (A1): As Shown | Date: MAY 2022 | Job No: 21.143 | Rev: P0

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

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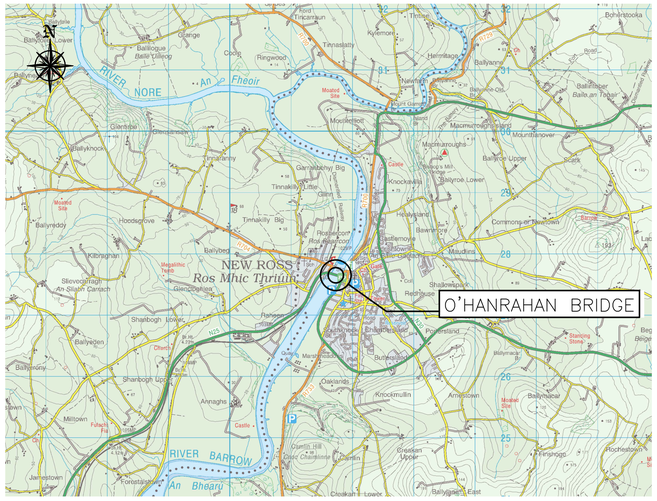
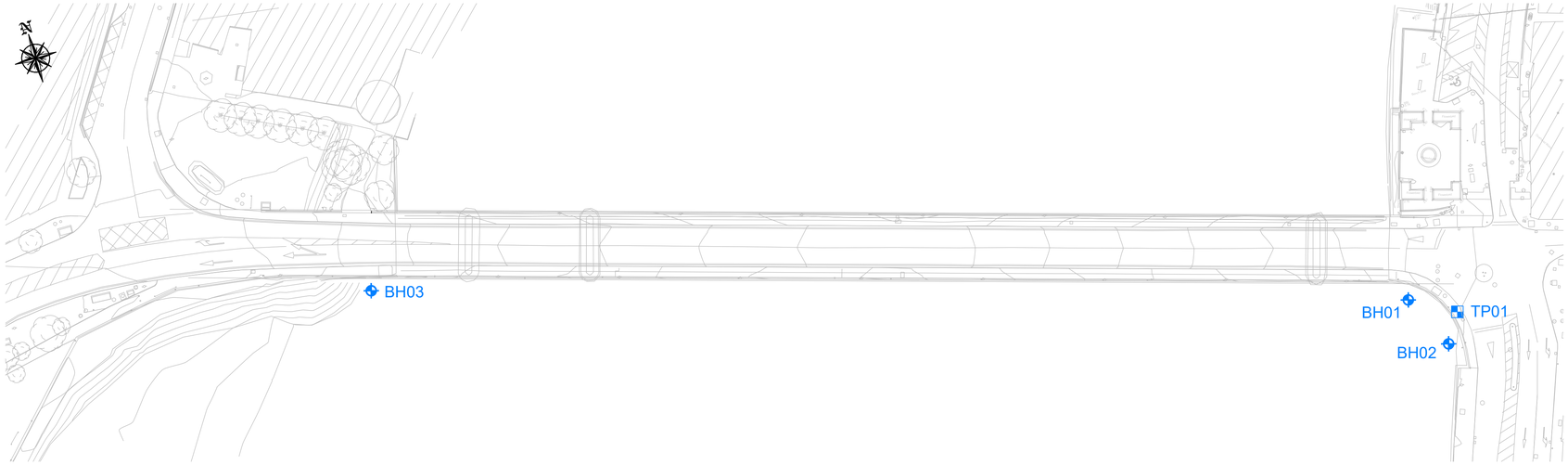
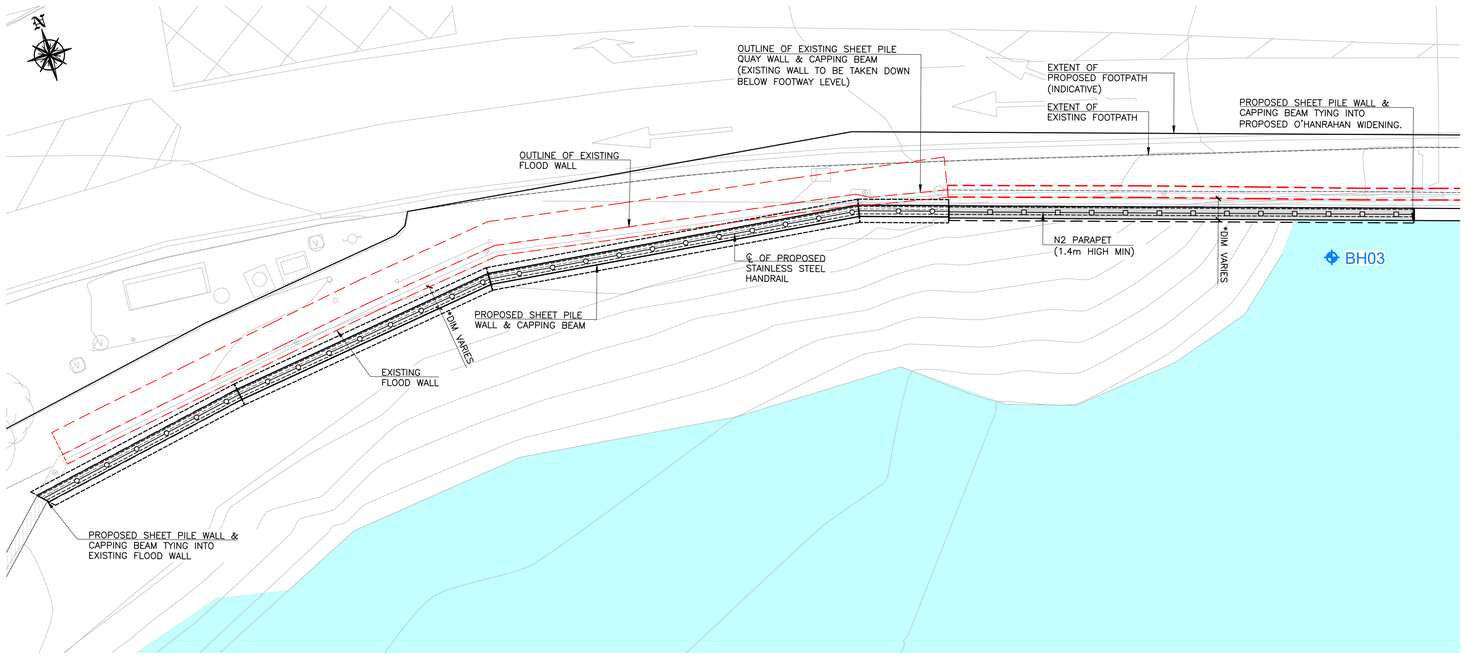


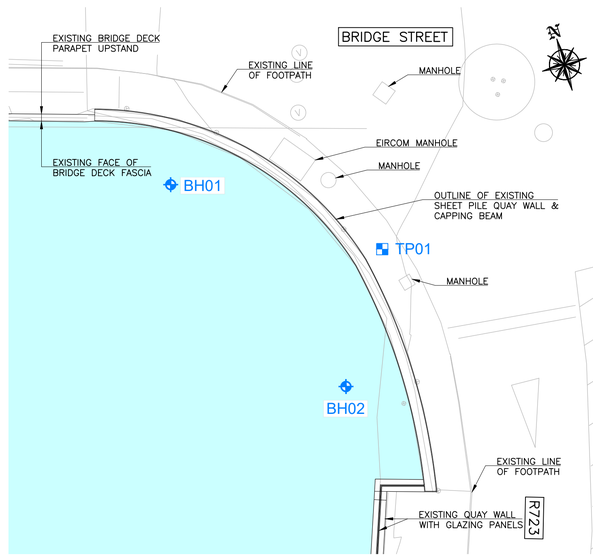
SITE LOCATION PLAN
A1 SCALE 1:50,000
A3 SCALE 1:100,000



SITE LAYOUT
A1 SCALE 1:500
A3 SCALE 1:1000



GI LOCATION PLAN ON SOUTHWEST CORNER
A1 SCALE 1:125
A3 SCALE 1:250



GI LOCATION PLAN ON SOUTHEAST CORNER
A1 SCALE 1:125
A3 SCALE 1:250

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM AT MALIN HEAD.
3. ALL CO–ORDINATES ARE TO IRISH TRANSVERSE MERCATOR.
4. EXTENT OF SITE AREA PROVIDED BY THE EMPLOYER EXCLUDES AREA WHICH MAY BE TEMPORARY OCCUPIED SUBJECT TO TRAFFIC SAFETY AND MANAGEMENT AND DIVERSIONS.
5. THE CONTRACTOR IS REQUIRED TO PROVIDE ACCESS THROUGH THE EXTENT OF SITE AND AREA PROVIDED BY THE EMPLOYER IN ACCORDANCE WITH THE SPECIFICATION.
6. THE EXISTING POSITION AND LEVEL OF SERVICES SHOWN TO BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR SHALL PROVIDE PROTECTION TO EXISTING SERVICES

LEGEND:

DEVELOPMENT BOUNDARY

Comhairle Contae Loch Garman
Wexford County Council

Kildare nro National Roads Office

No.	Revision	Date	By	Chk'd	App'd

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Drawn	Designed	Checked	Approved	Suitability Code - Description
ZZX	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Geotechnical Investigation Locations
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number: WBRC - ROD - ENV - S101 - DR - CB - 30012
Scale (A1)	As Shown
Date:	MAY 2022
Job No:	21.143
Rev:	P0

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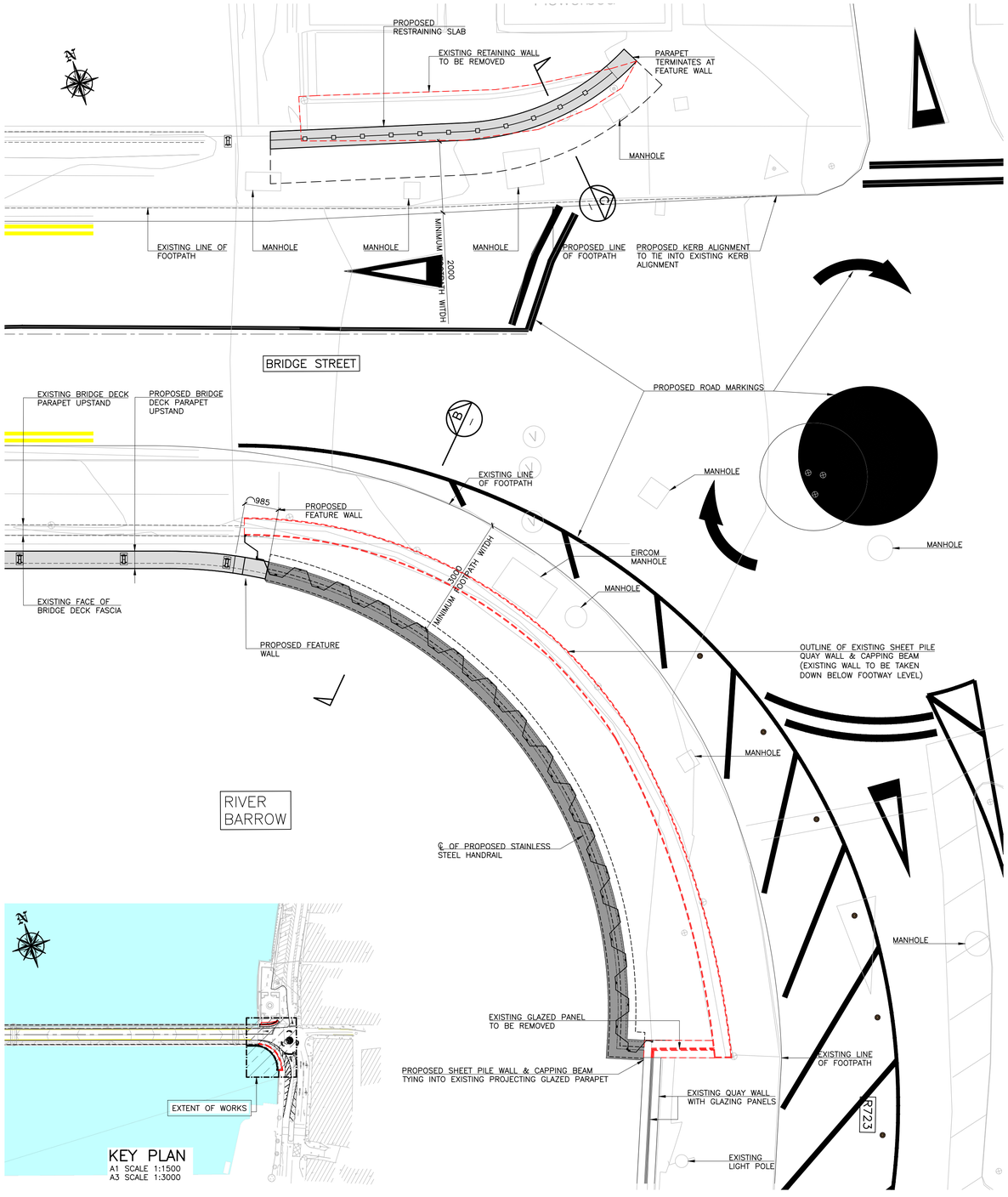
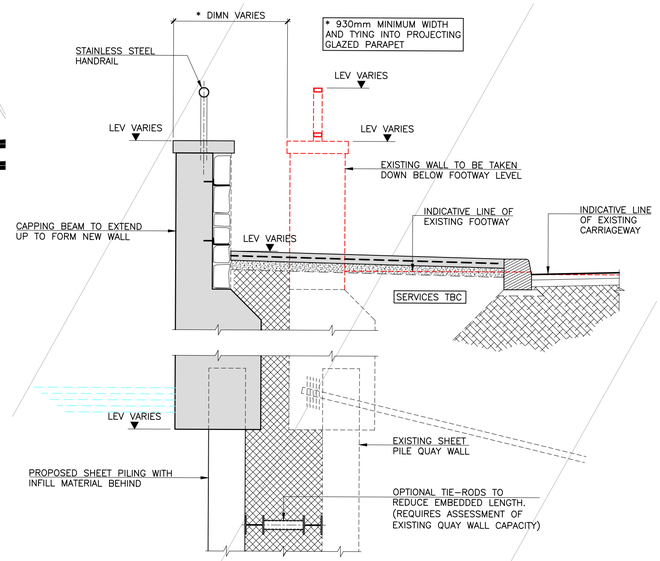


PART PLAN – BRIDGE WIDENING & REMEDIAL WORKS TO EASTERN QUAY WALLS

A1 SCALE 1:75

A3 SCALE 1:150

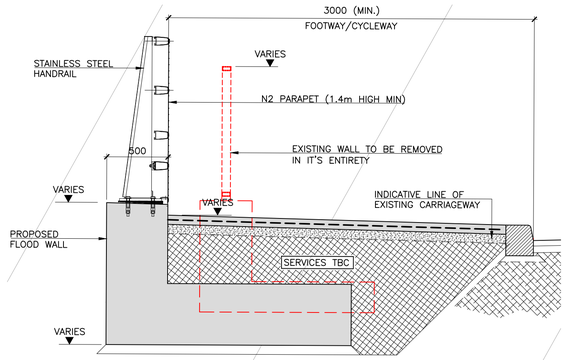


SECTION B

(TYPICAL SOUTHEAST QUAY WALL CROSS SECTION)

A1 SCALE 1:25

A3 SCALE 1:50



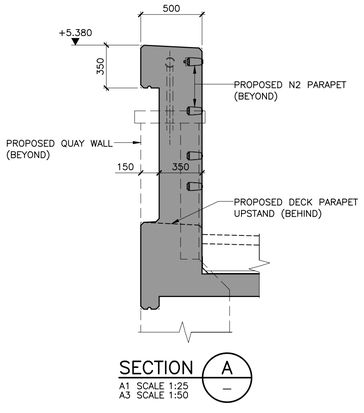
SECTION C

(TYPICAL NORTHEAST QUAY WALL CROSS SECTION)

(NORTHWEST WALL SIMILAR)

A1 SCALE 1:25

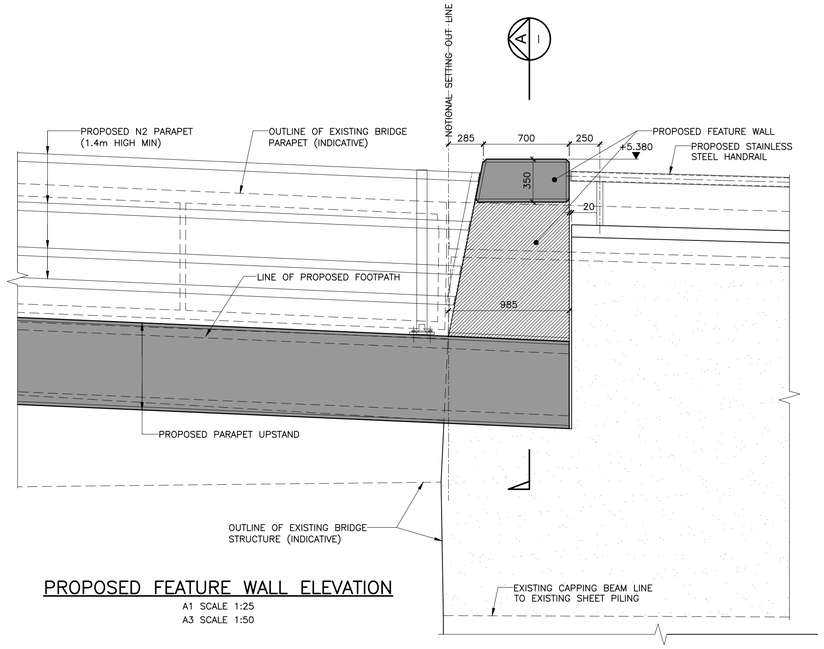
A3 SCALE 1:50



SECTION A

A1 SCALE 1:25

A3 SCALE 1:50



PROPOSED FEATURE WALL ELEVATION

A1 SCALE 1:25

A3 SCALE 1:50

NOTES:

1. REFER TO DRAWING WBRC-ROD-SBR-S101-DR-CB-30007 FOR GENERAL NOTES.

No.	Revision	Date	By	Chk'd	App'd

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Drawn	Designed	Checked	Approved	Suitability Code - Description
OB	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Remedial Works to Eastern Approach Quay Wall
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number: WBRC - ROD - SBR - S101 - DR - CB - 30013
Scale (A1)	As Shown
Date:	Oct' 2021
Job No:	21.143
Rev:	P0

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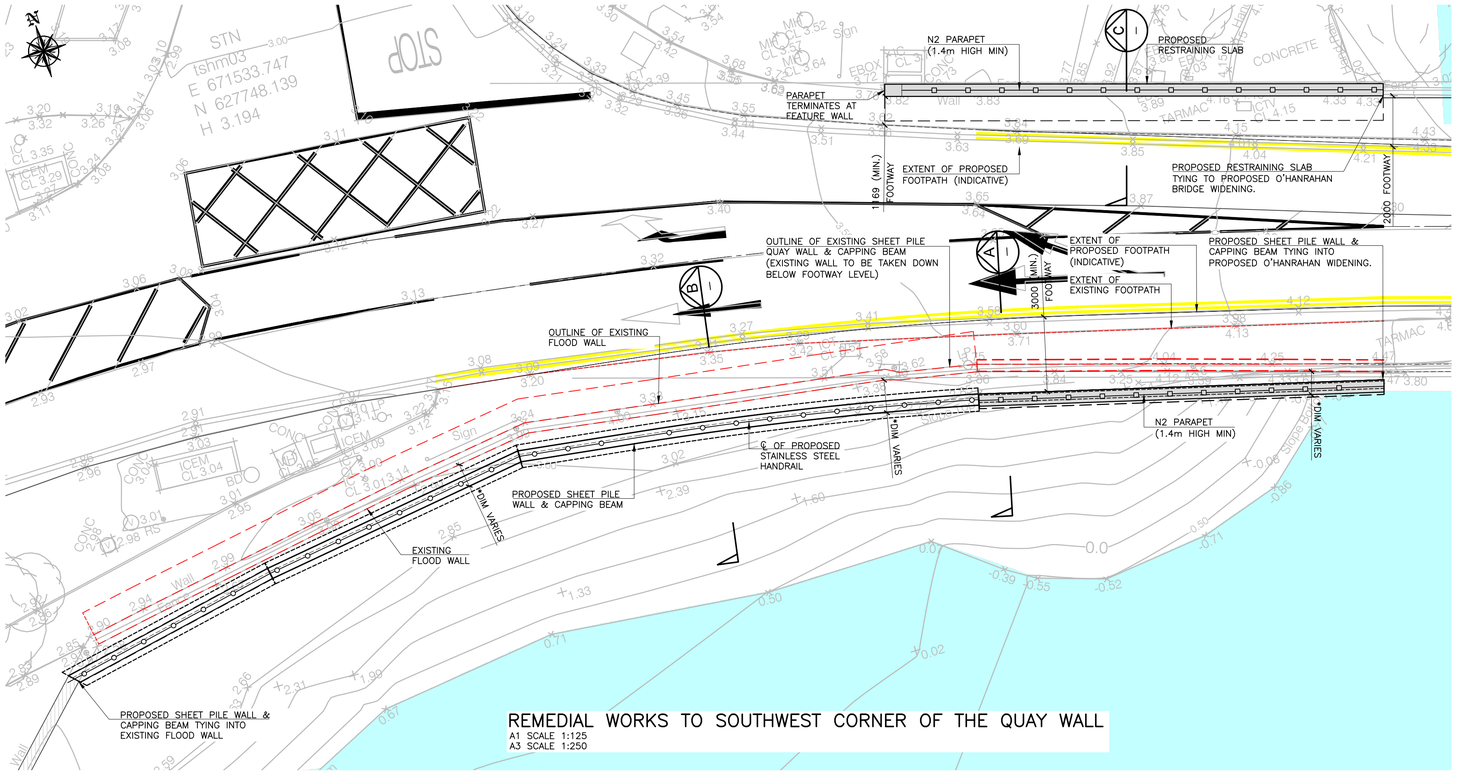
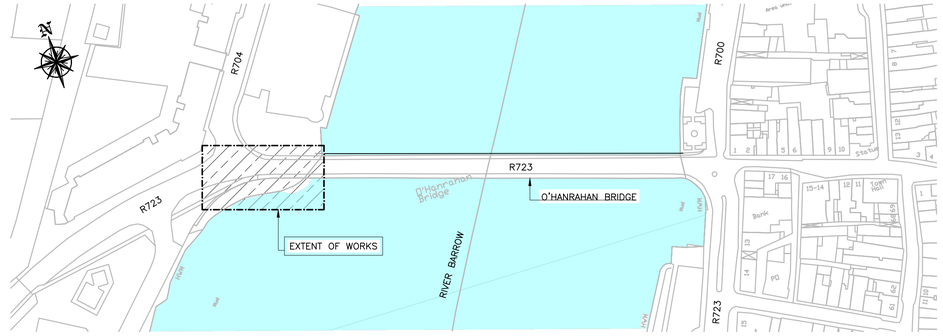


REMEDIAL WORKS TO SOUTHWEST CORNER OF THE QUAY WALL

A1 SCALE 1:125
A3 SCALE 1:250

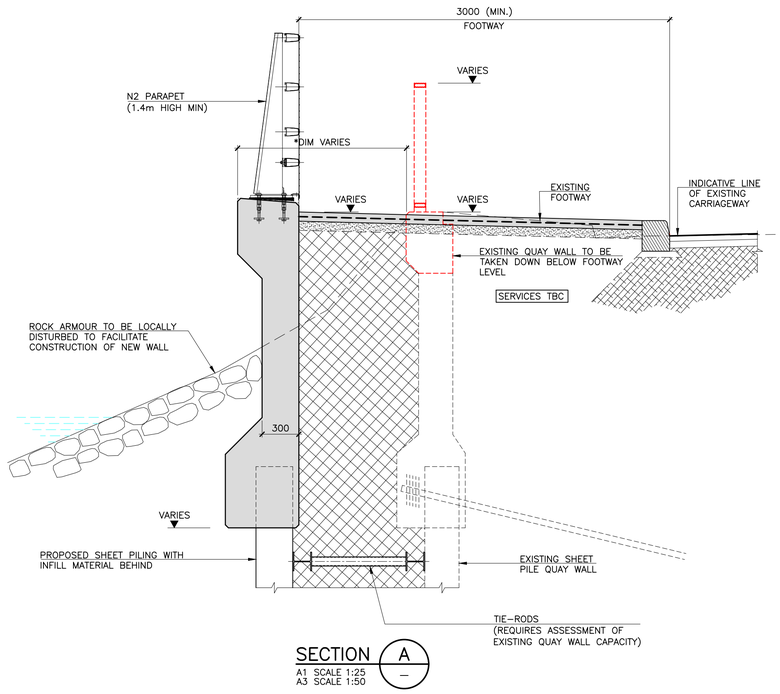


KEY PLAN

A1 SCALE 1:1500
A3 SCALE 1:3000

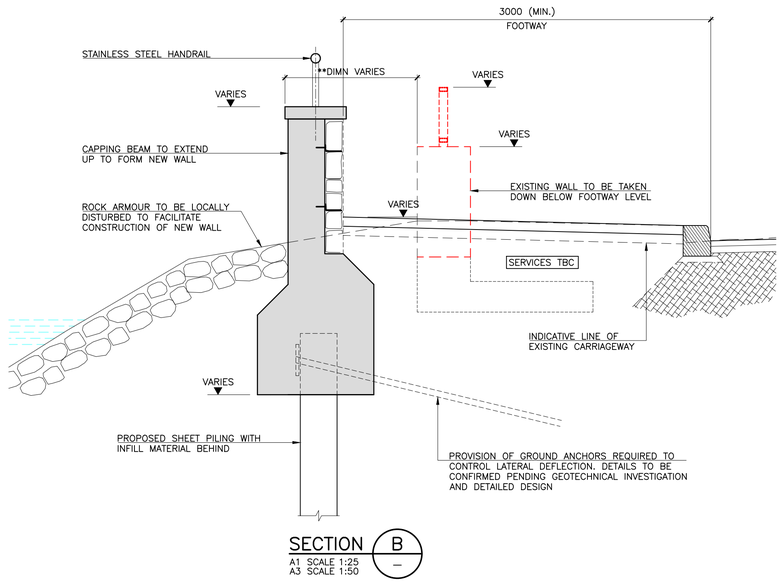
SITE LOCATION

A1 SCALE 1:50000
A3 SCALE 1:100000



SECTION A

A1 SCALE 1:25
A3 SCALE 1:50



SECTION B

A1 SCALE 1:25
A3 SCALE 1:50

NOTES:

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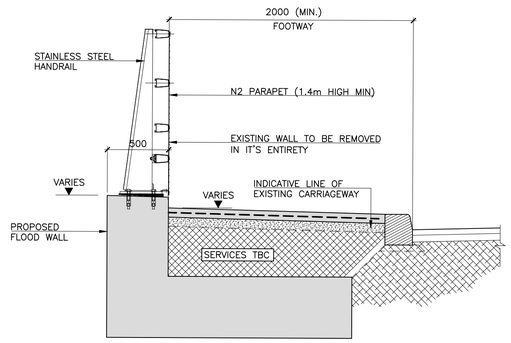
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM MALIN HEAD.
3. ALL CO–ORDINATES ARE IN METRES TO IRISH TRANSVERSE MERCATOR (ITM).



SECTION C
(TYPICAL NORTHWEST QUAY WALL CROSS SECTION)

(NORTHWEST WALL SIMILAR)
A1 SCALE 1:25
A3 SCALE 1:50

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DS	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Remedial Works to Southwest Corner of the Quay Wall
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number: WBRS - ROD - ENV - S101 - DR - CB - 30014
Scale (A1)	As Shown
Date:	June 2022
Job No:	21.143
Rev:	P0

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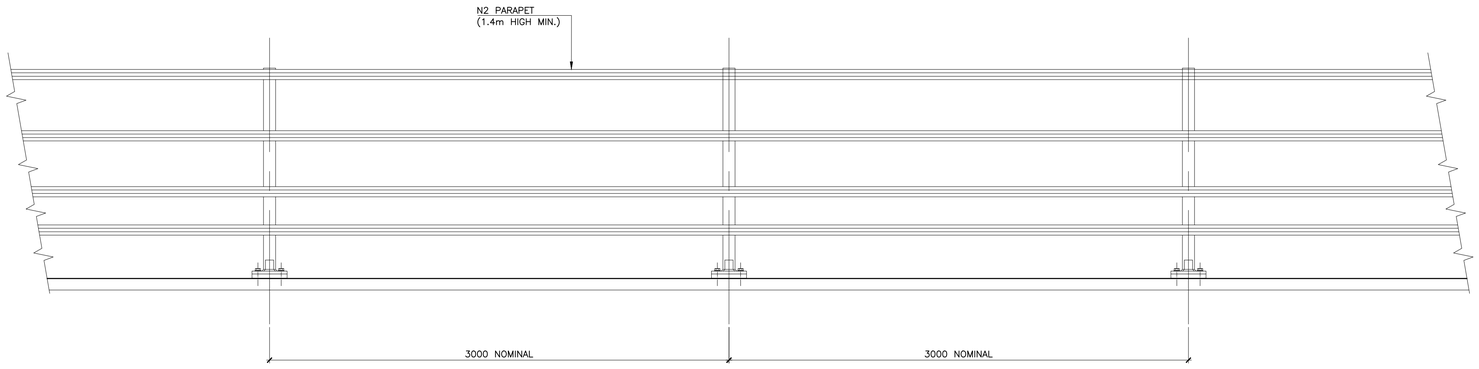
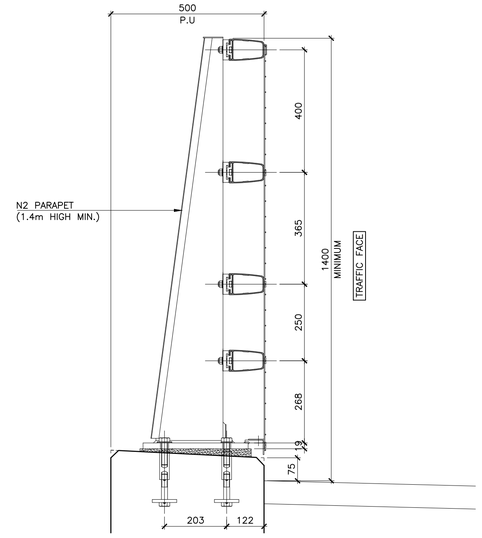


TYPICAL PROPOSED PARAPET ELEVATION

A1 SCALE 1:20
A3 SCALE 1:40



TYPICAL PROPOSED PARAPET SECTION

A1 SCALE 1:10
A3 SCALE 1:20

EXISTING PARAPET SAMPLE

PROPOSED PARAPET SAMPLE

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.
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ZZX	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Proposed Bridge Parapets

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
	WBRC	ROD	ENV	S101	DR	CB	30015

Scale (A1)	Date:	Job No:	Rev:
As Shown	Mar. 2022	21.143	P0

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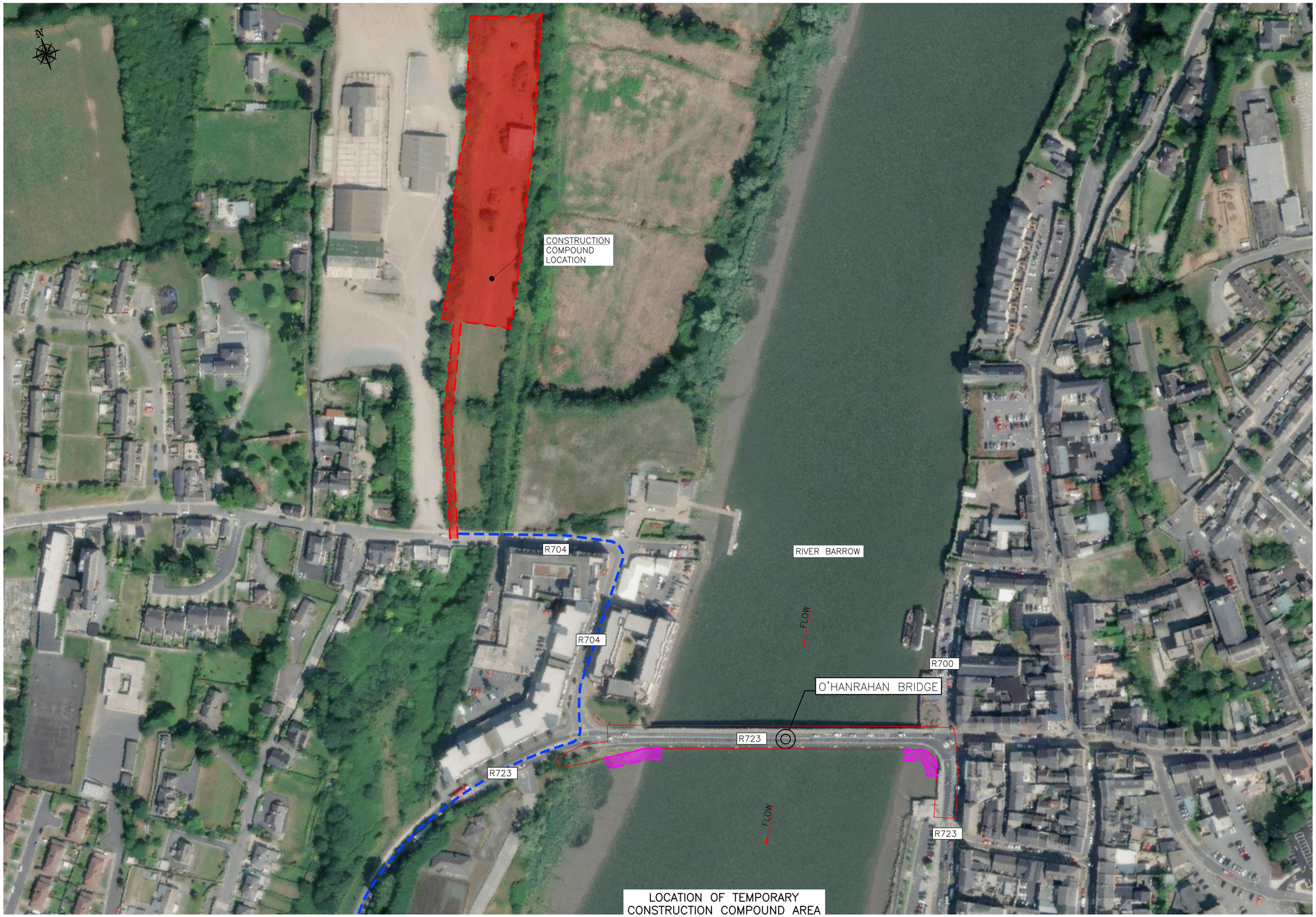

LEGEND:

- DEVELOPMENT BOUNDARY
- HAULAGE ROUTE
- POTENTIAL TEMPORARY CONSTRUCTION COMPOUND AREAS
- TEMPORARY WORK AREAS

LOCATION OF TEMPORARY CONSTRUCTION COMPOUND AREA

A1 SCALE 1:1250
A3 SCALE 1:2500

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Drawn	Designed	Checked	Approved	Suitability Code - Description
ZZX	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Location of Temporary Construction Compound Area

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
	WBRC	ROD	ENV	S101	DR	CB	30016

Scale (A1)	Date:	Job No:	Rev:
As Shown	MAY 2022	21.143	P0

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OB	CH	MR	JK	S4 - Stage Approval

Project Stage: Preliminary

Project Title: O'Hanrahan Bridge Widening Project

Drawing Title: Temporary Traffic Management Plan Stage 1 of 5

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
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Scale (A1): 1:250 | Date: Sept 2021 | Job No: 21.143 | Rev: P0

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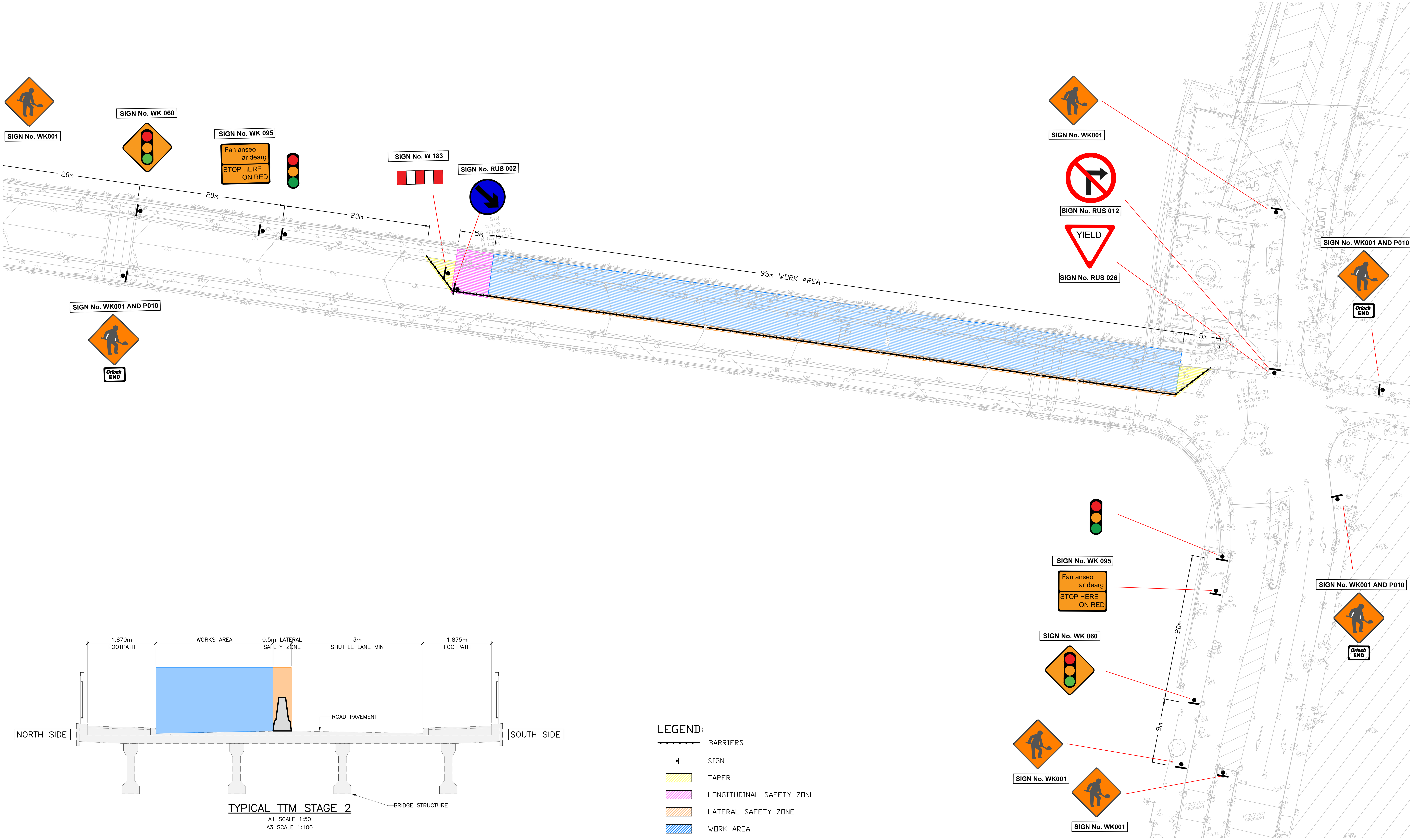

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OB	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Temporary Traffic Management Plan Stage 2 of 5
Drawing Number	Project WBRC - Originator ROD - Volume ENV - Location S101 - Type DR - Role CB - Number 30018
Scale (A1)	1:250
Date:	Sept 2021
Job No:	21.143
Rev:	P0

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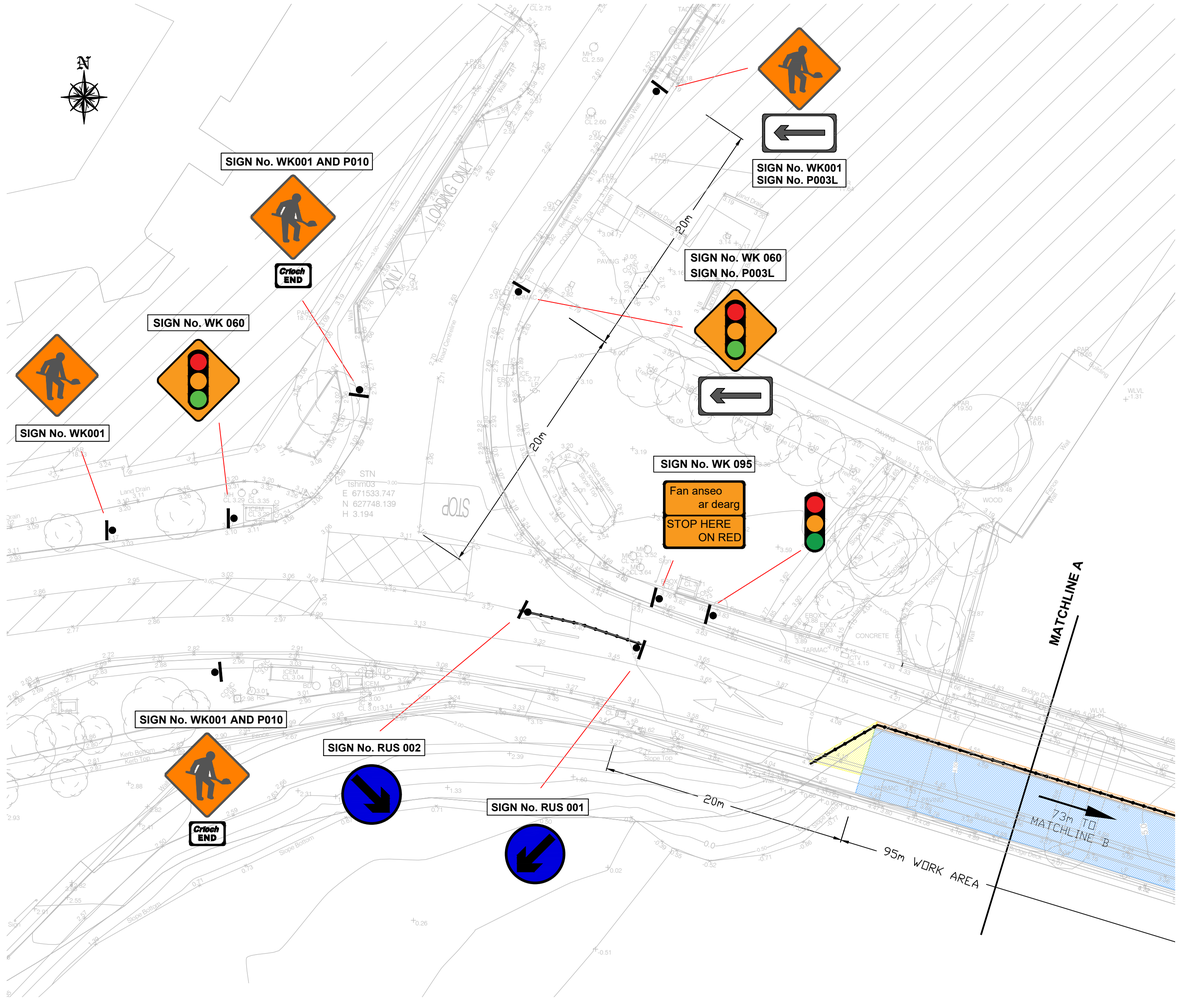

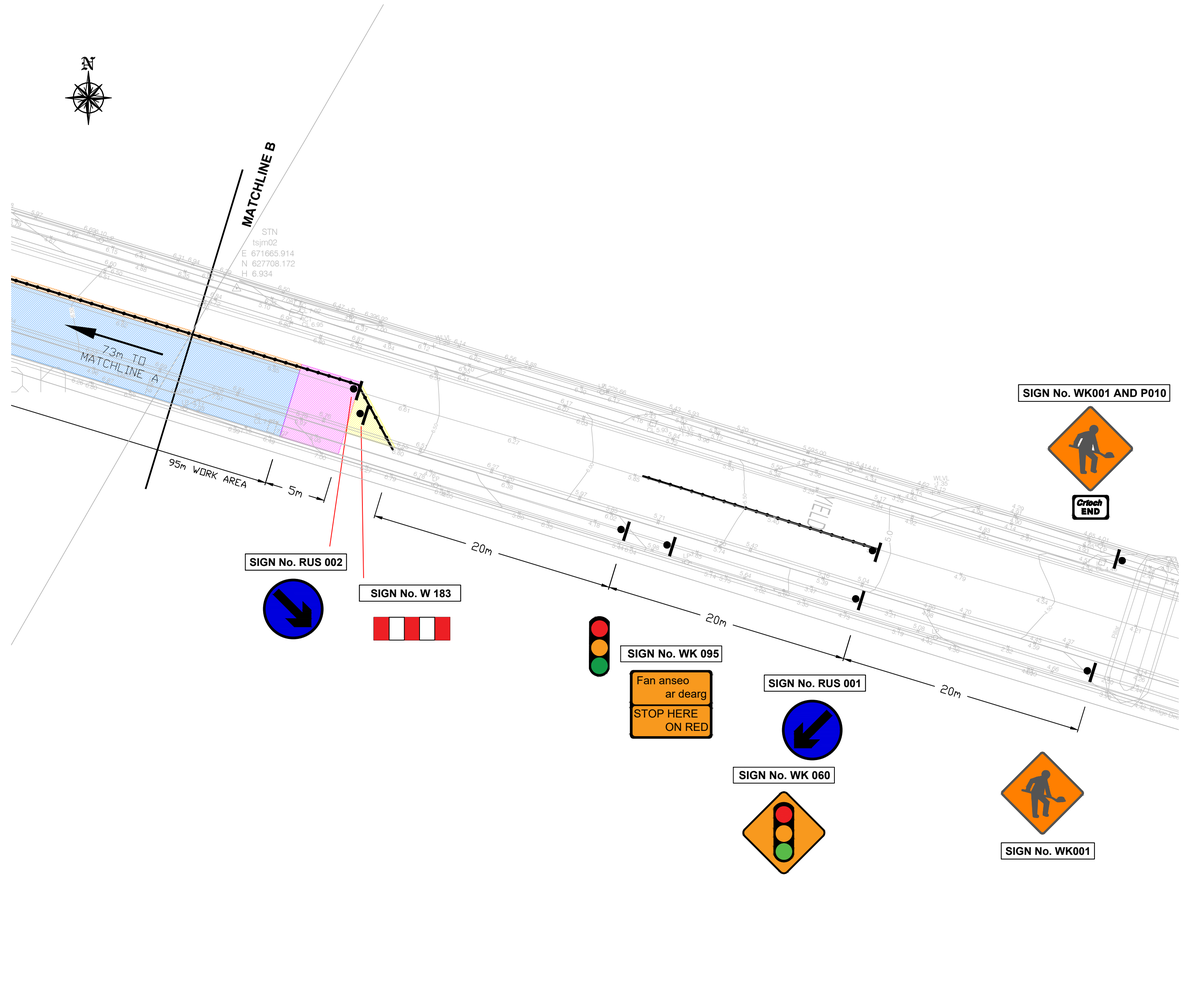

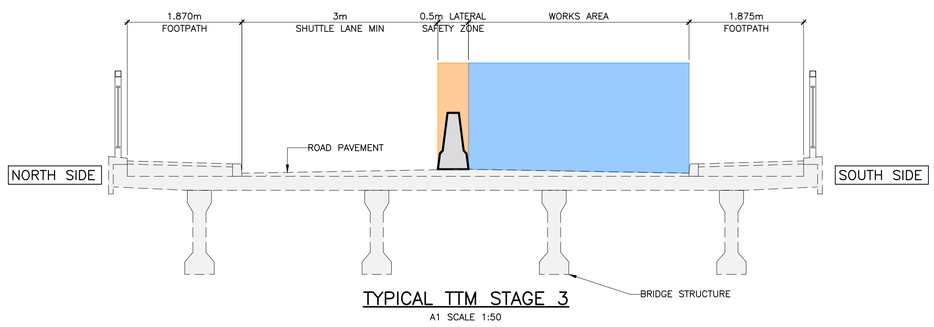

TYPICAL TTM STAGE 3

A1 SCALE 1:50
A3 SCALE 1:100

LEGEND:

- BARRIERS
- SIGN
- TAPER
- LONGITUDINAL SAFETY ZONE
- LATERAL SAFETY ZONE
- WORK AREA

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Drawn	Designed	Checked	Approved	Suitability Code - Description
OB	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Temporary Traffic Management Plan Stage 3 of 5
Drawing Number	Project | Originator | Volume | Location | Type | Role | Number: WBRC - ROD - ENV - S101 - DR - CB - 30019
Scale (A1)	1:250
Date:	Sept 2021
Job No:	21.143
Rev:	P0

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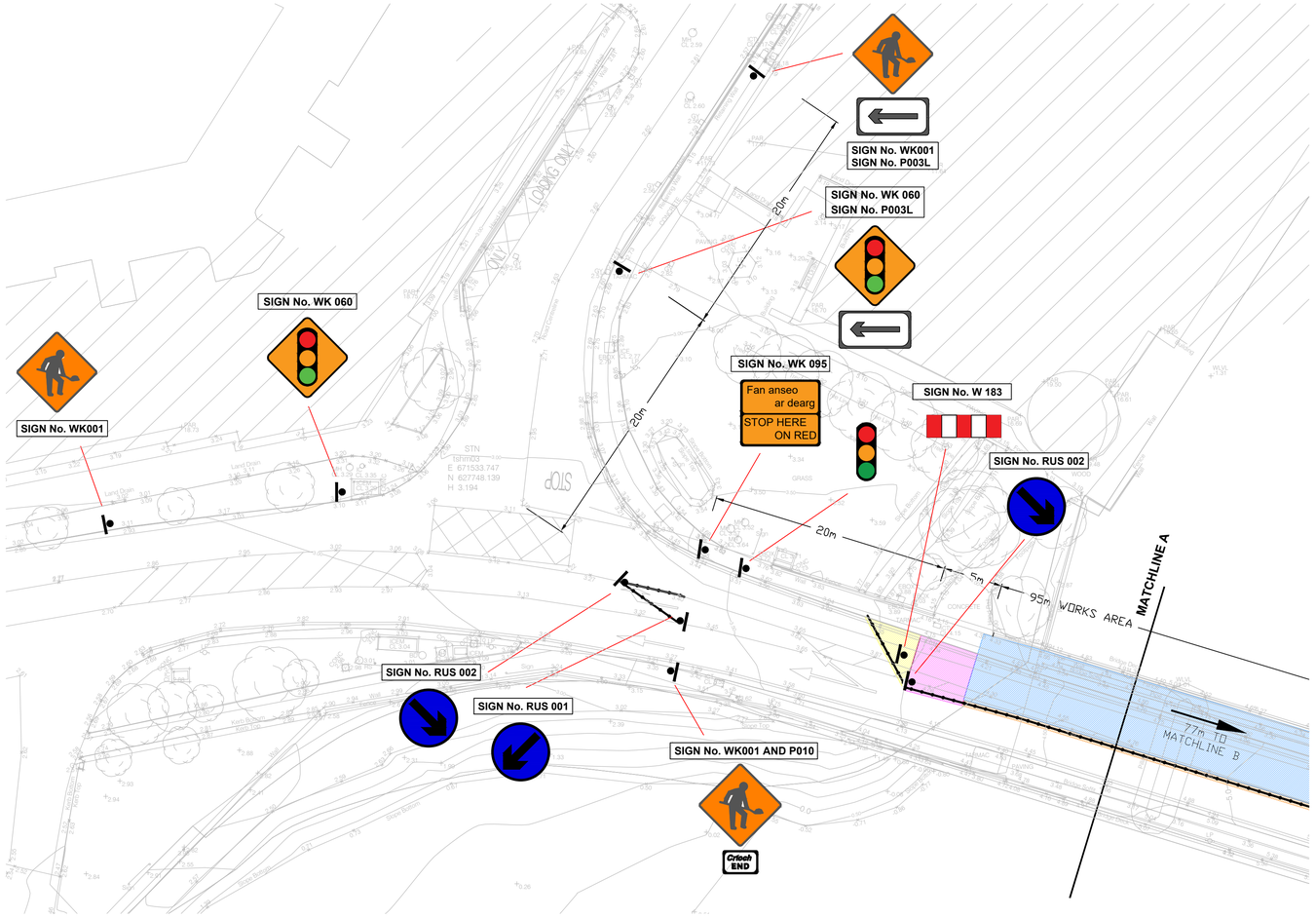

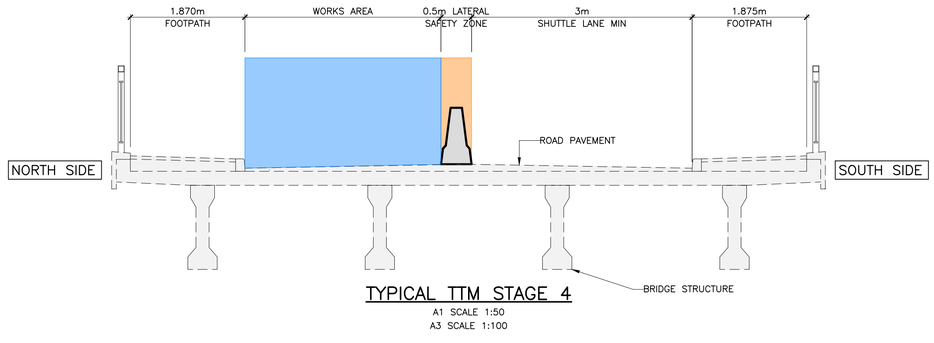

TYPICAL TTM STAGE 4

A1 SCALE 1:50
A3 SCALE 1:100

LEGEND:

- BARRIERS
- SIGN
- TAPER
- LONGITUDINAL SAFETY ZONE
- LATERAL SAFETY ZONE
- WORK AREA

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Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Temporary Traffic Management Plan Stage 4 of 5

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
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Scale (A1)	1:250	Date:	Sept 2021	Job No:	21.143	Rev:	P0

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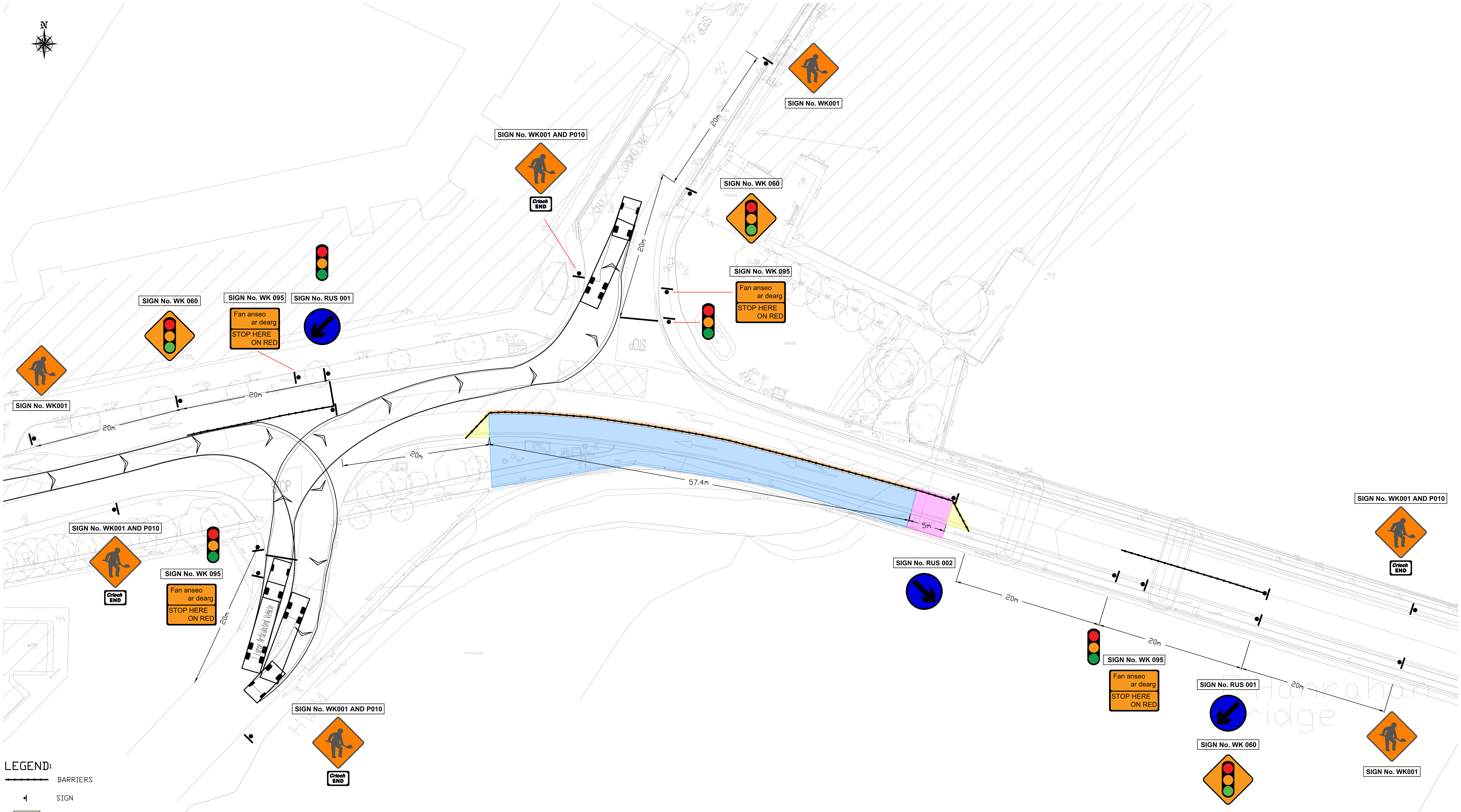

LEGEND:

- BARRIERS
- SIGN
- TAPER
- LONGITUDINAL SAFETY ZONE
- LATERAL SAFETY ZONE
- WORK AREA

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. ALL LEVELS ARE IN METRES TO ORDNANCE DATUM MALIN HEAD.
3. ALL CO-ORDINATES ARE IN METERS TO IRISH TRANSVERSE MERCATOR (ITM).

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Drawn	Designed	Checked	Approved	Suitability Code - Description
AC	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Temporary Traffic Management Plan Stage 5 of 5
Drawing Number	Project WBRC - Originator ROD - Volume ENV - Location S101 - Type DR - Role CB - Number 30021
Scale (A1)	1:250
Date:	August 2022
Job No:	21.143
Rev:	P0

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Appendix B
Habitat Map

Appendix B

Legend

- Site Boundary
- Study Area
- BL3 - Buildings and artificial surfaces
- CC1 - Sea walls, piers and jetties
- FW4 - Drainage ditches
- WL1 - Hedgerows
- WL2 - Treelines
- BL3 - Buildings and artificial surfaces
- CC1 - Sea walls, piers and jetties
- CW2 - Tidal rivers
- FS1 - Reed and large sedge swamps
- ED3 - Recolonising bare ground
- WD5 - Scattered trees and parkland
- GA2 - Amenity grassland (improved)
- GA1 - Improved agricultural grassland
- WS2 - Immature woodland
- GS2 - Dry meadows and grassy verges
- LS4 - Mud shores
- WS1 - Scrub
- WD1 - (Mixed) broadleaved woodland

N

0 50 100 200 Meters

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Habitat Mapping

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
	WBRC	ROD	ENV	S101	DR	CB	30023

Scale (A1)	Date:	Job No:	Rev:
1:1,000@A1	October 2022	21.143	P0

08 January 2018 10:55:25 \\RODDUBFP1\J\2021\2143\21143-02_WIP\08 MODELS\01 CAD\03 TEMPLATES\A1 ROD BORDER.DWG

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Appendix C
Benthic Survey Reports

APPENDIX C-1

Benthic Survey Report
Southeast Corner of O'Hanrahan Bridge

BENTHIC SURVEY

O' Hanrahan Bridge survey

New Ross

ASU Report M01/22-1

(January 2022)

Commissioned by: Roughan & O'Donovan Consulting Engineers
Carried out by: Aquatic Services Unit
January 2022

1. Introduction and Brief

Roughan & O'Donovan Consulting Engineers commissioned the Aquatic Services Unit to undertake a benthic biological survey of a small area of intertidal sediment located on the south-eastern corner of O' Hanrahan Bridge, New Ross, in order to identify the intertidal communities present.

2. Methodology

Fieldwork was carried out at low tide on the 14th of January 2022. A site walkover was undertaken to identify any hard benthos habitats and to obtain general overview of the site. Soft sediment sampling was undertaken at three locations, which were selected from the high water to low water level. These samples were taken using a 0.01m^2 core (11 cm diameter). Five replicate samples were collected at each location to a depth of 15cm. In addition, at each of the three sampling locations, a 0.25m^2 area was marked out and dug through to identify any large fauna which might not have appeared in the replicate core samples. A small sample of sediment was also collected from each site for granulometric and loss on ignition analyses. All sampling stations were positioned using a Garmin eTrex hand-held GPS. All stations are displayed on a map (Figure 1) with positions listed in Table I. Habitats were identified using the JNCC Marine Habitat Classification System (Connor *et al*., 2004).

Table I Location of sampling sites at New Ross. Sampling locations are presented in Irish Transverse Mercator (ITM)

Site	Easting	Northing
S_01	671750.7	627651.5
S_02	671745.1	627653.0
S_03	671734.9	627654.7

Figure 1 Map showing positions of sampling stations (Image courtesy of Google Earth, Image © 2021 Maxar Technologies).

Granulometric analysis was carried out on oven dried sediment samples from each station using the protocols described by Holme & McIntyre (1984). The sediment was passed through

a series of nested brass test sieves with the aid of a mechanical shaker. The brass sieves chosen were 4mm, 2mm, 1mm, 500µm, 250µm, 125µm and 63µm. The sediments were then divided into three fractions: % Gravel (>2mm), % Sand (<2.0mm >63µm) and % Silt-Clay (<63µm).

Organic matter was estimated using the Loss on Ignition (LOI) method. One gram of dried sediment was ashed at 450˚C for 6 hours and organic carbon was calculated as % sediment weight loss.

On returning to the laboratory all faunal samples were sieved through a 0.5 mm mesh sieve, preserved in buffered formalin and subsequently sorted by eye. All fauna were identified using standard keys to north-west European fauna.

3. Results

Site Overview

The study site is a near rectangular section of intertidal immediately downstream of the bridge at New Ross on the eastern side of the River Barrow estuary. The area in question abuts the eastern quays immediately upstream of the JFK Memorial. The area is bounded to the west by the river, to the north by a curved sheet-pile wall and to the east and south by near vertical stone quay walls (Figure 2A). The shore is accessed by a flight of steps on the southern boundary of the site (Figure 2B). The area in question covers an area of approximately 500m^2 at low spring tide, almost all covered in soft deep mud which gives way to a small triangle of gravel and rubble in the southeast corner (Figure 2C) and a narrow line of discarded bricks and rubble covered with a thin coating of mud along the southern boundary (Figure 2B). The mud is devoid of visible signs of infaunal activity, i.e. there are no visible burrows, no worm casts and no bivalve irrigation holes. There were no algae or other aquatic plants on the mud or gravel. The quay walls were covered in green algae (Figure 2D), the majority of which was *Vaucheria* sp., a genus of alga common in freshwater and estuarine sites. In addition, there were trace amounts of filamentous green algae and very small amounts of *Ulva intestinalis* also present. Higher up on the quay walls were scattered small amounts of the moss *Cinclidotus fontinaloides*, a species often found on rocks and other hard substrates above the water line but subject to frequent inundation. The only higher plant visible were very scarce amounts of stunted plants of an *Oenanthe* species, possibly *O. crocata* (Hemlock water-dropwort) a common species in freshwater sites. There were no rare or unusual plants noted.

Figure 2 (A) General overview of the site from behind the JFK Memorial. (B) Access steps at southern boundary, also showing mud-covered rubble. (C) Gravel, brick and other debris in south east corner of site. (D) View of algae-covered quay wall from river side. (E) View of the sediment surface along the low water edge of the mudflat. (F) View of the sediment surface along the mid shore level of the mudflat.

3.2.1 Soft Sediment Fauna

Overall faunal abundances were low in the area with only 3 taxa/groups encountered in the soft sediment replicate core samples (Table II) and no fauna recovered from the sediment dig through. All fauna identified during the present survey are typical of estuarine conditions and very common in Irish coastal waters.

Table II List of species recorded from soft sediment core samples. All values expressed as numbers per core (0.01m^2).

		Oligochaetae spp.	*Peringia ulvae*	*Corophium* sp.
1	A	139	1	-
	B	98	1	-
	C	236	-	-
	D	237	-	-
	E	232	-	-
2	A	30	-	-
	B	16	1	-
	C	29	-	1
	D	24	-	-
	E	49	1	-
3	A	24	-	1
	B	14	-	-
	C	10	-	-
	D	25	-	-
	E	20	1	-

3.2.2 Granulometry & Organic Carbon

As expected, results from the granulometric analysis confirmed the presence of very high mud levels (silt/clay) in the area (Table III & Figure 3), with a higher proportion of sand present at Station 3 located along the low shore level of the small tidal mud flat. The high levels of mud are reflected in the high loss on ignition values present in the area.

Table III Sediment analysis results for organic carbon and granulometry from O' Hanrahan Bridge, New Ross.

Station Number	Coarse %>2mm	Sand %<2mm>63µm	Silt-Clay %<63µm	LOI %	Substrate Type
S_01	0%	5.92%	94.08%	7.32%	Slightly Sandy Mud
S_02	0%	5.75%	94.25%	7.47%	Slightly Sandy Mud
S_03	0%	22.47%	77.53%	5.04%	Sandy Mud

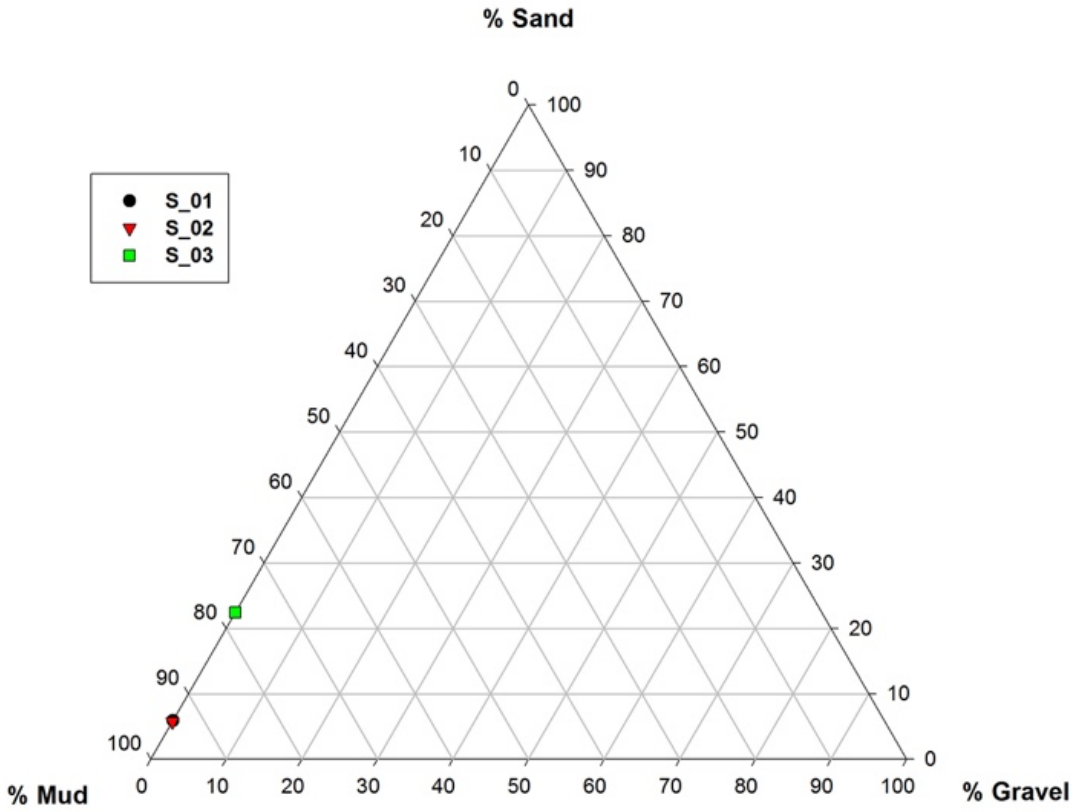

Figure 3 Ternary plot of granulometry results.

3.2.3 Habitat Assessment

The infaunal and granulometric results point to a single habitat type within the survey area. This has been identified as *Tubificoides benedii* and other oligochaetes in littoral mud [LS.LMu.UEst.Tben] (Connor *et al*., 2004). This habitat type has been described as extremely species-poor, consisting almost exclusively of oligochaetes. It is known to occur at the head of estuaries, in sheltered locations with no strong river flow and a strong freshwater influence, which is consistent with the conditions in the survey area at O' Hanrahans Bridge.

4. Conclusions

The habitats and taxa identified during the present survey are typical of upper estuarine systems, with no rare or protected species noted.

5. References

Connor, D.W., J.H. Allen, N. Golding, K.L. Howell, L.M. Lieberknecht, K.O. Northen AND J.B. Reker (2004) The Marine Habitat Classification for Britain and Ireland Version 04.05 ISBN 1 861 07561 8. In: JNCC (2015) The Marine Habitat Classification for Britain and Ireland Version 15.03. [July 2017]. Available from: https://mhc.jncc.gov.uk/

Holme, N.A. and McIntyre, A.D. (1984): Methods for the Study of Marine Benthos. Second Edition IBP Handbook 16.–399 pp. Oxford-London-Boston: Blackwell Scientific Publications

APPENDIX C-2

Benthic Survey Report
Southwest Corner of O'Hanrahan Bridge

BENTHIC SURVEY

O'Hanrahan Bridge survey

New Ross

ASU Report M10/22-1

(September 2022)

Commissioned by: Roughan & O'Donovan Consulting Engineers
Carried out by: Aquatic Services Unit
October 2022

1. Introduction and Brief

Roughan & O'Donovan Consulting Engineers, commissioned the Aquatic Services Unit (UCC) to undertake a benthic biological survey of a small area of intertidal sediment located on the south-western corner of O'Hanrahan Bridge, New Ross, in order to identify the intertidal communities present. An additional survey of the upper intertidal and supralittoral zones were undertaken to identify plant communities present in the area. The intertidal assessment was carried out by Derek Casey, MSc., Aquatic Services Unit, who has over 20 years professional experience in marine ecological assessments. The terrestrial survey was carried out by Mary O'Connor PhD. who has over 20 years professional experience as an ecologist/environmental scientist. She has worked for public and private sector clients and has several years' experience of ecological/environmental assessment and input into Environmental Impact Assessment and Appropriate Assessment Report.

2. Methodology

Soft sediment intertidal fieldwork was carried out at low tide on the 21st of September 2022. A site walkover was undertaken to obtain general overview of the site. Soft sediment sampling was undertaken at three locations, which were selected from the high water to low water level and were considered representative of the intertidal area in the vicinity of the proposed development. Five replicate 0.01m^2 cores (11cm diameter) were collected at each location to a depth of 15cm. In addition, at each of the three sampling locations, a 0.25m^2 area was marked out and dug through to identify any large fauna which might not have appeared in the replicate core samples. A small sample of sediment was also collected from each site for granulometric and loss on ignition analyses. All sampling stations were positioned using a Garmin eTrex hand-held GPS. The stations are displayed on a map (Figure 1) with positions listed in Table I. Habitats were identified using the JNCC Marine Habitat Classification System (Connor *et al*., 2004).

The terrestrial survey site visit was carried out on the 6th of September 2022. Habitats were classified according to (Fossitt 2000).

Table I Location of sampling sites at New Ross. Sampling locations are presented in Irish Transverse Mercator (ITM)

Site	Easting	Northing
S_01	671570	627716
S_02	671564	627715
S_03	671555	627720

Figure 1 Map showing positions of sampling stations (Image courtesy of Google Earth, Image © 2021 Maxar Technologies).

Granulometric analysis was carried out on oven dried sediment samples from each station using the protocols described by Holme & McIntyre (1984). The sediment was passed through a series of nested brass test sieves with the aid of a mechanical shaker. The brass sieves chosen were 4mm, 2mm, 1mm, 500µm, 250µm, 125µm and 63µm. The sediments were then divided into three fractions: % Gravel (>2mm), % Sand (<2.0mm >63µm) and % Silt-Clay (<63µm).

Organic matter was estimated using the Loss on Ignition (LOI) method. One gram of dried sediment was ashed at 450˚C for 6 hours and organic carbon was calculated as % sediment weight loss.

On returning to the laboratory all faunal samples were sieved through a 0.5 mm mesh sieve, preserved in buffered formalin and subsequently sorted by eye. All fauna were identified using standard keys to north-west European fauna.

3. Results

Site Overview

The study site is located along the western bank of the River Barrow, immediately downstream of O'Hanrahan Bridge. The site consists of a narrow band of very soft intertidal mud immediately adjacent to a reed bed and soft margins of grasslands. The sediment surface at the site was devoid of any visible fauna on the sediment surface i.e. no tracks or burrows were present on the sediment surface. Samples were collected in a transect from the low water extent to the highest tidal point of the soft sediment. A detailed description of the higher plants present at the site are presented in the botanical section of this report.

Figure 2 (A) View from bridge along the transect area between the reeds and River Barrow. (B) View along the soft-sediment intertidal bordering the reed bed along the western bank of the River Barrow. (C) Mudflats and reedbed next to broken ground typical of the supra-littoral margins at the site. (D) View of the small area of soft-sediment at the upper reaches of the mudflats bordering the reed beds. This is the location of S_03.

3.1 Botany

Reed Bed FS1 (Figure 3: Photos 1 & 2)

The River Barrow is tidal at New Ross and is considered to be at the upper estuarine extent of the Barrow. Fringing the muddy river channel of the Barrow River at Hanrahan's Bridge is typical reed bed vegetation which is common in upper estuarine environments on muddy substrates and where saline influence is more limited. *Phragmites* reed beds are an important component of emergent vegetation communities in estuarine systems. Here at the upper portion of the Estuary Common Reed (*Phragmites australis*) dominates over more halophytic plants which occur in more saline conditions such as Cord grasses (*Spartina* spp).

Common Reed (*P. australis*) is tall and a dominant competitor for light, so that dense stands of the common reed tend to be species poor in other plants but at the fringes of the reedbed trees (i.e . willows *Salix* spp) occur at the inland edge of the shore.

Fringing the reedbed towards the estuary side species such as Soft Stem Bulrush *Schoenoplectus* spp. (likely *tabermontani)* and Club Rush (*Bolboschoenus maritimus*) grow on the open mud and shoreward species such as some Reed Canary-grass (*Phalaris arundinacea*), Buck's horn plantain (*Plantago coronopus*) and willowherbs *(Epilobium* spp) also occur.

Links to Annex 1
Reedbed habitats are not protected as Annex 1 Habitats under the Natural Habitats Directive.

Willow Scrub WS1 (Figure 4: Photos 3 & 4)

At the upper extent of the Reed bed a small patch of White Willow (*Salix alba*) occurs; this is associated with some bramble (*Rubus fruticosus* agg.) on the landward side. The herbaceous layer consists of herbs, including nettle (*Urtica dioica*), Hogweed (*Heracleum sphondylium*), WillowHerbs eg. (*Epilobium hirsutum*) Hedge woundwort (*Stachys sylvatica*), Docks (*Rumex* spp) and rank grasses Couch Grass, False Oat Grass etc.

Links to Annex 1
This small area of willow scrub does not represent an Annex 1 Habitats under the Natural Habitats Directive.

Sea walls, piers and jetties CC1 (Figure 5: Photos 5 & 6)

Along the foreshore below the bridge there has been the import of protective rocks and an area of artificially made ground associated with the base of the bridge. Here vegetation has developed that is more typical of recolonising ground and is an eclectic mix of species. Species that indicate the coastal nature of the area include Sea Aster (*Aster tripolium*) and Common Mallow (*Malva sylvestris*). Also several species of disturbed ground occur including a variety of species of yellow asteraceae, Dandelions, Hawkbits, Sow thistles, docks (*Rumex* species), Brassicaceae, rank grasses Couch Grass, Cock's foot grass, False Oat Grass, Teasel, Willowherbs, Thistles, Plantains, Red Valerian, occasional woody saplings e.g. Ash.

Links to Annex 1
This small area of coastal built structure does not represent an Annex 1 Habitats under the Natural Habitat's directive.

Amenity Grassland GA2 (Figure 6: Photo 7)

A small area of amenity grassland (improved) occurs adjacent to the Bridge. This habitat is dominated by a variety of grasses including *Poa* species and with broadleaved herbs such as Daisy (*Bellis perennis*), Dandelion (*Taraxacum* spp.), clovers (*Trifolium* spp.) and plantains (*Plantago* spp.) are common.

Links to Annex 1
This small area of amenity grassland does not represent an Annex 1 Habitats under the Natural Habitat's directive.

Figure 3: Photo 1 and 2 Showing Reedbed and Fringing Club and Bulrushes on the Muddy Substrate at O'Hanrahan's Bridge.

Figure 4: Photo 3 and 4 shows a small area of Willow Scrub near O'Hanrahan's Bridge.

Figure 5: Photos 5 and 6 Shows vegetation on rock protection at O'Hanrahan's Bridge

Figure 6: Photo 7 Shows amenity grassland adjacent to O'Hanrahan's Bridge

3.2 Intertidal Soft Sediment

3.2.1 Soft Sediment Fauna

Overall faunal abundances in the area were high, dominated by oligochaetes with occasional high numbers of *Corophium* sp. and *Peringia ulvae*. However, diversity in the area is low, with only 3 taxa/groups encountered in the soft sediment replicate core samples (Table II) and no fauna recovered from the sediment dig through. All fauna identified during the present survey are typical of upper estuarine conditions and very common in Irish coastal waters.

		Oligochaetae spp.	*Peringia ulvae*	*Corophium* sp.
1	A	104	-	-
	B	250	-	10
	C	140	-	-
	D	210	-	-
	E	110	-	10
2	A	251	2	1
	B	280	-	4
	C	292	12	-
	D	388	24	-
	E	390	10	20
3	A	783	32	8
	B	704	12	12
	C	256	28	8
	D	654	22	6
	E	522	48	48

Table II List of species recorded from soft sediment core samples. All values expressed as numbers per core (0.01m^2).

3.2.2 Granulometry & Organic Carbon

As expected, results from the granulometric analysis confirmed the presence of very high mud levels (silt/clay) in the area (Table III & Figure 7). The high levels of mud are reflected in the relatively high loss on ignition values present in the area.

Station Number	Coarse %>2mm	Sand %<2mm>63µm	Silt-Clay %<63µm	LOI %	Substrate Type
S_01	0%	26.8%	73.2%	6.45%	Sandy Mud
S_02	0%	18.1%	81.9%	6.78%	Sandy Mud
S_03	0%	22.47%	77.53%	7.77%	Sandy Mud

Table III Sediment analysis results for organic carbon and granulometry from the south western corner of O'Hanrahan Bridge, New Ross.

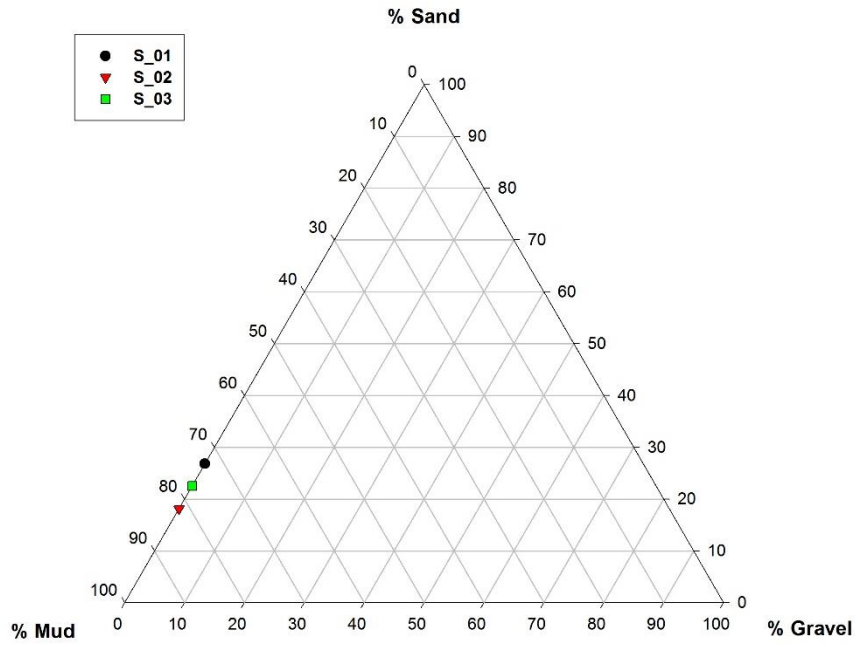

Figure 7 Ternary plot of granulometry results.

3.2.3 Soft Sediment Habitat Assessment

Results from the present survey are the same as those identified in a previous survey undertaken on the opposite bank of the River Barrow in January 2022. The infaunal and granulometric results point to a single habitat type within the survey area. This has been identified as *Tubificoides benedii* and other oligochaetes in littoral mud [LS.LMu.UEst.Tben] (Connor *et al*., 2004). This habitat type has been described as extremely species-poor, consisting almost exclusively of oligochaetes. This habitat is known to occur at the head of estuaries, in sheltered locations with no strong river flow and a strong freshwater influence, which is consistent with the conditions in the survey area. This is reflected in the plant species which have been identified in the upper intertidal and supra littoral, which are typical of a freshwater system, with a small number of low salinity, estuarine plants also present.

4. Conclusions

The habitats and taxa identified during the present survey are typical of upper estuarine systems, with no rare or protected species noted.

5. References

Connor, D.W., J.H. Allen, N. Golding, K.L. Howell, L.M. Lieberknecht, K.O. Northen AND J.B. Reker (2004) The Marine Habitat Classification for Britain and Ireland Version 04.05 ISBN 1 861 07561 8. In: JNCC (2015) The Marine Habitat Classification for Britain and Ireland Version 15.03. [July 2017]. Available from: https://mhc.jncc.gov.uk/

Fossitt J. 2000. A Guide to Habitats in Ireland. Heritage Council.

Holme, N.A. and McIntyre, A.D. (1984): Methods for the Study of Marine Benthos. Second Edition IBP Handbook 16.–399 pp. Oxford-London-Boston: Blackwell Scientific Publications.

Appendix D
Construction Environmental Management Plan

Appendix D

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O'Hanrahan Bridge Widening

Construction Environmental Management Plan

March 2023

Client:
Kildare County Council

ROD
ROUGHAN & O'DONOVAN

O'Hanrahan Bridge Widening

Construction Environmental Management Plan

TABLE OF CONTENTS

1. INTRODUCTION

This Construction Environmental Management Plan (CEMP) is prepared for the proposed O'Hanrahan Bridge Widening ("the proposed development") on behalf of Kildare County Council.

1.1 Purpose of the CEMP

This CEMP applies to all works associated with the proposed development.

As a contractor has not yet been appointed, this Construction Environmental Management Plan (CEMP) has not been formally adopted and further development and commitment to the CEMP will be undertaken following selection of Contractors and before commencement of site works.

It presents the approach and application of environmental management and mitigation for the construction of the proposed development. It aims to ensure that adverse effects from the construction phase of the proposed development, on the environment and the local communities, are avoided or minimised. It does not describe mitigation measures relating to the operation and decommissioning of the proposed development. These are provided in the Planning Report. The CEMP provides the environmental management framework for the appointed Contractors and sub-contractors as they incorporate the mitigating principles to ensure that the work is carried to reduce adverse effects on the environment. The construction management staff as well as contractors and sub-contractors' staff must comply with the requirements and constraints set forth in the CEMP in developing the finalised CEMPs. The key environmental aspects associated with the construction of the 'O'Hanrahan Bridge Widening' project, the appropriate mitigation and monitoring controls, are identified in this CEMP and its supporting documentation.

The implementation of the requirements of the CEMP will ensure that the construction phase of the project is carried out in accordance with the commitments made by Kildare County Council for the proposed development, and as required under the planning application. Once commenced, the CEMP is considered a living document that will be updated according to changing circumstances on the project and to reflect current construction activities. The CEMP will be reviewed on an ongoing basis during the construction process and will include information on the review procedures.

CEMP contains the following supporting environmental documents:

Appendix A	Natura Impact Statement – Mitigation Measures
Appendix B	Statutory Planning Consent including any additional Environmental commitments
Appendix C	Environmental Operating Plan
Appendix D	Incident Response Plan

2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Project Description

O'Hanrahan Bridge is located in the urban centre of New Ross, in Co. Wexford, where it carries the single carriageway R723 Regional Road over the River Barrow. The river forms the boundary between County Wexford and County Kilkenny for the most part. The catchment includes a considerable amount of arable land, as well as pasture, woodland and large towns such as New Ross.

The primary function of the proposed development is to provide a shared pedestrian and cycleway from the New Ross quay front to Rosbercon Quay on the north-western side of the bridge, that is accommodated along the widened section of O'Hanrahan Bridge.

O'Hanrahan Bridge is a 9-span post-tensioned concrete beam and reinforced concrete slab bridge over the River Barrow in New Ross town, Co. Wexford. The overall length of the bridge is 175m with an out-to-out width of 11.6m. The proposed works aim to widen the bridge deck by approx. 1m in order to accommodate an enhanced combined pedestrian and cycleway. The widening works are to take place on the southern side of the bridge through the replacement of the existing bridge deck cantilever and parapet edge beam. As a result, the instream piers will not be affected. However, in order to tie the new widened section into the quays at the eastern end and ensure continuity of the new cycleway, the scheme requires for an approx. 20m long section of the existing quay wall on the south-east corner of the bridge to be reconstructed up to 2m out from the existing quay wall. This section will require working instream. Similarly, approx. 60m section of the south-west corner of the bridge will require widening works by approximately 1m out from the existing wall. The length of new sheet piles in front of the wingwalls will be approximately 19m, of which 5m will be located directly in the river. The remaining 41m of new wall will be constructed in front of the existing flood wall, all driven at the top of the embankment above the water level.

In addition, the edge beam on the northern side of the bridge will be strengthened to accommodate upgrading of the existing parapet. The existing surfacing and footways will be removed to allow the provision of bridge deck waterproofing and joint replacements before the widened footways are constructed and carriageway surfacing reinstated. The works will involve a number of service diversions and upgrades in both footways. Finally, it is also proposed to replace the existing bridge lighting.

Furthermore, concrete repair works will be undertaken on the existing bridge in areas where minor concrete defects are identified.

2.1.1 Overview of the activities on site

The construction programme for the proposed development is approximately 36 weeks (9 months).

- Site setup and establishment of construction compound;
- Ground Investigations (GI);
    - GI works will be undertaken in the area of the southeast and southwest quay wall to inform the design of the proposed sheet pile wall. The works will consist of a trial pit (TP01) and three river boreholes (BH01, BH02 and BH03).

- Widening of the bridge deck (southern side);
    - The widening of the southern side of the bridge will consist of approx. 1m wide reinforced concrete cantilever slab that will be made integral with the existing deck slab. The cantilever slab will include an upstand edge beam to support the proposed new N2 parapet.
- Widening of the quay/wing walls (south-east corner);
    - The quay wall will be extended by up to 2m on the south-east corner to facilitate the transition from the widened southern part of the bridge to the existing quay wall on the eastern side of the bridge. A sheet pile wall will be installed up to 2m from the face of the existing quay wall. Installation of the sheet piles will be completed via a piling rig from a river barge. The existing flood defence wall will be taken down below footway level and the space between the sheet pile wall and the front face of the existing quay wall will be filled with compacted fill material.
- Widening of the quay/wing walls (south-west corner);
    - The quay wall will be extended by approximately 1m on the south-west corner to facilitate the transition from the widened southern part of the bridge to the existing quay wall on the western side of the bridge. A sheet pile wall will be installed 1m from the face of the existing southern wingwall. Installation of the sheet piles will be completed via a piling rig either from the landside or from a river barge. The existing flood defence wall will be taken down below footway level and replaced by a matching flood defence wall along the line of the widened quay wall. These will be supported by a new reinforced concrete capping beam on the sheet piles. The new sheet piled wing wall will be tied back to the existing quay wall and backfilled with compacted fill material.
- Replacement of northern parapet;
    - The existing parapets are approximately 1m high and will be replaced with 1.4m high N2 containment level parapets in accordance with DN-REQ-03034. The parapet edge beam on the northern side of the bridge will be reconstructed to facilitate the higher containment parapet.
- Resurfacing and waterproofing of bridge deck;
    - To facilitate the waterproofing of the bridge deck, the existing road surface will be excavated to expose the top of the bridge deck. The deck surface will be prepared, and multiple layers of waterproofing membrane will be applied to the surface. New road surfacing material will be laid, and footpaths will be reconstructed.
- Installation of expansion joints;
- Concrete repairs to underside of the bridge;
- Relocation of underground utilities, where required;
- All ancillary works.

2.2 Construction Programme Sequence

The construction methodology is preliminary and subject to change following the detailed design and preparation of the CEMP by the appointed Contractor. Access to and across O'Hanrahan Bridge will be maintained throughout the construction phase. However, there will be unavoidable restrictions to single lane traffic which KCC will endeavour to keep to a minimum to avoid significant impacts. These will be detailed as part of the CEMP which will be developed by the Contractor and agreed with Kildare County Council at contract award stage.

The works are expected, subject to An Bord Pleanála approval, to commence in late 2023, with construction likely to be approximately 9 months in duration.

2.2.1 Construction sequence and methodology

The works will consist of the widening and upgrade of the main bridge itself, and the construction of the southeast and southwest quay wall. Due to the length of the bridge, and the need to keep traffic open with at least one lane open at all times, it is likely that the work will consist of at least four phases on the bridge itself and a possible fifth phase for the quay walls. The proposed works will be undertaken on a live carriageway and will necessitate the use of lane closures and potential night works to complete the construction. Refer to traffic management drawings for details of traffic management phasing.

Ground Investigations

A separate GI contract will be carried out prior to the commencement of the main works. GI river works will be undertaken in the following sequence (river borehole):

- Drilling equipment and personnel to be loaded onto jack-up barge at access point as agreed with the Client;
- The drilling rig will be positioned and secured over the moon pool (an opening inside the barge);
- Geotextile membrane will be placed on the working area;
- Absorbing padding and drip tray will be positioned beside/below rig engine;
- Positioning of barge and securing of jack-up legs once GPS location has been confirmed;
- Drilling will be carried out at low tide only using geobor-s rotary drilling and sample recovery of rock and soil;
- Once the scheduled depth is reached and upon approval from the Engineer, the drilling will stop, the barge will be positioned and secured at the next location and the process will be repeated.

GI road works will be undertaken in the following sequence (road trial pit):

- Appropriate Road Opening License (ROL) will be applied and received before commencing of the works;
- Traffic management will be implemented;
- The engineer will CAT scan the location of the works and marking the trace of any services;
- The excavator will locate into position and excavating to the required depth;
- If services are encountered impeding or preventing the full excavation of the trial pit relocation may be required;
- Excavated material will be logged and sampled for laboratory testing;
- Backfilling will be carried out immediately after the completion of the excavation.

Main bridge work sequencing

(1) Implement traffic management measures and lane closures for south-eastern side of bridge;

(2) Implement protective measures to prevent debris entering the river;

(3) Remove existing footpaths, road surfacing, waterproofing, expansion joints whilst protecting / diverting existing services and expose concrete deck;

(4) Remove existing lighting columns, parapets and breakout parapet edge beam and deck cantilever;

(5) Construct new widened cantilever slab, edge beams and lighting column corbels. Scaffolding to construct this slab will be propped/cantilevered off the existing bridge structure;

(6) Carry out concrete deck repairs where necessary;

(7) Install new parapets and lighting columns;

(8) Install new waterproofing;

(9) Construct new footpath/cycleway and drainage system;

(10) Install new carriageway surfacing and expansion joints;

(11) Switch traffic management to south-western end of bridge and repeat steps 2 to 11;

(12) Switch traffic management to north-eastern end of bridge;

(13) Implement protective measures to prevent debris entering the river, such as the use of silt-screens to trap and arrest any falling debris;

(14) Remove existing footpaths, road surfacing, waterproofing, expansion joints whilst protecting / diverting existing services and expose concrete deck;

(15) Divert existing watermain on northern side of bridge to southern side;

(16) Remove existing lighting columns, parapets and breakout parapet edge beam;

(17) Construct new edge beams and lighting column corbels;

(18) Carry out concrete deck repairs where necessary;

(19) Install new parapets and lighting columns;

(20) Install new waterproofing;

(21) Construct new footpath and drainage system;

(22) Install new carriageway surfacing and expansion joints;

(23) Switch traffic management to north-western end of bridge and repeat steps 14 to 24;

(24) Redivert watermain to northern side of bridge;

(25) Remove traffic management;

(26) Undertake concrete repairs to bridge abutments, piers and underside of deck as necessary;

(27) Remove protective measures in river.

Construction sequence of southeast quay wall

(1) Procurement of sheet piles and traffic management set up;

(2) Mobilisation of piling rig;

(3) Transportation of structural steelwork to lay down area;

(4) Installation of sheet piles to required embedded depth (approx. 22 linear m in length);

(5) Back-filling behind newly installed sheet piles with compacted granular 6N/P fill (approx. 150m^3), monitoring for movement;

(6) Following the installation of the sheet piled wall, scaffolding will be erected to facilitate the construction of the reinforced concrete capping beam (new flood

wall). The scaffolding will be cantilevered off of the sheet pile in order to avoid further instream work and also to prevent any concrete spillage or debris from entering the river;

(7) Erect formwork for reinforced concrete capping beam and tie reinforcement steel;

(8) Pour in-situ concrete for new capping beam and upstand wall to match existing flood defence wall (approx. 40m^3 of concrete);

(9) Take down existing flood defence wall to below footpath level (reuse existing stonework where possible);

(10) Completion of footway pavement and erection of stone cladding to new flood defence wall (approx. 10m^3 of stonework);

(11) Removal of traffic management.

Construction sequence of southwest quay wall

(1) Temporary removal of existing rock armour using an excavator;

(2) Procurement of sheet piles and traffic management set up;

(3) Mobilisation of piling rig;

(4) Transportation of structural steelwork to lay down area;

(5) Installation of sheet piles to required embedded depth (60 linear m);

(6) Back-filling behind newly installed sheet piles with compacted granular 6N/P fill (approx. 100m^3) and reinstatement of rock armour, monitoring for movement;

(7) Erect formwork for reinforced concrete capping beam and tie reinforcement steel;

(8) Following the installation of the sheet piled wall, scaffolding will be erected to facilitate the construction of the reinforced concrete capping beam (for new flood wall and parapet). The scaffolding will be cantilevered off of the sheet pile in order to avoid further instream work and also to prevent any concrete spillage or debris from entering the river;

(9) Pour in-situ concrete for new capping beam and upstand wall to match existing flood defence wall (approx. 60m x 1.5m^2 = 90m^3 of concrete);

(10) Install new N2 parapet;

(11) Take down existing flood defence wall and existing parapet to below footpath level (reuse existing stonework where possible);

(12) Completion of footway pavement and erection of stone cladding to new flood defence wall (approx. 10m^3 of stonework);

(13) Removal of traffic management.

Piling Methodology

- Piling is anticipated to be carried out from a jack-up barge positioned in the River Barrow to avoid disruptions to traffic and costly traffic management. The barge will carry a crane and/or long reach excavator equipped with a vibratory hammer that drives piles into the ground by vibration. In case of reaching a lower pile toe level than specified, impact driving may be required. The stack of sheet piles will be placed on an additional pontoon placed next to the barge, from a loading / unloading point on the west side of the River Barrow either at the marina, or on lands south of the bridge.

- Piling works will start from the southern end and progress towards the south-eastern abutment. It is proposed to complete the closing sheet pile at low tide so as to reduce impacts on aquatic species (i.e., avoid trapping fish).
- The work process involves the barge anchoring and stabilising itself, for which the barge shall be repositioned during high tide. Similarly, all the necessary material and personnel shall be transported during high tide.
- The pile is lowered to a position and the vibrating clamp is attached to the head of the pile. The vibrations generated by the vibratory hammer drive the pile into the ground. The vibration and noise generated by this process are continuous during the driving time but are less than those induced by impact driving. With the extent of piling works limited to approximately 20-25m in length, barge relocations are anticipated to be minor, or not required.
- The sheet pile alignment is set so that the back side of the sheet piles is at a distance of approximately 1m from the front face of the existing quay wall. Localised obstacles such as dislodged blocks in the mudflats will be removed by an excavator bucket prior to piling works.
- It is envisaged that piles will be embedded into the upper layer of weathered rock or dense gravels anticipated at ca. 15-20m below ground level (to be confirmed by the ground investigation). Sheet piles will meet the required top of wall level matching the existing quay wall level.
- The construction is assumed to be carried out during normal working hours (daytime), 6 days a week. The estimated timeframe for 20-25m sheet pile driving is approximately 4 weeks. This excludes set up and other activities on site, either prior to, or after pile driving. The piling will occur intermittently throughout the day, with the remainder of the time spent on ancillary processes such as setting up the barge, positioning the piles, checking tolerances, delivering material and personnel, and similar.

Piling durations to satisfy environmental requirements

The following general procedure will be followed for any pilling activities ("piling event" means any period of continuous piling; "quiet period" means any period in which there is no piling by any rig):

- Piling works shall not be undertaken between the 1st of April and the 31st May;
- There shall be no night-time piling;
- Vibratory piling shall be the standard method for the installation of all piles. Impact piling shall only be employed where the required pile toe level cannot be achieved by vibratory piling
- The duration of any vibratory piling event shall not exceed 180 piling minutes,
- The length of any impact piling event shall not exceed 200 strikes;
- Following every piling event, there shall be a quiet period of at least 30 minutes. Only following 30 minutes of no piling whatsoever can the cumulation of piling minutes be re-zeroed.

The above limitations apply to all piling activity for the proposed widening of the quay wall.

Based on the time expected to be required for the installation of each pile (including ancillary processes), the limits prescribed above will not prolong the proposed programme for riverside or landside piling.

Resurfacing and waterproofing of bridge deck

- To facilitate the waterproofing of the bridge deck, the existing road surface will be excavated to expose the top of the bridge deck;
- The deck surface will be prepared, cleaned and primed;
- Multiple layers of a waterproofing membrane will be applied to the surface;
- An adhesive coating will be applied to ensure the new material will stick;
- New (narrower) road surfacing material will be laid and rolled and footpaths will be reconstructed; and
- Road markings will be reapplied.

Concrete repairs to Piers, Abutments and Deck Soffit

- Concrete repairs will be carried out where minor areas of defective concrete are identified;
- Defective concrete will be broken out by handheld drill/impact hammer or other specified method; and
- The exposed surfaces will be suitably primed, and an approved proprietary prebagged repair mortar/concrete will be placed by hand and allowed to dry.
- Protective measures will be in place at all times during construction to prevent debris from falling into the river.

Table 2-2 Construction Programme

Construction Element	Approx. Duration of each task
Mobilisation, compound set up	2 weeks
Works on southern side of bridge	Approx. 4 months
Works on northern side of bridge	Approx. 4 months
Works on southeast quay wall*	Approx. 2 months (incl. 4 weeks of pile-driving)
Works on southwest quay wall**	Approx. 2 to 2.5 months (incl. 4 to 6 weeks of pile driving)
Concrete repairs to underside of bridge*	4-6 weeks
Total Construction Phase	**Approx. 9 months**
***** These works can be carried out in parallel with the main bridge works ****** these works can be carried out following completion of the southeast corner and in parallel with the main bridge widening works	

2.2.2 Working Hours

The permitted working hours arising from construction works is as shown in the following table. The Contractor may propose night-time works outside of these hours provided it is agreed with Kildare County Council. On O'Hanrahan bridge, night works will likely be confined to the eastern half and underside of the structure only due to the close proximity of residential apartments on the western side.

Table 2-3 Working Hours

Period	Hours
Mon to Thurs	08:00 - 19:00

Period	Hours
Mon to Thurs (where evening working is approved by KCC)	19:00 - 22:00
Fri	08:00 - 17:00
Sat	08:00 - 16:00
Sun and Bank Holiday	not permitted

2.2.3 Sourcing of Materials

All imported material will be sourced from the nearest possible locations. Concrete, backfill and surfacing materials can be found from a number of manufacturers / quarries locally.

Only those quarries that conform to all necessary statutory consents will be used in the construction phase.

It is assumed that the Contractor will source the sheet piles directly from the manufacturer/supplier. While Irish-based sheet pile suppliers exist, there is a greater range of sheet piles from the manufacturers/suppliers that exist in the UK.

2.2.4 Temporary Construction Compound

The temporary construction compound will be set up and maintained by the successful Contractor. The construction compound and the associated temporary access road will be located within lands on the west side of the River Barrow, with access onto the R704 Regional Road as shown in Figure 2-1 below, and in Drawing No. WBRC-ROD-ENV-S101-DR-CB-30016 in Appendix A. The lands are in the ownership of Wexford County Council.

At the time of writing, these lands are used as a construction compound for the separately proposed South East Greenway project which will be completed prior to the commencement of the construction phase for the proposed development.

Figure 2-1 Location of the Construction Compound

2.2.5 Construction Traffic Management

Temporary traffic management arrangements are to be implemented to facilitate ongoing access to construction access points throughout the works.

The following restrictions will be adhered to unless agreed otherwise with Kildare County Council:

- The Contractor shall provide and maintain temporary traffic management in accordance with the Department of Transport Traffic Signs Manual.
- Access to local properties shall be maintained at all times. Works to any accesses shall be planned in consultation with the property owners to minimise disruption.
- Existing footways and cycle tracks shall be maintained at all times except where such footways and cycle tracks are at the point of being removed for the completion of the works. In such circumstances, the Contractor shall provide temporary footpath or cycle track diversions, with sufficient advance signage informing people of the diversions.
- Fuel for vehicles will be stored in a mobile double skinned tank.
- The contractor will be required to submit a Construction and Demolition (C&D) Waste Management Plan to Kildare County Council for approval which should address all types of material to be disposed of.
- Roads used by construction traffic will be monitored visually and a road sweeper used to remove debris from construction activities when required.

- Loads of materials leaving site shall be assessed and covered where necessary to reduce dust impacts.
- Development of a detailed construction programme that gives consideration to traffic flows and aims to avoid coincidentally high volumes of traffic using the same roads where possible.
- The Contractor shall allow for variable message signs (VMS) in accordance with Chapter 8 paragraph 8.2.4 of the Traffic Signs Manual on approach routes affected by traffic management measures, restrictions or road closures.
- The Contractor shall liaise with the Roads Authority in respect of any temporary road closures, lane closures, and other traffic management controls required to be carried out to ensure the safety of the workforce and the general public during the duration of the works.
- Where floodlighting of the works area is required in poor daylight conditions, the positioning of the lighting units must not be such as to cause glare to drivers.

Visual inspections will also be undertaken and recorded at regular, frequent intervals, to ensure that the existing road infrastructure remains in an acceptable condition throughout the duration of construction activities or should evidence of any defects arise during the construction period, remedial actions and/or works can be put in hand forthwith. Wheel washes for construction vehicles will be provided (if necessary) at the development site to prevent mud and dust being brought onto the public road. The site entrance and the immediate approach roads will be monitored and swept clean when necessary.

Construction vehicles and site personnel will be required to adhere to the approved access routes and timing restrictions. Construction plant, equipment and vehicles will be parked onsite. No vehicles associated with the proposed development will be parked on the public roads.

3. CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

This CEMP will be used to develop the CEMP by the Contractor to meet the requirements of ISO 14001 and all site works will be undertaken in compliance with the CEMP. The CEMP will include details of the topics listed below:

- Environmental Policy;
- Environmental Aspects Register;
- Project Organisation and Responsibilities;
- Project Communication and Co-ordination;
- Training;
- Operational Control;
- Checking and Corrective Action;
- Environmental Control Measures; and
- Complaints Procedure.

The CEMP will detail all the environmental aspects and impacts associated with this contract such as waste management, pollution prevention and protection of flora and fauna with particular emphasis on the nearby Special Area of Conservation (SAC), Special Protection Area (SPA), proposed Natural Heritage Area (pNHA) and water quality in the watercourses. The Register of Impacts provides the framework for identifying the potential environmental impacts generated by construction and the associated works. The Environmental Operational Control Procedures and activity-specific method statements will detail the working methods necessary for managing and mitigating these impacts, whether it is by prevention or mitigation. Prior to the commencement of construction activities, the Environmental Operational Control Procedures and activity-specific method statements will be completed so as to conform to precise site-specific requirements at the location of the proposed O'Hanrahan Bridge Widening.

3.1 Environmental Policy

The Contractor will complete an Environmental Policy with consideration for impacts on the natural and built environment. All project personnel will be accountable for the environmental performance of the Project and will be made aware of the Environmental Policy at induction. The Environmental Policy will consider and make commitments with regard to the protection of Natura 2000 sites, and any pNHA and/or Natural Heritage Area (NHA) sites, emissions to the atmosphere, maintenance of water quality, resource usage, energy consumption and waste management.

3.2 Environmental Aspect Register

Once appointed, the Contractor will prepare a register of all sensitive environmental features which have the potential to be affected by the construction works, together with details of commitments and agreements made during the preparation of the Planning Report and Natura Impact Statement (i.e., any conditions that may be imposed by An Bord Pleanála) and the contract documentation, with regards mitigation of potential environmental impacts.

The Environmental Aspects Register provides the relevant information for the preparation of construction method statements and will be regularly updated during the works.

The Environmental Aspects Register will consider sensitive environmental features as listed below (please note this list is not exhaustive and will be amended and expanded upon as required by the Contractor):

- Identification of all waterways and drainage outlets for the protection against ingress of suspended solids or any pollutant;
- Air emissions;
- Noise emissions
- Vibration emissions;
- Light emissions;
- Waste generation;
- Treatment of contaminated materials;
- Treatment of invasive species;
- Use of hazardous materials;
- Energy usage;
- Water usage;
- Discharge of wastewater;
- Traffic generation;
- Biodiversity (terrestrial and aquatic ecology);
- Landscape and Visual impacts;
- Soils, Geology and Hydrogeology;
- Hydrology; and
- Archaeology, Architectural and Cultural Heritage.

3.3 Project Organisation and Responsibilities

The Contractor's CEMP will define the roles and responsibilities of the project team. The Contractor is responsible to ensure that all members of the Project Team, including sub-contractors, comply with the procedures set out in the CEMP. The Contractor will ensure that all persons working on site are provided with sufficient training, supervision and instruction to fulfil this requirement.

Key staff will be notified of their appointment and confirm that their responsibilities are clearly understood.

The principal environmental responsibilities for key staff can be identified in the following sections.

3.3.1 Project Manager

The Project Managers main duties and responsibilities in relation to the CEMP include liaising with the Project Team in assigning duties and responsibilities in relation to the CEMP to individual members of the main contractor's project staff.
It is the responsibility of the Project Manager to approve key personnel required for employment on the project. He/She will liaise with the site Environmental Manager.

The Project Manager will lead the works on site. He/She will be responsible for the management and control of the activities and will have overall responsibility for the implementation of the CEMP. He/She will be assisted by the site Environmental Manager who will act as his/her deputy.

3.3.2 Site Manager

The Site Manager's environmental management responsibilities include, but are not limited to:

- Liaise with the site Environmental Manager and the Project Team in assigning duties and responsibilities in relation to the CEMP, to individual members of the main contractor's project staff;
- Liaising with Site Manager in preparing, reviewing and updating all site-specific method statements for activities where there is a risk of pollution or adverse effects on the environment;
- Liaising with the site Environmental Manager in agreeing site specific Method Statements with Third Parties;
- Ensuring that all relevant information on project programming, timing, construction methodology, etc., is communicated from the contractor's Project Team, including the Project Manager, to the site Environmental Manager in a timely and efficient manner in order to allow pre-emptive actions relating to the environment to be taken where required;
- Ensuring that the risk assessments for control of noise and environmental risk are prepared and effectively monitored, reviewed and communicated on site;
- Close liaison with the site Environmental Manager to ensure adequate resources are made available for implementation of the CEMP; and
- Ensuring that the site Environmental Manager reviews all method statements, performs regular and frequent environmental site inspections and that relevant environmental protocols are incorporated and appended.

3.3.3 Environmental Manager

In order to ensure the successful development, implementation and maintenance of the Environmental Operating Plan (EOP), the Contractor will be required to appoint an independent site Environmental Manager to provide independently verifiable audit reports.

The site Environmental Manager must possess sufficient training, experience and knowledge appropriate to the nature of the task to be undertaken, a Level Eight qualification recognised by the Higher Education and Training Awards Council (HETAC), or a university equivalent, or other qualification acceptable to the Employer, in Environmental Science or Environmental Management, Environmental Hydrology, Engineering or other relevant qualification acceptable to the Employer.

Separate from the on-going and detailed monitoring carried out by the contractor as part of the EOP, the EM shall carry out the inspection/ monitoring regime described below, and report to the Contractor. The results will be stored in the site Environmental Manager's monitoring file and will be available for inspection/ audit by the Client, National Parks and Wildlife Service (NPWS) or Inland Fisheries Ireland (IFI) staff. All inspections/ monitoring/ results will be recorded on standard forms.

The responsibilities of the site Environmental Manager include, but are not limited to:

- Ensuring that the CEMP is finalised, implemented and maintained;

- Liaising with Site Manager in preparing, reviewing and updating all site-specific method statements for activities where there is a risk of pollution or adverse effects on the environment;
- Liaising with Site Manager in agreeing site specific Method Statements with Third Parties;
- Being familiar with the information in the pre-construction surveys, construction requirements, An Bord Pleanála and Planning Service decisions and all relevant Method Statements;
- Being familiar with the contents, environmental commitments and requirements contained within the reference documentation listed in the CEMP;
- Being familiar with the baseline data collated during the compilation of the EIAR and the NIS;
- Assisting Management in liaising with the Engineers and Kildare County Council and the provision of information on environmental management during the construction of the project;
- Liaising with the Site Manager and the Project Team in assigning duties and responsibilities in relation to the EOP, to individual members of the main Contractor's project staff;
- Overseeing, ensuring coordination and playing a lead role in third party consultations required statutorily, contractually and in order to fulfil best practice requirements;
- Ensuring that all relevant works are undertaken in accordance with the relevant legislation in the Republic of Ireland;
- Liaising with the designated licence holders and specific agent defined in the licence with respect to licences granted pursuant to the Wildlife Acts 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011;
- Bring any legal constraints that may occur during certain tasks to the attention of management;
- Hold copies of all permits and licenses provided by waste contractors;
- Ensuring that any operations or activities that require certificates of registration, waste collection permits, waste permits, waste licences, etc have appropriate authorisation;
- Gathering and holding documentation with respect to waste disposal;
- Keeping up to date with changes in environmental practices and legislation and advising staff of such changes and incorporating them into the CEMP;
- Liaising with contactors and consultants prior to works;
- Procuring the services of specialist environmental contactors when required;
- Ensuring that all specialist environmental contactors are legally accredited and proven to be competent;
- Coordinating all the activities of the specialist environmental contractors;
- Ensuring that environmental induction training is carried out on all personnel on site and ensuring that toolbox talks include aspects of environmental awareness and training;
- Respond to all environmental incidents in accordance with legislation, the CEMP and company policy/procedures;

- Responsible for notifying the relevant statutory authority when environmental incidents occur and producing the relevant reports as required;
- Ensuring that all relevant works have (and are being carried out in accordance with) the required permits, licenses, certificates and planning permissions;
- Carrying out regular documented inspections of the site to ensure that work is being carried out in accordance with the Environmental Control Measures and relevant site-specific Method Statements;
- Preparing and being ready to implement at all times the Emergency Incident Response Plan; and
- Responsible for reviewing all environmental monitoring data and ensuring that they all comply with stated guidelines and requirements.
- For more detailed list of duties refer to the EOP contained in Appendix C to this CEMP.

3.3.4 Design Manager

The main duties and responsibilities of the Design Manger include:

- Be familiar with the CEMP and relevant documentation referred to within;
- Be familiar with the contents, commitments and requirements contained within the reference documents; and
- Participate in Third Party Consultations and liaising with third Parties through the site Environmental Manager.

3.3.5 Site Agents

The Site Agents are responsible for the following:

- Ensuring Forepersons under his/her control adhere to the relevant Environmental Control measures and relevant site-specific Method Statements, etc.
- Ensuring that the procedures agreed during third party consultations are followed;
- Reporting immediately to the site Environmental Manager any incidents where there has been a breach of agreed environmental management procedures, where there has been a spillage of a potentially environmentally harmful substance, where there has been an unauthorised discharge to ground, water or air, damage to habitat, etc.
- Attending environmental review meetings and preparing any relevant documentation as required by Management.

3.3.6 Forepersons

The Forepersons on site are responsible for the following:

- Ensuring personnel under his/her control adhere to the relevant environmental control measures and relevant site-specific Method Statements;
- Reporting immediately to the site agents and site Environmental Manager any incidents where there has been a breach of agreed procedures e.g. spillages and discharges.

3.3.7 Employer's Representative

Name: [To be inserted by successful contractor]

Duties and Responsibilities

The Employer's Representative (ER) acts on behalf of the Employer during the course of a construction project. The EOP will be audited by the Employer's Representative to ensure that the Contractor is compliant with the environmental provisions of the Contract Documents.

3.3.8 Project Supervisor Construction Stage

The role of the Project Supervisor Construction Stage (PSCS) is to manage and co-ordinate health and safety matters during the construction stage. The PSCS will be appointed before the construction work begins and will remain in that position until all construction work on the project is completed.
It is the responsibility of the PSCS to ensure that the project:

- is designed and is capable of being constructed to be safe and without risk to health;
- is constructed to be safe and without risk to health;
- can be maintained safely and without risk to health during subsequent use; and
- complies in all respects, as appropriate, with the relevant statutory provisions.

The PSCS will maintain contact with the Project Supervisor Design Process (PSDP) throughout the construction phase to communicate any health and safety related issues. The PSDP will prepare a written safety file appropriate to the characteristics of the project, containing relevant health and safety information, to be taken into account during any subsequent construction work following completion of the project.

3.3.9 All Project Personnel

All project personnel have the following responsibilities:

- Reporting any operations and conditions that deviate from the CEMP to the Site Agent and site Environmental Manager. Depending on circumstances it may be appropriate for general operatives and machinery operators to report directly to their Foreperson who will then report to the site Environmental Manager and Site Agent;
- Taking an active part in site safety and environmental meetings;
- Ensuring awareness of the contents of method statements, plans, supervisors' meetings or any other meetings that concern the environmental management of the site; and
- Attend environmental training as required.

3.3.10 Ecological Clerk of Works (ECoW)

In order to ensure the successful development and implementation of the CEMP, the Contractor will appoint an independent Ecological Clerk of Works (ECoW). The ECoW must possess training, experience and knowledge appropriate to the role, including:

- An NFQ Level 8 qualification or equivalent or other acceptable qualification in ecology or environmental biology; and,
- Demonstrable experience in the protection of European sites.

The principal functions of the ECoW are:

- To provide ecological supervision of the construction of the proposed development and thereby ensure the full and proper implementation of all the mitigation measures relating to biodiversity prescribed in the EIAR and NIS;

- To regularly review the outcome of the specialist hydroacoustic monitoring if being undertaken and, on that basis, make any necessary adjustments to the mitigation; and
- To carry out weekly inspections and reporting on the implementation of the Contractor's Biosecurity Protocol.

During the preparation of the Contractor's CEMP, the site Environmental Manager may, as appropriate, assign other duties and responsibilities to the ECoW.

In exercising his/her functions, the ECoW will be required to keep a monitoring file and this will be made available for inspection or audit by Kildare County Council, the NPWS or IFI at any time.

3.3.11 Project Archaeologist

The Project Archaeologist on site is responsible for the following:

- Relevant licences to the Department of Housing, Local Government and Heritage required for the project in advance of any construction work taking place and throughout the project as required;
- To supervise works in vicinity of known archaeological sites'; and
- To supervise any pre-construction archaeological survey works.

Section 26 of the National Monuments Act 1930 (as amended) requires that excavations for archaeological purposes must be carried out by suitably qualified and experienced archaeologists acting under an excavation licence. Inappropriate excavation of a heritage site could result in damage to, or destruction of, the integrity, setting or historical context of the site, contrary to the public interest.

3.3.12 Other

Subject to the environmental commitments / requirements, other environmental specialists will be employed as required during the construction works.

3.4 Training and Induction

3.4.1 Site induction

All employees and subcontractors involved on site will be given a comprehensive induction prior to commencement of the works. The environmental training and awareness procedure will ensure that staff are familiar with the principles of the CEMP, the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

This environmental training can be run concurrently with safety awareness training. Training will include:

- Overview of the Environmental Policy and Construction Environmental Management Plan, goals and objectives;
- Awareness in relation to risk, consequence and methods of avoiding environmental risks as identified within the Register of Aspects and with the planning conditions;
- Awareness of roles and individual environmental responsibilities and environmental constrains to specific jobs;

- Location of and sensitivity of Special Area of Conservations, Special Protection Areas, protected monuments, structures etc.
- Location of habitats and species to be protected during construction, how activities may affect them and methods necessary to avoid impacts.
- A record will be kept of a signed register on the project files of all attendees of the environmental induction.
- Toolbox talks based on specific activities being carried out will be given to personnel by the nominated project representative. These will be based on specific activities being carried out and will include environmental issues particular to the project, including the impact on bird populations and water quality namely:
- Oil/Diesel spill prevention and safe refuelling practice;
- Storage of materials including oil/diesels and cement;
- Emergency response processes used to deal with spills;
- Minimising disturbance to wildlife;
- Emergency response to include water pollution hotline to the EPA/Irish Rail for regulator response. Identification of registered / accredited spill cleanup company for oil etc.; and
- Consideration of importance of containment of vehicle washing, containments of concrete / cement / grout washout etc, bank protection using hessian to prevent excessive scour and mobilisation of suspended solids, maintenance of vegetation corridors etc.

3.4.2 Specific training and awareness

A project specific training plan that identifies the competency requirements for all personnel allocated with environmental responsibilities will be produced by the Contractor. Training will be provided by the Contractor to ensure that all persons working on site have a practical understanding of environmental issues and management requirements prior to commencing activities. A register of completed training is to be kept by the SEM. The Site Manager will ensure that environmental emergency plans are drawn up and the SEM will conduct the necessary training/inductions.

3.5 Project communication and co-ordination

Environmental issues and performance aspects will be communicated to the workforce on a regular basis. Weekly project meetings, which follow a set agenda incorporating the environment, will be held alongside overall management meetings.

All staff and sub-contractors involved in all phases of the project will be encouraged to report environmental issues.

3.6 Operational control

Site works will be checked against the CEMP requirements. Any mitigation measures that have been agreed with the Statutory Authorities, or are part of planning conditions, will be put into place prior to the undertaking of the works for which they are required, and all relevant staff will be briefed accordingly.

Method statements that are prepared for the works will be reviewed / approved by the Client Project Manager and where necessary, the relevant Environmental

Specialist. All method statements for works in, near or liable to impact on a waterway must have prior agreement with IFI and NPWS.

A Quality Management System (QMS) will also be put into operation for the project. Document control will be in accordance with this QMS and copies of all audits, consents, licences, etc will be finalised by the Site Environmental Manager and their team and kept on site for review at any time.

3.7 Checking and corrective action

Daily inspections of the site and the works will be undertaken to minimise the risk of environmental damage and to ensure compliance with the CEMP. Any environmental incidents are to be reported immediately to the Site Foreman. The Site Environmental Manager will undertake periodic inspections and complete an assessment of the project's environmental performance with regard to the relevant standards/legislation and the contents of the CEMP. Following these inspections, the Site Environmental Manager will produce a report detailing the findings which will be provided to the Client Project Manager and reviewed at the monthly project meeting.

3.8 Environmental control measures

Licensing requirements will be in place and specific procedures to manage the key environmental aspects of the project will be developed by the contractor prior to work commencing.

3.9 Complaints procedure

A liaison officer will be available to allow for member of the pubic or interested parties to make complaints about the construction works. The CEMP will contain details of the complaints procedures and a monitoring system will be implemented to ensure that any complaints are addressed, and satisfactory outcome is achieved for all parties.

4. ENVIRONMENTAL COMMITMENTS

Project environmental mitigation has been set out in the application documentation, in the Planning Report and Natura Impact Statement in particular, and will be detailed in the final CEMP, in accordance with this CEMP. The final CEMP will provide a framework for compliance auditing and inspection to ensure that these construction practices and mitigation measures, as set out in the Planning Report and the conditions in the planning approval, are adhered to. It should be noted that Section 4.1 of this CEMP details the key mitigation measures which are detailed in the Planning Report.

4.1 Mitigation Measures – Planning Report

The mitigation measures detailed in the following sections have been derived from the Planning Report. Mitigation measures for each environmental factor are divided into either the construction or operational phase of the proposed development.

4.1.1 Traffic and Transport

4.1.1.1 Construction Phase

As with any construction project, the contractors shall carry out a comprehensive Construction Traffic Management Plan (CTMP) in consultation with the local authority, Wexford Co. Co., before the commencement of the construction phase. The purpose of such a plan is to outline the measures to manage the expected construction traffic during the construction period and will be revised accordingly as works progress. The CTMP will also detail how facilities for existing road users will be maintained whilst construction operations are proceeding. The CTMP will ensure at least one footpath on O'Hanrahan Bridge always remains open and appropriate infrastructure and signage is provided to ensure the safe passage of pedestrian across the bridge, including people with mobility impairments.

4.1.2 Population and Human Health

4.1.2.1 Construction Phase

The mitigation and monitoring measures to be implemented for population and human health during the construction phase are as follows:

- A Construction Environmental Management Plan (CEMP) will be implemented as part of the construction stages to account for all works associated with the construction of the proposed development, including pre-construction site clearance works. This plan will ensure construction practices and measures are put in place to minimise any effects on road users.
- A Construction Traffic Management Plan (CTMP) will be submitted for approval to Kildare County Council by the appointed Contractor prior to the commencement of any construction works as part of the Environmental Management Plan. This plan will ensure that required diversions are put in place during temporary road closures and that temporary traffic works and road safety measures will be in place during the duration of the construction phase to minimise the impact on local road users. The CTMP will be required to minimise disruption to economic and residential amenities. The plan will ensure access is maintained along O'Hanrahan Bridge for vehicles, pedestrians, cyclists and economic operators at all times.
- An Environmental Operating Plan (EOP) will be implemented prior to construction works. This plan will outline procedures for the delivery of environmental mitigation measures and for addressing day-to-day

environmental issues that can arise from construction. The EOP will ensure that appropriate measures relating to working at heights and near water are implemented during the construction stages.

- In order to minimise air quality impacts, a Dust Management Plan will be implemented as outlined in Section 12 of the Planning Report.
- Noise and vibration mitigation measures are detailed in Section 13 of the Planning Report. A comprehensive Construction Environmental Management Plan, which includes adopting appropriate mitigation measures, will manage the risk of noise impacting the local community. The plan will outline stringent construction limits and guidelines to protect residential and commercial amenities, including the application of binding noise limits and hours of operation. These measures will ensure that noise and vibration impacts will be reduced to the greatest possible extent.
- All construction areas, including the proposed temporary construction compound, will be suitably fenced and screened, and access to the site will be limited to authorised personnel in the interest of public health and safety.
- Safe working practices, in accordance with the relevant legislation, will be in place during the construction phase to protect the workers and visitors to the construction sites.

With the application of the mitigation measures identified in this section, along with those specific mitigation measures related to Population and Human Health described in other sections of this report, no likely significant impacts are predicted during construction stage.

4.1.2.2 Operational Phase

There are no operational stage mitigation measures required for population and human health. The proposed development is aimed at pedestrians and cyclists use only.

4.1.3 Biodiversity

4.1.3.1 General Mitigation Measures

Mitigation by Avoidance

The proposed development minimises land-take from ecologically sensitive areas and has been constraints-led from the initial phase, through an iterative design process, and into the final proposed development. The design has followed the basic principles outlined below to eliminate the potential for impacts on Key Ecological Receptors where possible, and to minimise such impacts where total elimination is not possible. The proposed development has been designed to minimise direct or indirect impacts on any habitats or species or other ecological features that were classified as being of Local Importance (Higher Value) or above. The widening of the bridge deck and quay wall has been designed to avoid, as far as possible, direct, indirect or secondary adverse effects on European sites and other designated sites for nature conservation. All piling works within the river will avoid the periods between the 1st April and the 31st May as advised by IFI, in order to avoid impacts on European Eel, which migrate along banks during this time along with other fish species including Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon.

Mitigation by Design

The proposed development has been designed having regard to European and national legislation and all relevant guidelines in relation to ecology and engineering best practice for the planning and construction of developments. These guidelines

and best practice provide practical measures that can be incorporated into the design to minimise the impact and protect the receiving environment. The following is an overview of the design measures that will be employed to minimise and avoid significant impacts on the ecological receptors within the zone of influence.

- A Construction and Environmental Management Plan (CEMP), Environmental Operating Plan (EOP) and Incidence Response Plan (IRP) have been produced to ensure that the construction does not lead to any unanticipated negative impacts on the environment.
- Vibratory driven sheet piles forming the new quay wall have been selected as their installation is generally quieter than impact piling and minimises disturbance and land take from benthic habitats and mudflats. Noise levels from vibratory piling rise slowly, and for this reason vibratory piling is frequently employed as a mitigation measure where impact piling was originally proposed. In this case, while almost all piling is expected to be vibratory piling, impact piling shall only be employed where the required pile toe level cannot be achieved by vibratory piling. The length of any impact piling event shall not exceed 200 strikes.
- The proposed lighting columns will be of a similar height and spacing to the existing, will utilise the existing lighting duct in the footpath and will provide a lighting intensity similar to what is already in place. The lighting plan will be designed in accordance with *Bats and artificial lighting in the UK* (BCT, 2018). There will be ongoing disturbance impacts, although there will be no net-deterioration in terms of light spill onto the River Barrow as a result of the proposed development.
- The Contractor will appoint a Site Environmental Manager to carry out environmental monitoring and to ensure that the mitigation measures proposed in this planning report is followed.

Construction Phase

Artificial Lighting

As discussed in the assessment of impacts above, artificial lighting associated with the construction of the proposed development poses a risk of potential negative impacts on habitats and species within and adjacent to the River Barrow. Therefore, the following limits on construction lighting is proposed:

- Subject to any Health & Safety and/or navigational requirements, construction lighting over the river channel shall be turned off outside of working hours.
- Construction lighting shall be limited to the minimum area required to be lit and minimise light spill to areas not required for construction.

Given the implementation of the above measures, these works are unlikely to give rise to significant impacts beyond the duration of the works and, therefore, no additional mitigation is proposed in relation to these works.

Water Quality

As is normal practice with infrastructure projects, a Construction Environmental Management Plan (CEMP) has been prepared for the proposed development and are included in Appendix B of this Planning Report. These will be updated and finalised by the selected contractor to suit the detailed construction methodology and allocate responsibilities to individuals in the construction team. In doing so, the measures detailed in the appended reports will be considered minimum requirements to be considered and improved upon. The level of detail provided within the Plans is

sufficient to allow an assessment of the anticipated impacts including residual impacts.

The following will be implemented as part of this plan:

- An Environmental Operating Plan (EOP) (Appendix C of the CEMP) outlines procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of developments.
- An Incident Response Plan (see Appendix D of the CEMP) detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.
- All necessary permits and licenses for in-stream construction work for provision of the proposed development will be obtained prior to the commencement of construction.
- Inform and consult with the National Parks and Wildlife Service and Inland Fisheries Ireland.

During construction, cognisance will have to be taken of the following guidance documents for construction work on, over or near water.

- *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016).
- *C532 Control of water pollution from construction sites: guidance for consultants and contractors* (CIRIA, 2001).
- *CIRIA C648 Control of water pollution from linear construction projects: technical guidance* (CIRIA, 2006).
- *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes* (NRA, 2006).

Based on the above guidance documents, the following principal mitigation measures will be adhered to for the construction phase:

Sedimentation and surface water run-off

- Sheet piling for the new quay wall shall be installed prior to any excavation on the landward side and demolition of the existing quay wall boundary. This will form an effective barrier to run-off from the site during construction.
- Any material stockpiled shall be located a minimum of 30 m from the edge of the river and shall also be covered and remain stockpiled for as short a time as possible.
- The Contractors shall provide method statements for weather and tide/storm surge forecasting and continuous monitoring of water levels in Waterford Harbour and the removal of site materials, fuels, tools, vehicles and persons from flood zones in order to minimise the risk of input of sediment or construction materials into the river during flood events.
- The works area (including the site compound) will be limited to the minimum required to undertake the necessary elements of the project.
- Surface water flowing onto the construction area will be minimised through the provision of berms, diversion channels or cut-off ditches.
- Protection of waterbodies from silt load will be carried out through the use of gully silt/sediment filters and shallow berms in hardstanding areas to provide adequate treatment of runoff to watercourses.

- Settlement tanks/ponds, silt traps/bags and bunds will be used. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap.
- The anticipated site compound/storage facility will be fenced off at a minimum distance of 5 m from the top of the edge of the watercourse bank. Any works within the 10 m buffer zone will require measures to be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse. CEMP has been drafted and will need to be finalised by the appointed Contactor.
- Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with the TII document "*Guidelines for the crossing of watercourses during the construction of National Road Schemes*". All chemical and fuel filling locations will be contained within bunded areas and set back a minimum of 50 m from watercourses.
- Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner, off site, to prevent pollution.
- The construction discharge will be treated such that it will not reduce the environmental quality standard of the receiving watercourses.
- Water quality monitoring will be undertaken in the River Barrow, with weekly samples being taken from at least 2 months prior to commencement of construction until at least 4 months post-completion. Water samples will be taken from at least two locations. The final number and location of sampling points will be determined by the Site Environmental Manager. The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager on an ongoing basis during construction. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation will be undertaken to identify the source of this non-compliance and corrective action will be taken where the this is deemed to be associated with the proposed development.

Concrete Works

The use and management of concrete in or close to watercourses must be carefully controlled to avoid spillage which has a deleterious effect on water chemistry and aquatic habitats and species. As the use of concrete cannot be avoided, the following control measures will be employed:

- Hydrophilic grout and quick-setting mixes or rapid hardener additives shall be used to promote the early set of concrete surfaces exposed to water.
- When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used.
- Any plant operating close to the water will require special consideration on the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters.
- The weather forecast will be consulted prior to commencing concrete pours. No such works will be undertaken if inclement weather is forecast such that precipitation may make it difficult to maintain a dry working area.
- There will be no spills of concrete, cement, grout or similar materials hosed into surface water drains. Such spills shall be contained immediately and runoff prevented from entering the watercourse.

- Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses.
- On-site concrete batching and mixing activities will only be allowed at the identified construction compound areas.
- Washout from concrete lorries, with the exception of the chute, will not be permitted on site and will only take place at the construction compound (or other appropriate facility designated by the manufacturer).
- Chute washout will be carried out at designated locations only. These locations will be signposted. The Concrete Plant and all Delivery Drivers will be informed of their location with the order information and on arrival to site.
- Chute washout locations will be provided with an appropriate designated, contained impermeable area and treatment facilities including adequately sized settlement tanks. The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the construction stage settlement facilities) or alternatively disposed of as waste in accordance with the Contractor's Waste Management Plan.

Hydrocarbons and other chemicals (See also Section 9 of the Planning Report)

- Land-based vehicles and plant shall be refuelled off-site, where possible.
- All land-based fuelling of machinery shall be undertaken on an impermeable base in bunded areas at least 50 m from the edge of the river.
- Marine based fuelling will only be undertaken using specifically designed nozzles to prevent spillages and spill kits will be available.
- All fuelling equipment shall be regularly inspected and serviced.
- Any petrol- or diesel-fuelled pumps or other machinery shall be located within temporary bunded units.
- All fuel, oils, chemicals, hydraulic fluids, on-site toilets etc. shall be stored in the construction site compound, on an impermeable base which shall be bunded to 110% capacity and appropriately secured.
- All plant and construction vehicles shall be inspected daily for oil leaks and a full service record shall be kept for all plant and machinery.
- Spill kits shall be available on site during construction, including on the jack-up barge during pile driving.
- All waste oils, empty oil containers and hazardous wastes shall be disposed of in accordance with the Waste Management Act, 1996 (as amended).
- Owing to the presence of contaminants within the construction site, excavation shall be limited to the absolute minimum necessary.

Operational Phase

Artificial Lighting

During the operation of the proposed development, lighting columns will be of a similar height and spacing to the existing and will utilise the existing lighting duct in the footpath. The following mitigation measures will be integrated into the lighting design:

- Lighting outside the intended area of illumination will be minimised. Where light spill cannot be avoided, louvres, cowls or shields will be fitted to the columns.
- Lighting will be LED and have no upward light spill (apart from intentional up-lighting) and a sharp horizontal cut off.

- Lighting will be a warm-white colour of 2700K or less.

4.1.3.2 Specific Mitigation Measures

KER 1 River Barrow and River Suir, including Annex I 'Estuaries'

In addition to the mitigation measures described under construction and operational phase mitigation measures, the following measures will apply to KER 1.

KER 2 Intertidal Habitats, including Annex I 'Mudflats and sandflats not covered by seawater at low tide'

In addition to the mitigation measures described under construction and operational phase mitigation measures, the following measures will apply to KER 2.

KER 3 Migratory Fish and Marine Mammals

In addition to the mitigation measures described under construction and operational phase mitigation measures, the following measures will apply to KER 3.

The rationale for this mitigation is fully detailed in the NIS for the proposed development (included as part of this Planning Application).

Hydroacoustic Impacts

The mitigation for hydroacoustic impacts is as follows ("piling event" means any period of continuous piling by one or two rigs; "quiet period" means any period in which there is no piling by any rig):

- Piling works shall not be undertaken between the 1st April and the 31st May as advised by IFI during consultation.
- There shall be no piling between sunset and sunrise.
- Vibratory piling shall be the standard method for the installation of all piles. Impact piling shall only be employed where the required pile toe level cannot be achieved by vibratory piling.
- The duration of any vibratory piling event shall not exceed 180 piling minutes.
- The length of any impact piling event shall not exceed 200 strikes.
- An appropriate soft-start/ramp-up procedure shall be used for all impact piling events. Where it is possible according to the operational parameters of the equipment and materials concerned, the underwater acoustic energy output shall commence from a lower energy start-up (i.e., a peak sound pressure level not exceeding 170 dB re: 1µPa @1m) and, thereafter, be allowed to gradually build up to the necessary maximum output over a period of 20 – 40 mins.
- Following every piling event, there shall be a quiet period of at least 30 minutes. Only following 30 minutes of no piling whatsoever can the cumulation of piling minutes be re-zeroed.
- Rotary drilling will be the method used to drill the boreholes over other methods such as percussion drilling which give rise to higher levels of noise. Furthermore, these works will take place at low tide to allow for greater attenuation of noise within the mud in the absence of water. This mitigation will ensure that any hydroacoustic impacts will not give rise to a significant barrier to the movements of Twaite Shad or other species, or other significant effects on such species, in the Barrow Estuary as a result of the ground investigations.

KER 4 Otter

The mitigation measures outlined under general mitigation measures are sufficient to reduce any potential negative effects on Otter to slight, not significant or imperceptible levels. Therefore, no further specific mitigation is required for KER 4.

KER 5 Bat Species

The mitigation measures outlined under general mitigation measures are sufficient to reduce any potential negative effects on Bat species to slight or imperceptible levels. Therefore, no further specific mitigation is required for KER 5.

KER 6 Invasive Alien Species

In addition to the mitigation measures described under construction and operational phase mitigation measures, the following measures will apply to KER 6.

Terrestrial Plant Species

In order to minimise the risk of the introduction or spread of invasive alien plant species (IAPS) during construction, all land-based works shall be executed in accordance with best practice for biosecurity in construction. In particular, prior to commencement, the Contractor shall prepare a detailed Biosecurity Protocol describing his/her proposed approach to ensuring that IAPS are not imported or spread during the construction of the proposed development. The Biosecurity Protocol shall include, as a minimum, the following measures to prevent the spread of invasive species:

- Good construction site hygiene will be employed to prevent the introduction and spread of problematic IAPS by thoroughly washing vehicles prior to leaving any site.
- All plant and equipment employed on the construction site (e.g. excavators, piling equipment etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of IAPS.
- All washing must be undertaken in areas with no potential to result in the spread of IAPS, as detailed in the Construction Environmental Management Plan.
- Any soil and topsoil required on the site will be sourced from a stock that has been screened for the presence of any IAPS and where it is confirmed that none are present.
- All site staff shall be made aware of the Contractor's Biosecurity Protocol and receive training in the importance of good site biosecurity.

Aquatic Species

The use of barges during the construction of the proposed development poses the risk of introducing invasive alien species to the aquatic environment both in the vicinity of the works and in the wider Suir-Barrow-Nore Estuary. This has the potential to significantly affect the integrity of aquatic and intertidal habitats in the zone of influence.

In order to minimise the risk of either the introduction or spread of aquatic invasive alien species and thereby avoid negative impacts on these habitats, the owner or operator of the barge or barges shall provide documentary evidence (in the form of a completed and signed Marine Institute "*Cleaning and Disinfection Declaration Form*") that the vessel was fully de-fouled within the 6 months immediately preceding its engagement in the construction of the proposed development.

In relation to other construction activities the principles and appropriate measures in the IFI guidance document *Biosecurity Protocol for Field Survey Work* (IFI, 2010) shall be followed and shall form part of the Contractor's Biosecurity protocol.

4.1.3.3 Implementation

In order to give effect to the mitigation prescribed in the EcIA contained within Section 8 of the Planning Report, it should be a condition of any consent granted in respect of the proposed development that all of the mitigation, including monitoring and enforcement, prescribed in the EcIA be binding, during the construction phase, on the Contractor and, during operational phase, on Wexford County Council. Accordingly, all of the mitigation prescribed in the EcIA shall be transposed into the Contract Documents for the construction of the proposed development.

During construction, all works must comply with relevant legislation and guidelines in order to reduce and minimise environmental impacts and to protect all ecological receptors. In particular, there must be full compliance with the following:

- The CEMP.
- The Schedule of Commitments.
- The mitigation prescribed in the EcIA and in the NIS.
- Any conditions which might be attached to the proposed development's planning consent.
- Any requirements of stakeholders and statutory bodies, e.g. the NPWS and IFI, including:
    - *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016).
- All applicable legislative requirements in relation to environmental protection.
- All relevant construction industry guidelines, including:
    - *C532 Control of water pollution from construction sites: guidance for consultants and contractors* (CIRIA, 2001).
- Any biosecurity requirements arising from the preceding points.
- The Transport Infrastructure Ireland (TII) and National Roads Authority (NRA) Environmental Assessment and Construction Guidelines, specifically:
    - *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.*
    - *Guidelines for the Testing and Mitigation of the Wetland Archaeological Heritage for National Road Schemes.*
    - *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes.*
    - *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance.*
    - *Guidelines for the Treatment of Noise and Vibration in National Road Schemes.*
    - *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.*
    - *Management of Waste from National Road Construction Projects.*
    - *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.*

This list is non-exhaustive. All environmental commitments/requirements and relevant legislation and guidelines which are current at the time of construction will be followed.

4.1.4 Hydrology

4.1.4.1 Construction Phase

As is normal practice with infrastructure projects, an Environmental Operating Plan (EOP) and Construction Environmental Management Plan (CEMP) will be prepared for the scheme. These will be developed by the selected contractor to suit the detailed construction methodology and allocate responsibilities to individuals in the construction team. In doing so, the measures detailed in the appended reports will be considered minimum requirements to be considered and improved upon. The level of detail provided within the current drafts of the Plans is sufficient to allow an assessment of the anticipated impacts including residual impacts.

The following will be implemented as part of this plan:

- An Incident Response Plan (see requirements outlined in the CEMP) will be finalised by the contractor detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.
- All necessary permits and licenses for in stream construction work for provision of the flood defences will be obtained prior to the commencement of construction.
- During construction, cognisance will have to be taken of the following guidance documents for construction work on, over or near water.
- *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites* (Eastern Regional Fisheries Board).
- *Central Fisheries Board Channels and Challenges – The enhancement of Salmonid Rivers.*
- *CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors.*
- *CIRIA C648 Control of Water Pollution from Constructional Sites.*
- *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (TII, 2006).*

Based on the above guidance documents concerning the control of construction impacts on the water environment, the following outlines the standard mitigation measures that will be adhered to for the construction phase, in order to protect all catchments and watercourses from direct and indirect impacts.

Standard Mitigation Measures

- The works area (including the site compound) will be limited to the minimum required to undertake the necessary elements of the project.
- Surface water flowing onto the construction area will be minimised through the provision of berms, diversion channels or cut-off ditches.
- Protection of waterbodies from silt load will be carried out through the use of gully silt/sediment filters and shallow berms in hardstanding areas to provide adequate treatment of runoff to watercourses.

- Settlement tanks/ponds, silt traps/bags and bunds will be used. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap.
- The anticipated site compound/storage facility will be fenced off at a minimum distance of 5m from the top of the edge of the watercourse bank. Any works within the 10m buffer zone will require measures to be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse. This CEMP has been drafted and will need to be finalised by the appointed Contactor.
- Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with the TII document "*Guidelines for the crossing of watercourses during the construction of National Road Schemes*". All chemical and fuel filling locations will be contained within bunded areas.
- Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner, off site, to prevent pollution.
- The construction discharge will be treated such that it will not reduce the environmental quality standard of the receiving watercourses.
- Water quality monitoring will be undertaken in the River Barrow, with weekly samples being taken from at least 2 months prior to commencement of construction until at least 4 months post-completion. Water samples will be taken from at least two locations. The final number and location of sampling points will be determined by the Site Environmental Manager. The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager and Ecological Clerk of Works on an ongoing basis during construction. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation will be undertaken to identify the source of this non-compliance and corrective action will be taken where this is deemed to be associated with the proposed development.

Specific Mitigation Measures - Concrete Works

The use and management of concrete in or close to watercourses must be carefully controlled to avoid spillage which has a deleterious effect on water chemistry and aquatic habitats and species. As the use of concrete cannot be avoided, the following control measures will be employed:

- Hydrophilic grout and quick-setting mixes or rapid hardener additives shall be used to promote the early set of concrete surfaces exposed to water.
- When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used.
- Any plant operating close to the water will require special consideration on the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters.
- Placing of concrete in or near watercourses will be carried out only under the supervision of the Ecological Clerk of Works (ECoW).
- The weather forecast will be consulted prior to commencing concrete pours. No such works will be undertaken if inclement weather is forecast such that precipitation may make it difficult to maintain a dry working area.

- There will be no spills of concrete, cement, grout or similar materials hosed into surface water drains. Such spills shall be contained immediately and runoff prevented from entering the watercourse.
- Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses.
- On-site concrete batching and mixing activities will only be allowed at the identified construction compound areas.
- Washout from concrete lorries, with the exception of the chute, will not be permitted on site and will only take place at the construction compound (or other appropriate facility designated by the manufacturer).
- Chute washout will be carried out at designated locations only. These locations will be signposted. The Concrete Plant and all Delivery Drivers will be informed of their location with the order information and on arrival to site.
- Chute washout locations will be provided with an appropriate designated, contained impermeable area and treatment facilities including adequately sized settlement tanks. The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the construction stage settlement facilities) or alternatively disposed of as waste in accordance with the Contractor's Waste Management Plan.

Flooding

The Contractor will provide method statements for weather forecasting and continuous monitoring of water levels in the River Barrow. The Contractor will also provide method statements for the removal of site materials, fuels, tools, vehicles and persons from flood zones in order to minimise the risk to persons working on the site as well as potential input of sediment or construction materials into the river during flood events.

4.1.4.2 Operational Phase

There are no mitigation measures proposed for the operational phase of the proposed development.

4.1.5 Soils, Geology and Hydrogeology

4.1.5.1 Mitigation by Design

The construction works will be carried out with the least feasible disturbance of soils to avoid any requirement for excavation of in-situ ground and creation of waste.

The quantity of imported backfill for the gap between the sheet piles and the existing quay wall, is minimised by design, as the alignment of the sheet pile wall was carefully selected as close as possible to the existing wall without compromising wall stability or the proposed alignment.

4.1.5.2 Specific Mitigation Measures

Approximately 330m^3 of construction and demolition waste will be generated during the demolition of existing paving, pavement, parapets and footpaths which will be exported from site. The quantity is very small given the scale of the project, and will be disposed of by the contractor who will ensure that all subsurface materials excavated during the construction phase of the proposed development are managed in accordance with the relevant waste management legislation. The successful contractor will ensure that all subsurface materials are removed from the site and sent to authorised waste management facilities (i.e. which hold all relevant, valid permits / licences) which accept the corresponding types of waste. The contractor

will be required to submit a Construction and Demolition Waste Management Plan (CDWMP) to the local authority for approval, which will address all types of material to be disposed of. The contractor will undertake the environmental testing of the material to be disposed of in order to determine the waste acceptability characteristics.

All imported material will be sourced from the nearest possible locations. A number of suitable active quarries with all necessary statutory consents exist across County Wexford and southwest County Wexford, such as Oaklands Quarry in Ballykelly, New Ross. The mentioned quarry is accessible through R733 which links to the proposed development via R723. There may be other suitable quarries, in addition to the quarry identified above, that the Contractor may select as the source for construction materials. Only those quarries that conform to all necessary statutory consents may be used in the construction phase by the appointed Contractor.

A project-specific Construction Environmental Management Plan (CEMP) will be prepared for the development by the contractor. It will be maintained by the contractor for the duration of the construction phase. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures. As a minimum, the CEMP for the proposed development will be formulated in consideration of the standard best practice. The CEMP will include a range of site-specific measures which include:

- Safety measures for working from barges in-river, including but not limited to risk of pollutants from the machinery stationed on the barge and operating with bulk materials such as backfill gravel on the barge.
- Runoff will be controlled and treated to minimise impacts to groundwater and the River Barrow.
- Temporary storage of any contaminated material on-site shall be carefully managed so as to limit any risk of contaminated surface water runoff leaving the site or infiltrating to groundwater. Runoff from the material shall be directed to a lined pond or temporary sewer/tank and the water shall be disposed of off-site for treatment at an appropriate licenced facility in accordance with the relevant waste management legislation. Alternatively, the material shall be covered while stored to remove the risk of surface water contamination.
- All hazardous materials will be stored within secondary containment, designed to retain at least 110% of the storage contents. Temporary bunds for oil/diesel storage tanks will be used on the site during the construction phase.
- The successful contractor will ensure that spill kits and hydrocarbon absorbent packs are stored in the site compound, and that operators will be fully trained in the use of this equipment.
- The successful contractor will ensure that silt and sediment barriers are installed (and maintained in proper working order) at the perimeter of earthworks areas to limit transport of erodible soils to watercourses.
- Where soils are being excavated and removed from site, the successful contractor will ensure that dust generation will be avoided, by damping down material during excavation and loading onto trucks for off-site removal, if necessary.
- Safe materials handling of all potentially hazardous materials will be emphasised to all construction personnel employed during construction, including the usage of appropriate PPE.

- The successful contractor will prepare an Incident Response Plan (IRP) which outlines measures to be implemented to prevent and address spillages of hazardous substances.

4.1.6 Landscape and Visual

4.1.6.1 Construction Phase

No specific landscape and visual mitigation measures are deemed necessary for the temporary construction stage works because these will be minor and short-lived.

4.1.6.2 Operational Phase

Mitigation measures are "embedded" into the scale, setting, design, tone, material and finish of the proposed development, in order to avoid any adverse landscape or visual impact. Thus, no specific mitigation measures are required, in this instance.

4.1.7 Air Quality and Climate

4.1.7.1 Construction Phase

Air Quality

The proactive control of fugitive dust will ensure the prevention of significant emissions. The key aspects of controlling dust are listed below and in Appendix E of the Planning Report. These measures will be incorporated into the overall Construction Environmental Management Plan (CEMP) prepared in respect of the proposed development.

In summary, the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.
- During any demolition processes, water suppression should be used, preferably with a hand-held spray. Only the use of cutting, grinding or sawing equipment fitted or used in conjunction with a suitable dust suppression technique such as water sprays/local extraction should be used.
- Drop heights from conveyors, loading shovels, hoppers and other loading equipment should be minimised, if necessary fine water sprays should be employed.

At all times, these procedures will be strictly monitored and assessed by competent experts. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Climate GHGA

The Institute of Environmental Management and Assessment (IEMA) guidance note on "Assessing Greenhouse Gas Emissions and Evaluating their Significance" (IEMA 2022) states that the crux of significance regarding impact on climate is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050. Mitigation has taken a leading role within the Guidance compared to the previous edition published in 2017. Early engagement is key and therefore mitigation should be considered from the outset of the project and continue throughout the project's lifetime in order to maximise GHG emissions savings. As well as stakeholders, key points of engagement include the design team and client who have a significant role to play in the reduction of GHG emissions.
The following guidance has been used when considering mitigation and resilience with respect to climate risk:

- IEMA EIA Guide to: Climate Change Resilience and Adaptation (IEMA 2020a).
- Technical guidance on the climate proofing of infrastructure in the period 2021-2027 (European Commission 2021a).
- Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change (European Commission 2021b).
- PE-ENV-01104: Climate Guidance for National Rods, Light Rail and Rural Cycleways (Offline & Greenways) – Overarching Technical Document (TII 2022d).
- PE-ENV-01105: Climate Assessment of Proposed National Roads – Standard (TII 2022e).

Monitoring of the embodied carbon in the construction and operational phases will be conducted. The aim of the monitoring will be to seek further ways to minimise climate impacts. Monitoring will include; embodied carbon of construction materials, water usage, power and fuel usage and waste generation (including reuse and recycling rates). Where monitoring shows the proposed development is not meeting its targets, further mitigation will be put in place.

During the construction phase vehicles, generators etc., will give rise to some GHG emissions, however the proposed development's impact on climate due to traffic can be minimised through mitigation measures. The following mitigation measures will be put in place to minimise emissions:

- Implement a policy which prevents idling of vehicles both on and off-site including HGV holding sites.
- Construction Phase traffic shall be monitored to ensure construction vehicles are using the designated haul routes.
- All plant and machinery will be maintained and serviced regularly.
- Efficient scheduling of deliveries will be undertaken to minimise emissions.
- Construction vehicles shall conform to the latest EU emissions standards and where reasonably practicable, their emissions should meet upcoming standards

prior to the legal requirement date for the new standard. This will ensure emissions on haul routes are minimised.

Climate CCRA

The purpose of the CCRA is to assess the impact of climate change and build in additional resilience to the proposed development where weaknesses to future climate change are identified. Mitigation measures with respect to CCRA fall into three main categories:

- Grey Actions: technical or engineering oriented responses to climate impacts (i.e. drainage design).
- Green Actions: nature-based solutions to develop the resilience of human and natural systems.
- Soft Actions: involve the alterations in behaviour, regulation, or systems of management (i.e. increased monitoring or management plans). Soft measures are considered the most flexible and inexpensive to implement.

A considerable part of the mitigation measures with respect to the CCRA are within the control by other experts (i.e. drainage design, a grey measure). A risk register (Appendix 12.3) was generated in order to document the risk assessment process and mitigation that was applied by specialists and members of the design team.

Where residual risk of future climate change remains, additional mitigation will be applied. These include management plans, monitoring or communication with TII on updated potential risks. Mitigation measures include time scales (i.e. annually, after a climate hazard event) and the responsible party. To ensure mitigation and adaptation measures to combat residual risks are binding, they will be included in the appropriate project documentation (Phase 5 design reports onwards in CEMPs and OEMPs).

4.1.7.2 Operation Phase

Monitoring of carbon emissions will also include the ongoing management of adaptation and mitigation in order to measure their effectiveness, with consideration given to the vulnerabilities to extreme heat and cold. If monitoring of adaptation measures and mitigation measures indicates the measures are not effectively minimising embodied carbon or climate is impacting on the construction of the proposed development then they should be reviewed and updated.

4.1.8 Noise and Vibration

4.1.8.1 Construction Phase

As outlined in Section 13.6.1 to 13.6.4 of the Planning Report, the construction works are not expected to result in a significant impact during Daytime. Nevertheless, mitigation measures are necessary to reduce the noise from all activities to as low a level as feasible.

Appropriate general mitigation measures are set out as follows:

- A noise barrier shall be provided for the noisy activities which are defined in the Noise and Vibration section of the Planning Report. The noise barrier shall be located between the noise source and NSL and close to the noise source in order to provide maximum attenuation.
- In addition to this, a Construction Environmental Management Plan (CEMP) will be prepared prior to the construction phase outlining all measures undertaken to reduce construction noise levels emanating from the proposed site. This

plan will detail a range of measures aimed at controlling construction activities at the boundary of the site adjacent to the nearest noise sensitive properties and additional general measures aimed at reducing noise levels from the proposed site.

- The contractor will implement proactive community relations and will notify the likely effected noise sensitive locations before the commencement of any works forecast to generate appreciable levels of noise or vibration, outlining the nature and duration of the works.
- With regard to mitigation for construction activities, best practice control measures from construction sites within *BS 5228 (2009 +A1 2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2* will be used to control noise and vibration impacts. The contractor will ensure that all best practice noise and vibration control methods will be used as necessary in order to ensure impacts to nearby residential noise sensitive locations are not significant. This will be particularly important during demolition, and foundation constructions, including piling works, which are likely to be activities to have the highest potential noise and vibration impact.
- Construction activity will mostly take place during daytime hours Monday to Friday and Saturdays. It may be necessary to work outside these times at certain critical stages during the project to minimise public disturbance such as temporary road closures at night. Consideration will be given to the scheduling of activities in a manner that reflects the location and sensitivity of the site and the nature of neighbouring properties. Each potentially noisy event/activity will be considered on its individual merits and scheduled according to its noise level, proximity to sensitive receptors and possible options for noise control within the contractors' construction management plan. In situations where a particularly noisy activity is scheduled e.g. piling or other activities of similar noise level, the use of other on-site activities will be scheduled to ensure control of cumulative noise levels.

Other noise-related mitigation methods are described below and will be implemented for the project in accordance with best practice. These methods include:

- Select plant with low inherent potential for generation of noise and/or vibration.
- Situate any noisy plant as far away from sensitive properties as permitted by site constraints.
- Sequence activities to avoid using noisy plant simultaneously.
- Proper maintenance of plant will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Use of less intrusive audible warnings such as broadband vehicle reversing alarms.
- Compressors will be attenuated model 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 that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- During construction, the contractor will manage the works to comply with noise limits outlined above.

- Audible warning systems should be switched to the minimum setting required by the Health & Safety Executive or the Health & Safety Authority.

Noise & Vibration Monitoring

Where practicable it is recommended that noise and vibration from construction activities to off-site residences be limited to the values set out in Table 13-7 and Table 13-12 in the Planning Report. This may be achieved by undertaking noise and vibration monitoring at locations representative of the closest sensitive receptors.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

Vibration monitoring should be conducted in accordance with BS 6472 for human disturbance and BS ISO 4866:2010 for building damage.

Construction Working Hours

The permitted working hours are set out in section 4.5 in the Planning Report. In exceptional circumstances the Employer's Representative may allow the contractor to undertake night time works. Heavy or noisy construction activities will be avoided outside normal daytime hours and the amount of work outside normal daytime hours will be strictly controlled.

Piling Mitigation Measures

Piling is the activity which is most likely to cause disturbance. Specific guidance in relation to pilling is outlined below.

- Piling programmes should be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. If piling works are in progress on a site at the same time as other works of construction or demolition that themselves may generate significant noise and vibration, the working programme should be phased so as to prevent unacceptable disturbance at any time.
- Prior notice of the piling schedule should be given to the potentially affected residents.
- A vibration test programme will be established at the outset of the works to ensure compliance with the criteria.
- Vibratory piling will be the primary method of piling for the proposed development. Impact piling will only be used when vibratory piling cannot fully impede the sheet pile into bedrock.
- In certain types of piling works there will be ancillary mechanical plant and equipment that may be stationary, in which case, care should be taken in location selection, having due regard also for access routes. When appropriate, screens or enclosures should be provided for such equipment.

4.1.9 Archaeology, Architecture and Cultural Heritage

4.1.9.1 Construction Phase

Architectural Heritage and Topographical Survey

An Architectural Heritage and Topographical Survey of the section of the masonry quay wall in proximity to the proposed development at the southeastern side of the bridge shall be carried out in advance of construction. The survey shall comprise a

measured survey, a detailed written description, reporting (incorporating the results of the Wade and Metal Detection Survey), and the preparation of an archive.

All elements of the survey shall be carried out in accordance with a written method statement. The method statement will, if necessary, be submitted in support of an application for a licence to the DHLGH. The Architectural Heritage and Topographical Survey should include:

- A description of the masonry quay wall that references its location and setting, condition, fabric, dimensions and any visible evidence for its use and history.
- Customised building recording sheets shall be used to record the fabric, dimensions and location of features identified within the quay wall. Terminology should follow the criteria in the NIAH Handbook (2021).[1]
- A photographic survey, with photographs displaying, at a minimum, the main elevation, the setting of the quay walls and any related features, showing features of special interest, as well as detailed photographs of these features with scales, as appropriate.
- A topographic site plan showing the relevant structure and any nearby structures. The site area shall be recorded as an annotated and contoured site plan showing boundaries and representative ground profiles. Control points should be established with a 3D survey grid referenced to OD and ITM.
- Detailed annotated ground plan and representative profiles.
- Detailed annotated elevation drawings of the main external elevation, key internal elevation and any significant features.

The Architectural Heritage and Topographical Survey shall be carried out in accordance with best professional practice and conducted by qualified competent and authorised professionals. The significance of the masonry quay wall shall be recorded using the rating criteria outlined in the *NIAH Handbook* (2021).

While it is probable that the majority of the extant quay wall at the southeastern side of the extant O'Hanrahan bridge dates to the mid-nineteenth century, it is possible that elements of earlier phases, possibly dating to the medieval and/or post-medieval period may be incorporated within the existing structure. A simple and inexpensive means to determine the date of the masonry is through mortar analysis of the lower and higher areas on the masonry. This could be carried out at the junction of the steps and the vertical quay wall and include a closer examination of the form of the masonry of the extant section to the southeast of the flood relief wall.

At the proposed works area at the southwestern side of O'Hanrahan bridge there is potential for previously unrecorded built heritage elements associated with former quaysides and/or riverbank activities to survive within the mud and estuarine deposits at this side of the river. Therefore, it is recommended that in advance of any construction works taking place a wade and/or dive survey with metal-detection survey should be undertaken in consultation with NMS and TII Project Archaeologist. The surveys should be undertaken under licence, by a suitably competent and qualified archaeologist with the experience necessary to undertake work in this type of environment. Particular care should be taken to assess the potential for any medieval or post-medieval quayside structures surviving within the works area, and the report on the survey should identify where additional archaeological works (if any) are required in advance of construction. The significance of any built heritage elements identified during the course of this work should be recorded using the rating

[1] Available at: https://www.buildingsofireland.ie/app/uploads/2021/03/NIAH-Handbook-Edition-March-2021.pdf

criteria outlined in the *NIAH Handbook* (2021). The archaeologist should also undertake archaeological monitoring of all piling or in-channel works which have the potential to disturb or uncover archaeological features, finds or deposits in the river.

The proposed archaeological mitigation for all sheet-piling works is discussed in Archaeological Monitoring below.

Archaeological Monitoring

The services of a suitably qualified and experienced archaeologist, with experience in underwater archaeology, shall be engaged to carry out archaeological monitoring for the construction works programme; to include archaeological monitoring of dryland, foreshore and in-stream works. The aim of the licensed archaeological monitoring is to ascertain the location, nature, date, character, extent and significance of any archaeological features/deposits/objects that may be uncovered during site investigations and/or construction works and to undertake the necessary amount of archaeological investigation on all such features/deposits/objects so as to determine their horizontal and vertical extents and to produce the necessary report(s) on the findings.

The archaeological monitoring shall be licensed by the National Monuments Service of the Department of Housing, Local Government and Heritage and a detailed method statement should accompany the licence application. The method statement, which shall lay out the monitoring strategy for each location where works are proposed, shall be prepared in consultation with the TII Project Archaeologist. The archaeological monitoring shall be carried out in two separate phases:

1. Site investigations will involve the investigation of two boreholes on the foreshore area and a test pit/slit trench on land at the eastern side of the bridge, and one borehole is proposed at the southwestern side of the bridge. The test pit/ slit trench should be archaeologically monitored. Borehole logs should be made available to the monitoring archaeologist as the detail included should be presented in the archaeological monitoring report for the proposed works.
2. During construction, to include the sheet piling works at both sides of the bridge, and construction of footings for the new wall at the western side of the bridge.

In addition to the licence eligible archaeologists, the archaeological team shall include a topographical surveyor to attend onsite as required. A communication strategy shall form part of the monitoring strategy to ensure full communication is in place between the monitoring archaeologist and the plant operators at all times during works. The archaeological personnel undertaking the monitoring will be in a position to monitor directly all elements of the works, to ensure they have unobstructed views of the excavations/other works, and the plant and machinery operators should be prepared to facilitate the archaeological personnel in the undertaking of their monitoring work.

As part of the Finds Retrieval Strategy in the methodology, all excavated material removed shall be spread and searched for archaeological objects and metal detected (under licence) to assess the artefact-bearing potential of the deposits. Sufficient archaeological personnel shall be in place to cover all aspects of the monitoring works.

Should potential archaeology be identified during the works, then the construction works shall be suspended in that location and the NMS, the TII-assigned Project

Archaeologist, Project Engineer and Contractor shall be notified. Minor or isolated features/deposits shall be fully excavated and recorded by the archaeological team during the course of their archaeological monitoring, subject to the agreement of the NMS, TII-assigned Project Archaeologist and Project Engineer. Further archaeological works may also be required, that depending on recommendations from NMS may include further archaeological assessment, test-excavations, avoidance/preservation *in situ*, or full excavation. In order to establish the date, nature and significance of archaeological features/deposits, bulk samples of soil/sediment/mortar should be obtained, as appropriate.

Following the completion of works, reports detailing the outcome of the monitoring shall be forwarded to the NMS and other statutory authorities, as per the conditions of the archaeological licences.

Communication and Awareness Strategy

All on-site personnel shall be made aware of the significance of the masonry quay walls during works. Signage and barriers/fencing shall be erected for the duration of the construction phase to protect the quay walls from damage.

4.1.9.2 Operation Phase

No mitigation measures are required for cultural heritage during the operational phase of the proposed development.

4.1.10 Material Assets and Land

4.1.10.1 Construction Phase

During construction, it will be ensured that all utilities will be repaired or replaced without unreasonable delay. The following mitigation measures have been proposed for the construction of the proposed development:

Prior to commencing construction works, the Contractor will be required to:

- Prepare a Construction and Environmental Management Plan (CEMP) and Construction Traffic Management Plan (CTMP) of which the contents of which must be approved in advance by Kildare County Council.
- Traffic Management will be put in place to ensure access to residential and commercial property is maintained during construction.
- Prepare an Incident Response Plan detailing the procedures to be undertaken in the event of a spill of chemical, fuel or other hazardous wastes, a fire, or non-compliance incident with any permit of license issues.
- Prepare a site plan showing the location of all surface water drainage lines and proposed discharge points to surface water. This will also include the location of all existing and proposed surface water protection measures, including best practice measures such as monitoring points, sediment traps, settling basins, interceptors etc.
- Existing roads to be kept open to facilitate access as far as practicable, with temporary diversions implemented where necessary to ensure access is maintained.
- Residents will be notified in advance of any disruption to utilities.

4.1.10.2 Operational Phase

During operation, there are no predicted impacts to material assets and therefore, no mitigation measures are necessary.

5. STATUTORY PLANNING CONSENT

When the planning application is approved by An Bord Pleanála for the proposed development the entire contents of the statutory approval and any conditions will be complied with as part of the CEMP. The Statutory Planning consent will be inserted as an Appendix (Appendix B) into the final CEMP once statutory planning approval is received and will be carried forward into the Contractors CEMP.

6. ENVIRONMENTAL OPERATING PLAN

An Environmental Operating Plan (EOP) is prepared to outline procedures for delivery of environmental mitigation measures for addressing general day-to-day environmental issues that can arise during the construction phase of the proposed development. The EOP is a live document and will be further developed and updated by the Contractor during the project construction stage. The EOP is contained in Appendix C to this CEMP.

7. INCIDENT RESPONSE PLAN

The Incident Response Plan (IRP) describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts are prompt, efficient, and appropriate to particular circumstances. The IRP is contained within Appendix D to this CEMP.

APPENDIX A

Natura Impact Statement - Mitigation Measures

1. NATURA IMPACT STATEMENT – MITIGATION MEASURES

1.1 Principles and Approach

Section 4 of the Natura Impact Statement (NIS) assessed the adverse effects likely to arise from the proposed development on the specific Attributes and Targets which define the Conservation Objectives for a number of Qualifying Interests of the River Barrow and River Nore SAC, Lower River Suir SAC and the River Nore SPA. This section prescribes mitigation measures to ensure their full and proper implementation aimed at mitigating these adverse effects, thereby protecting the integrity of these European sites during the construction and operation of the proposed development.

The mitigation measures prescribed in the NIS have been designed according to the principle of a mitigation hierarchy, as outlined in the European Commission's guidance document *Assessment of plans and projects in relation to Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (EC, 2021). According to this hierarchy, mitigation measures first suggest *avoidance* (i.e. preventing significant impacts from happening in the first place) and then *reduction* of impact (i.e. reducing the magnitude and/or likelihood of an impact).

As mitigation measures are related directly to impacts and only indirectly to receptors and as, in this case, all of the affected receptors have been identified as being affected the same set of impacts, to describe mitigation measures under the headings of the relevant receptors would lead to undue repetition. Therefore, the measures prescribed in this NIS are described under the headings of the types of impacts which they are intended to mitigate.

1.2 Mitigation Measures

1.2.1 Water Quality

As is normal practice with infrastructure projects, a Construction Environmental Management Plan (CEMP) has been prepared for the proposed development and is included in Appendix D of this NIS. This will be updated and finalised by the selected contractor to suit the detailed construction methodology and allocate responsibilities to individuals in the construction team. In doing so, the measures detailed in the appended reports will be considered minimum requirements to be considered and improved upon. The level of detail provided within the Plans is sufficient to allow an assessment of the anticipated impacts including residual impacts.

The following will be implemented as part of this plan:

- An Environmental Operating Plan (EOP) (Appendix C of Appendix D) outlines procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of developments.
- An Incident Response Plan (Appendix D of Appendix D) detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.
- All necessary permits and licenses for in-stream construction work for provision of the proposed development will be obtained prior to the commencement of construction.
- Inform and consult with the National Parks and Wildlife Service and Inland Fisheries Ireland.

During construction, cognisance will have to be taken of the following guidance documents for construction work on, over or near water.

- *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016)*
- *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (Eastern Regional Fisheries Board)*
- *Central Fisheries Board Channels and Challenges – The enhancement of Salmonid Rivers.*
- *C532 Control of water pollution from construction sites: guidance for consultants and contractors (CIRIA, 2001)*
- *CIRIA C648 Control of water pollution from linear construction projects: technical guidance (CIRIA, 2006)*
- *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (TII, 2006)*

Based on the above guidance documents, the following principal mitigation measures will be adhered to for the construction phase:

Sedimentation and surface water run-off

- Sheet piling for the new site boundary shall be installed prior to any excavation on the landward side and demolition of the existing quay wall boundary. This will form an effective barrier to run-off from the site during construction.
- Any material stockpiled shall be located a minimum of 30 m from the edge of the river and shall also be covered and remain stockpiled for as short a time as possible.
- The Contractors shall provide method statements for weather and tide/storm surge forecasting and continuous monitoring of water levels in Waterford Harbour and the removal of site materials, fuels, tools, vehicles and persons from flood zones in order to minimise the risk of input of sediment or construction materials into the river during flood events.
- The works area (including site compounds) will be limited to the minimum required to undertake the necessary elements of the project.
- Surface water flowing onto the construction area will be minimised through the provision of berms, diversion channels or cut-off ditches.
- Protection of waterbodies from silt load will be carried out through the use of gully silt/sediment filters and shallow berms in hardstanding areas to provide adequate treatment of runoff to watercourses.
- Settlement tanks/ponds, silt traps/bags and bunds will be used. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap.
- The anticipated site compound/storage facility will be fenced off at a minimum distance of 5 m from the top of the edge of the watercourse bank. Any works within the 10 m buffer zone will require measures to be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse. CEMP has been drafted and will need to be finalised by the appointed Contactor. See the CEMP in Appendix D for further detail.

- Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with the TII document "*Guidelines for the crossing of watercourses during the construction of National Road Schemes*". All chemical and fuel filling locations will be contained within bunded areas.
- Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner, off site, to prevent pollution.
- The construction discharge will be treated such that it will not reduce the environmental quality standard of the receiving watercourses.
- Water quality monitoring will be undertaken in the River Barrow, with weekly samples being taken from at least 2 months prior to commencement of construction until at least 4 months post-completion. Water samples will be taken from at least two locations. The final number and location of sampling points will be determined by the Site Environmental Manager. The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager on an ongoing basis during construction. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation will be undertaken to identify the source of this non-compliance and corrective action will be taken where the this is deemed to be associated with the proposed development.

Concrete Works

The use and management of concrete in or close to watercourses must be carefully controlled to avoid spillage which has a deleterious effect on water chemistry and aquatic habitats and species. As the use of concrete cannot be avoided, the following control measures will be employed:

- Hydrophilic grout and quick-setting mixes or rapid hardener additives shall be used to promote the early set of concrete surfaces exposed to water;
- When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used;
- Any plant operating close to the water will require special consideration on the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters;
- Placing of concrete in or near watercourses will be carried out only under the supervision of the Ecological Clerk of Works (ECoW);
- The weather forecast will be consulted prior to commencing concrete pours. No such works will be undertaken if inclement weather is forecast such that precipitation may make it difficult to maintain a dry working area.
- There will be no spills of concrete, cement, grout or similar materials hosed into surface water drains. Such spills shall be contained immediately, and runoff prevented from entering the watercourse;
- Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses;
- On-site concrete batching and mixing activities will only be allowed at the identified construction compound areas;
- Washout from concrete lorries, with the exception of the chute, will not be permitted on site and will only take place at the construction compound (or other appropriate facility designated by the manufacturer);

- Chute washout will be carried out at designated locations only. These locations will be signposted. The Concrete Plant and all Delivery Drivers will be informed of their location with the order information and on arrival to site; and
- Chute washout locations will be provided with an appropriate designated, contained impermeable area and treatment facilities including adequately sized settlement tanks. The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the construction stage settlement facilities) or alternatively disposed of as waste in accordance with the Contractor's Waste Management Plan.

Hydrocarbons and other chemicals

- Land-based vehicles and plant shall be refuelled off-site, where possible.
- All land-based fuelling of machinery shall be undertaken on an impermeable base in bunded areas at least 50 m from the edge of the river.
- Marine based fuelling will only be undertaken using specifically designed nozzles to prevent spillages and spill kits will be available.
- All fuelling equipment shall be regularly inspected and serviced.
- Any petrol- or diesel-fuelled pumps or other machinery shall be located within temporary bunded units.
- All fuel, oils, chemicals, hydraulic fluids, on-site toilets etc. shall be stored in the construction site compound, on an impermeable base which shall be bunded to 110% capacity and appropriately secured.
- All plant and construction vehicles shall be inspected daily for oil leaks and a full-service record shall be kept for all plant and machinery.
- Spill kits shall be available on-site during construction, including on the jack-up barge during pile driving.
- All waste oils, empty oil containers and hazardous wastes shall be disposed of in accordance with the Waste Management Act, 1996 (as amended).
- Owing to the presence of contaminants within the construction site, excavation shall be limited to the absolute minimum necessary.

Flooding

The Contractor will provide method statements for weather forecasting and continuous monitoring of water levels in the River Barrow. The Contractor will also provide method statements for the removal of site materials, fuels, tools, vehicles and persons from flood zones in order to minimise the risk to persons working on the site as well as potential input of sediment or construction materials into the river during flood events.

Operational Phase

No water quality impacts are predicted to arise during the operation of the proposed development.

1.2.2 Hydroacoustic Impacts

Hydroacoustic Impacts

The mitigation for hydroacoustic impacts is as follows ("piling event" means any period of continuous piling by one or two rigs; "quiet period" means any period in which there is no piling by any rig):

- Piling works shall not be undertaken between the 1st April and the 31st May as advised by IFI during consultation.
- There shall be no piling between sunset and sunrise.
- Vibratory piling shall be the standard method for the installation of all piles. Impact piling shall only be employed where the required pile toe level cannot be achieved by vibratory piling.
- The duration of any vibratory piling event shall not exceed 180 piling minutes.
- The length of any impact piling event shall not exceed 200 strikes.
- An appropriate soft-start/ramp-up procedure shall be used for all impact piling events. Where it is possible according to the operational parameters of the equipment and materials concerned, the underwater acoustic energy output shall commence from a lower energy start-up (i.e., a peak sound pressure level not exceeding 170 dB re: 1µPa @1m) and, thereafter, be allowed to gradually build up to the necessary maximum output over a period of 20 – 40 mins.
- Following every piling event, there shall be a quiet period of at least 30 minutes. Only following 30 minutes of no piling whatsoever can the cumulation of piling minutes be re-zeroed.
- Rotary drilling will be the method used to drill the boreholes over other methods such as percussion drilling which give rise to higher levels of noise. Furthermore, these works will take place at low tide to allow for greater attenuation of noise within the mud in the absence of water. This mitigation will ensure that any hydroacoustic impacts will not give rise to a significant barrier to the movements of Twaite Shad or other species, or other significant effects on such species, in the Barrow Estuary as a result of the ground investigations.

1.2.3 Lighting

In summary, light spill onto the river channel during hours of darkness has the potential to form a barrier to the migration of nocturnal species and to encourage night-time activity of diurnal species, causing them to become more vulnerable to nocturnal predators.

Therefore, the following limits on construction lighting is proposed:

- Subject to any Health & Safety and/or navigational requirements, construction lighting over the river channel shall be turned off outside of working hours.
- Construction lighting shall be limited to the minimum area required to be lit and minimise light spill to areas not required for construction.
- In order to further limit any light spill, solid hoarding shall be erected around areas which will be subject to night-time construction activities.

Given the implementation of the above measures and the short duration of night-time construction activities, these works are unlikely to give rise to any impacts beyond the duration of the works and, therefore, no additional mitigation is proposed in relation to these works.

During the operation of the proposed development, lighting columns will be of a similar height and spacing to the existing and will utilise the existing lighting duct in the footpath. The following mitigation measures will be integrated into the lighting design:

- Lighting outside the intended area of illumination will be minimised. Where light spill cannot be avoided, louvres, cowls or shields will be fitted to the columns.
- Lighting will be LED and have no upward light spill (apart from intentional up-lighting) and a sharp horizontal cut off.
- Lighting will be a warm-white colour of 2700K or less.

1.2.4 Invasive Alien Species

In order to minimise the risk of the introduction or spread of invasive species during construction, all land-based works shall be executed in accordance with best practice for biosecurity in construction. In particular, prior to commencement, the Contractor shall prepare a detailed Biosecurity Protocol describing his/her proposed approach to ensuring that invasive species are not imported or spread during the construction of the proposed development.

Terrestrial Plant Species

In order to minimise the risk of the introduction or spread of invasive alien plant species (IAPS) during construction, all land-based works shall be executed in accordance with best practice for biosecurity in construction. In particular, prior to commencement, the Contractor shall prepare a detailed Biosecurity Protocol describing his/her proposed approach to ensuring that IAPS are not imported or spread during the construction of the proposed development. The Contractor's Biosecurity Protocol shall be in accordance with *The Management of Invasive Alien Plant Species on National Roads – Standard* (TII, 2020a) and *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance* (TII, 2020b). The Biosecurity Protocol shall include, as a minimum, the following measures to prevent the spread of invasive species:

- Good construction site hygiene will be employed to prevent the introduction and spread of problematic IAPS (i.e., Himalayan Balsam and Common Cord-grass) by thoroughly washing vehicles prior to leaving any site.
- All plant and equipment employed on the construction site (e.g., excavators, piling equipment etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of IAPS.
- All washing must be undertaken in areas with no potential to result in the spread of IAPS, as detailed in the Construction Environmental Management Plan.
- Any soil and topsoil required on the site will be sourced from a stock that has been screened for the presence of any IAPS and where it is confirmed that none are present.

Aquatic Species

The use of barges during the construction of the proposed development poses the risk of the introduction of invasive alien species to the aquatic environment both in the vicinity of the works and in the wider Barrow-Nore-Suir Estuary. This has the potential to significantly affect the integrity of aquatic and intertidal habitats in the zone of influence. In order to minimise the risk of either the introduction or spread of aquatic invasive alien species and thereby avoid negative impacts on these habitats, the owner or operator of the barge shall provide documentary evidence (in the form of a

completed and signed Marine Institute "*Cleaning and Disinfection Declaration Form*") that the vessel was fully de-fouled within the 6 months immediately preceding its engagement in the construction of the proposed development.

In relation to other construction activities, including pre-construction surveys and any other site inspections, the principles and appropriate measures in the IFI guidance document *Biosecurity Protocol for Field Survey Work* (IFI, 2010a) shall be followed and shall form part of the Contractor's Biosecurity protocol.

1.2.5 Fish Rescue

As the sheet piling will be installed at high tide, there is a risk that fish could become trapped once the wall is closed off. In order to avoid this, the final sheet pile will be installed at low tide so that any fish that might have become trapped behind sheet piling will be able to escape with the receding tide before the area behind the new quay wall is closed off and filled in.

1.2.6 Monitoring

Water Quality

Monitoring of water quality shall be undertaken in the River Barrow, with samples taken, weekly for at least 2 months prior to commencement of construction, for the entire duration of construction and for at least 4 months post-completion. The parameters which shall be monitored include, but are not limited to:

- Suspended solids and turbidity;
- Total hydrocarbons;
- Ammonia, nitrates, nitrites and total nitrogen;
- Phosphates and total phosphorus;
- Dissolved oxygen and biological oxygen demand; and,
- Temperature and salinity.

Samples shall be taken from at least two different locations, including at least one location at an appropriate distance upstream of the proposed development and at least one other at an appropriate distance downstream of the proposed development. The final number and location of sampling points will be determined by the Site Environmental Manager. Given the strong tidal influence at the location of the proposed development, the date and exact time at which each sample is taken, as well as the water level and direction of flow, must be recorded in order to ensure that comparative analysis of samples can control for tidal influence, as well as other variables, e.g., fluvial conditions.

The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager on an ongoing basis during construction. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation shall be undertaken to identify the source of this non-compliance and corrective action will be taken where this is deemed to be associated with the proposed development.

Record of Habitats

In order to maintain an accurate and precise record of changes to intertidal and fringing habitats, particularly mudflats, a photographic record shall be made of these habitats. This record shall cover both sides of the river from 50m upstream of the sheet pile wall

to 50m downstream. All photographs shall be taken at low tide, every 2 months, beginning 6 months prior to commencement of construction and finishing 12 months after completion.
In addition, in order to accurately and precisely record any change in the structure and composition of biological communities of hard and soft intertidal substrates, sampling and analysis of these habitats shall be carried out at 6 months, 1 year, 2 years and 5 years post-construction. To facilitate meaningful comparative analysis and evaluation of the impacts of the proposed development, the sampling and analysis should follow the methodology employed by UCC Aquatic Services Unit in carrying out the pre-planning benthic surveys on 14th January and 21st September 2022 (in Appendix C).

Hydroacoustic Impacts

In order to allow for greater accuracy in the assessment of future plans and projects, it is recommended that hydroacoustic monitoring be undertaken for the duration of the proposed development's construction during which piling activities will take place. This monitoring shall establish the ambient underwater noise levels in the estuary (and the rate of sound attenuation) prior to and after construction and more accurately characterise the sound outputs in terms of SPL_{peak}, SPL_{RMS} and *SEL* at different frequencies arising from the different methods of pile driving and different types and sizes of piles. This monitoring shall be carried out by specialist underwater noise surveyors.

1.3 Implementation

In order to give effect to the mitigation prescribed in this NIS, it should be a condition of any consent granted in respect of the proposed development that all of the mitigation, including monitoring and enforcement, prescribed in this NIS be binding, during the construction phase, on the Contractor and, during operational phase, on Wexford County Council. Accordingly, all of the mitigation prescribed herein shall be transposed into the Contract Documents for the construction of the proposed development.

During construction, all works must comply with relevant legislation and guidelines in order to reduce and minimise environmental impacts and to protect all ecological receptors. In particular, there must be full compliance with the following:

- The CEMP
- The Schedule of Commitments.
- The mitigation prescribed in the Ecological Impact Assessment (EcIA) (submitted as part of the Planning Report) and in this NIS.
- Any conditions which might be attached to the proposed development's planning consent.
- Any requirements of stakeholders and statutory bodies, e.g., the NPWS and IFI, including:
    - *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016).
    - *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters* (NPWS, 2014).
    - *Bats and artificial lighting in the UK* (BCT, 2018).
- All applicable legislative requirements in relation to environmental protection.
- All relevant construction industry guidelines, including:

- *C532 Control of water pollution from construction sites: guidance for consultants and contractors* (CIRIA, 2001).

- Any biosecurity requirements arising from the preceding points.
- The Transport Infrastructure Ireland (TII) Environmental Assessment and Construction Guidelines, specifically:
  - *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.*
  - *Guidelines for the Testing and Mitigation of the Wetland Archaeological Heritage for National Road Schemes.*
  - *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*
  - *The Management of Invasive Alien Plant Species on National Roads – Standard.*
  - *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance.*
  - *Guidelines for the Treatment of Noise and Vibration in National Road Schemes.*
  - *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.*
  - *Management of Waste from National Road Construction Projects.*
  - *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.*

This list is non-exhaustive. All environmental commitments/requirements and relevant legislation and guidelines which are current at the time of construction will be followed.

1.3.1 Construction Environmental Management Plan

Appendix E of the NIS contains the Construction and Environmental Management Plan (CEMP) which shall be finalised by the Contractor, in agreement with Kildare County Council, prior to the commencement of the construction phase.

A CEMP deals with the Contractor's overall management and administration of a construction project in addition to any environmental control measures required during construction. A CEMP is prepared by the Contractor during the pre-construction phase, to ensure that the project is completed on-time and within budget. The CEMP will include a detailed programme of works. The CEMP is also developed to ensure that all construction activities are undertaken in a satisfactory and safe manner, to a delivery program meeting the Clients requirements. The Contractor will be required to include details under the following headings;

- Details of working hours and days;
- Details of emergency plan - in the event of fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incident within an area of traffic management. The plan must include contact names and telephone numbers for: Local Authority (all sections/departments); Ambulance; Gardaí and Fire Services;
- Details of chemical/fuel storage areas, (including location and bunding to contain runoff of spillages and leakages);
- Details regarding refuelling areas for machinery and vehicles.

- Details of construction plant storage, temporary offices;
- Traffic management plan (to be developed in conjunction with the Local Authority – Roads Section) including details of routing of network traffic; temporary road closures; temporary signal strategy; routing of construction traffic; programme of vehicular arrivals; on-site parking for vehicles and workers; road cleaning; other traffic management requirements such as traffic calming where necessary;
- Truck wheel wash details (including measures to reduce and treat runoff);
- Dust management to prevent nuisance and harmful effects (demolition & construction);
- Site run-off and drainage management plan;
- Noise and vibration management to prevent nuisance (demolition & construction);
- Landscape management;
- Soil management plan
- Management of contaminated land and assessment of risk for same by suitably qualified, trained and licenced personnel;
- Management of demolition of all structures and assessment of risks for same;
- Stockpiles;
- Project procedures & method statements for:
    - Site clearance, site investigations, excavations and working with asbestos containing materials (ACMS);
    - Management and removal of ACMs;
    - Demolition & removal of buildings, services, pipelines (including risk assessment and disposal);
    - Diversion of services;
    - Excavation;
    - Piling;
    - Construction of pipelines;
    - Temporary hoarding & lighting;
    - Disposal of surplus geological material (peat, soils, rock etc.);
    - Protection of watercourses from contamination and silting during construction;
- Site Compounds.
    - Temporary car parks for staff and site workers
    - Material processing areas / Material storage areas / plant storage

The production of the CEMP will also detail areas of concern with regard to Health and Safety and any environmental issues that require attention during the construction phase. Adoption of good management practices on site during the construction and operation phases will also contribute to reducing environmental impacts.

The CEMP has been appended (Appendix E). This is a preliminary document, which will be updated and finalised by the successful Contractor. Appended to the CEMP are the following constituent plans, also to be finalised by the Contractor:

- **Appendix C:** Environmental Operating Plan (EOP)
- **Appendix D:** Incident Response Plan (IRP)

Each of these plans is discussed in the following sections. The obligation to develop, maintain and implement the CEMP and all of the above-listed plans will form part of the contract documents for the construction phase.

Environmental Operating Plan

The EOP is a document that outlines procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of developments. Essentially the EOP is a project management tool. It is prepared, developed and updated by the Contractor during the construction stage and will be limited to setting out the detailed procedures by which the mitigation measures proposed as part of this NIS and the Planning Report and NIS and arising out of Wexford County Council's decision (if approving the proposed development) will be achieved. The EOP will not give rise to any reduction of mitigation measures or measures to protect the environment.

Before any works commence on site, the Contractor will be required to prepare an Environmental Operating Plan (EOP) in accordance with the TII *Guidelines for the Creation and Maintenance of an Environmental Operating Plan*. The EOP will set out the Contractors approach to managing environmental issues associated with the construction of the road and provide a documented account to the implementation of the environmental commitments set out in the EIAR and measures stipulated in the planning conditions. Details within the plan will include, as a minimum:

- All environmental commitments and mitigation stipulated in the planning documentation in respect of the proposed development, including sediment controls and other measures to ensure that water quality in the River Barrow is not degraded.
- Any requirements of statutory bodies such as the NPWS and IFI, including adherence to *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016).
- A detailed Biosecurity Protocol.
- A list of all applicable legislative requirements in relation to environmental protection and a method of documenting compliance with these requirements.
- Outline methods by which construction activities will be managed in such a manner as to avoid, reduce or remedy potential negative impacts on the environment.

To oversee the implementation of the EOP, the Contractors will be required to appoint a person to ensure that the mitigation measures included in this NIS and the Planning Report, the EOP and the statutory approvals are executed in the construction of the works and to monitor that those mitigation measures employed are functioning properly.

Incident Response Plan

The Incident Response Plan (IRP) describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts during the construction stage of the proposed development are prompt, efficient, and appropriate to particular circumstances.

The Contractor will finalise the IRP prior to the commencement of the proposed works to include the following information, at a minimum:

- Contact names and telephone numbers for the local authority, i.e., Wexford County Council (all sections and departments), An Garda Síochána and ambulance and fire services; and,
- Method statements for weather forecasting and continuous monitoring of water levels in the River Barrow. The plan must outline how the Contractor will respond to forecasted flood events, including but not limited to, details of removal of site materials, fuels, tools, vehicles and persons from flood zones.
- The measures to be taken to avoid or reduce the incident risk potential;
- Reference to the method statement and management plans for construction activities, insofar as they are relevant for the purposes of mitigating against health and safety and pollution incidents;
- Procedures to be adopted to contain, limit and mitigate any adverse effects, as far as reasonably practicable, in the event of a health and safety or pollution incident;
- Persons responsible for dealing with incidents and their contact details;
- Procedures for alerting key staff, appropriate emergency services, authorities, the Employer's Representative and clean-up companies, where required, and contact details of same;
- Procedures for notifying relevant statutory bodies, environmental regulatory bodies, local authorities and local water and sewer providers of pollution incidents, where required, and contact details of same;
- Standby / rota systems; and
- The types and location of emergency response equipment available and appropriate personal protective equipment to be worn.

An IRP has been appended to the CEMP (i.e., Appendix D of Appendix D). The document in its current form will be finalised by the successful Contractor prior to the commencement of the construction phase of the proposed development.

Implementation of the EOP

It will be a condition of the Contract for the construction of the proposed development that the successful Contractor fully implement the EOP throughout the works. To oversee the implementation of the EOP, the Contractor will be required to appoint a responsible Site Environmental Manager (SEM) to ensure that the environmental commitments (as described above) and the EOP are fully executed for the duration of works, and to monitor whether the mitigation measures employed are functioning properly (i.e., are effectively addressing the environmental impact(s) which they were prescribed for).

1.3.2 Site Environmental Manager

To ensure the successful development, implementation and maintenance of the EOP, the Contractor will appoint an independent Site Environmental Manager (SEM). He/she must possess training, experience and knowledge appropriate to the role, including a National Framework of Qualifications (NFQ) Level 8 qualification (or equivalent) or other acceptable qualification in environmental science, environmental management, hydrology or engineering. The principal functions of the SEM will be to ensure that the mitigation prescribed in this NIS, the Planning Report, the EOP and the CEMP, is fully and properly implemented and to monitor the construction stage from an environmental perspective. The SEM will also provide independently verifiable audit reports.

Separate from the on-going and detailed monitoring carried out by the Contractor as part of the EOP, the SEM will carry out the inspection and monitoring described below on behalf of NRDO. The results will be stored in the SEM's monitoring file and will be available for inspection or audit by NRDO, the NPWS or IFI.

- Daily reporting on weather and flood forecasting and daily reporting on the monitoring of peak water levels in the River Barrow.
- Weekly inspections of the principal control measures described in the CEMP and reporting of findings to the Contractor.
- Daily inspections of surface water treatment measures.
- Daily inspections of all outfalls to watercourses.
- Daily visual inspections of watercourse to which there are discharges from the works and those in the vicinity of construction works.
- Weekly inspections of wheel-wash facilities.
- Daily monitoring of any stockpiles.
- Auditing at least six times per quarter of the Contractor's EOP monitoring results.

APPENDIX B

Statutory Planning Consent

[The Statutory Planning consent will be inserted into the final CEMP once statutory planning approval is received and will be carried forward into the Contractors CEMP]

APPENDIX C

Environmental Operating Plan

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O'Hanrahan Bridge Widening

Environmental Operating Plan

March 2023

Client:
Kildare County Council

ROD
ROUGHAN & O'DONOVAN

O'Hanrahan Bridge Widening

Environmental Operating Plan

TABLE OF CONTENTS

1. INTRODUCTION

This document is the project-specific preliminary Environmental Operating Plan (EOP) for the O'Hanrahan Bridge Widening project. It is prepared to inform and provide a template for the successful contractor to develop and maintain an EOP for the construction of the O'Hanrahan Bridge Widening project.

1.1 Purpose and Scope

The preliminary EOP is designed to assist the main contractor in preventing, managing and/or minimising significant environmental impacts during the construction phase. The preliminary EOP sets out the mechanism by which environmental protection is to be achieved for the O'Hanrahan Bridge Widening project. The preliminary EOP describes the Environmental Management System (EMS) of the proposed development, which will be devised according to the criteria of ISO 14001:2015 – Environmental Management Systems and developed having regard to the National Road Authority (now known for operating purposes as Transport Infrastructure Ireland (TII)) *"Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan".* This preliminary EOP will be complemented by General Procedures, Work Procedures and Operations Instructions of the contractor. These documents will be in place within the site administration offices and appropriate site locations during the works.

This preliminary EOP covers the activities of the [*Successful Contractor Name*] and that of its sub-contractors. It outlines the environmental commitments in relation to the construction works and how these commitments are to be managed, including details of the monitoring systems and mitigation measures to be employed by the successful contractor. It also assigns responsibilities for ensuring the effective implementation of the EOP.

To achieve this objective, the finalised EOP should contain all Environmental Commitments and Requirements set out in:

- the Contract documents (in particular, the Works Requirements (WR));
- the Planning Report
- the Natura Impact Statement (NIS);
- any conditions and/or modifications imposed by An Bord Pleanála (ABP);
- the Schedule of Commitments, and provide a method of documenting compliance with these Environmental Commitments and conditions / modifications; (refer to the CEMP)
- List all relevant environmental legislative requirements and provide a method of documenting compliance with these requirements, and
- Outline methods by which construction work will be managed to prevent, reduce or compensate for potential adverse impacts on the environment. (refer to the CEMP – Schedule of Environmental Commitments)

The EOP of the contractor should address the following key requirements:

- Clearly identify the roles and responsibilities of the main contractor's staff having regard to the main contractor's organisational structure;
- Incorporate procedures for communicating with the public;
- Incorporate procedures for communicating with relevant site-personnel;

- Incorporate procedures for Environmental Awareness Training for the main contractor's staff;
- Incorporate monitoring procedures and responses to monitoring results, where contractually required, and
- Provide for a system of audit with regard to the effectiveness of the EOP during the construction life cycle of the project.

This preliminary EOP should be read in conjunction with the Construction Environmental Management Plan (**CEMP)** and serves as an indicative template for the main contractor to ensure that they are fully aware and plan for all Environmental Commitments and Requirements relevant to the proposed the development.

1.2 EOP Structure

The contents of this preliminary EOP are presented as follows:

Chapter 2 General Project Details
Chapter 3 Contract Sheets
Chapter 4 Reference Documents
Chapter 5 Organisational Structure / Duties and Responsibilities
Chapter 6 Environmental Commitments
Chapter 7 Environmental Control Measures
Chapter 8 Site-Specific Method Statements
Chapter 9 Environmental Awareness Training
Chapter 10 Communication
Chapter 11 Inspections, Auditing and Monitoring Compliance
Chapter 12 Handover of the Final EOP

1.3 Contractor's Environmental Policy Statement

Environmental management is fundamental to the successful operation of construction activities. Therefore, the Environmental Policy must, as a priority, be understood by all parties involved in the contract and adhered to throughout the course of the works to allow for legal compliance and environmental management.

The preliminary EOP shall be prepared having regard to the O'Hanrahan Bridge Widening Planning Report

[*Successful Contractor Name*] Environmental Policy Statement is detailed below.
[*Insert policy statement*]

2. GENERAL PROJECT DETAILS

2.1 Project description

This section will be completed by the successful contractor once appointed:

- Brief overview;
- Location of the project;
- Location of the compound;
- Contact Sheets for site, employer and third-party contacts;
- Register of all applicable legislation, including relevant standards, Codes of Practice and Guidelines;
- Organisational chart; and,
- Duties and responsibilities.

Project details which have been identified prior to appointment of the contractor are described in the subsequent subsections.

2.2 Project overview and location

2.2.1 Project location

O'Hanrahan Bridge is located in the urban centre of New Ross, in Co. Wexford, where it carries the single carriageway R723 Regional Road over the River Barrow.

The bridge is located within the urban environment of New Ross town, with the adjacent land use mainly consisting of commercial and residential use. The setting is urban with the bridge site surrounded by a mix of historic buildings and structures, tourism sites and commercial properties on the eastern side; and residential, commercial, and industrial properties on the western side.

The N25 previously travelled over O'Hanrahan Bridge as the main link between County Wexford and County Waterford until January 2020 when the New Ross Bypass was officially opened.

The primary function of the proposed development is to provide a shared pedestrian and cycleway from the New Ross quay front to Rosbercon Quay on the southern side of the bridge, that is accommodated along the widened section of O'Hanrahan Bridge.

2.2.2 Project description

O'Hanrahan Bridge is a 9-span post-tensioned concrete beam and reinforced concrete slab bridge over the River Barrow in New Ross town, Co. Wexford. The overall length of the bridge is 175m with an width of 11.6m. The proposed works aim to widen the bridge deck by approx. 1m in order to accommodate an enhanced combined pedestrian and cycleway which will connect to the future 'South East' Greenway. In order to tie the new widened section into the quays at the eastern end and ensure continuity of the new cycleway, the proposed development requires for a 20m long section of the existing quay wall on the south-east corner of the bridge to be reconstructed up to 2m out from the existing quay wall. This section will require working instream. Similarly, approx. 60m section of the south-west corner of the bridge will require widening works by approximately 1m out from the existing wall; The length of new sheet piles in front of the wingwalls will be approximately 19m, of which 5m will be located directly in the river. The remaining 41m of new wall will be constructed in

front of the existing flood wall, all driven at the top of the embankment above the water level.

In addition, the edge beam on the northern side of the bridge will be strengthened to accommodate upgrading of the existing parapet. The existing surfacing and footways will be removed to allow the provision of bridge deck waterproofing and joint replacements before the widened footways are constructed and carriageway surfacing reinstated. The works will involve a number of service diversions and upgrades in both footways. Finally, it is also proposed to replace the existing bridge lighting.

Furthermore, concrete repair works will be undertaken on the existing bridge in areas where minor concrete defects are identified.

Detailed description of the proposed development is provided in Section 3 Description of the Proposed Development of the O'Hanrahan Bridge Widening Planning Report.

2.2.3 Location of all works sites, compounds etc.

Detailed description of the proposed O'Hanrahan Bridge Widening project is provided in Section 3 Description of the Proposed Development and Section 4 Construction & Operational Phase of the Planning Report. Extents of the proposed development including construction sites, compounds etc., are shown in development drawings in Appendix A of the Planning Report.

2.2.4 Duration of the Project

It is anticipated that the construction of the proposed development will be phased and will last approximately 9 months.

The approximate duration of the main activities are shown in Table 2-1.

Table 2-1 Construction Sequence and Duration

Construction Element	Approx. Duration of each task
Mobilisation, compound set up	2 weeks
Works on southern side of bridge	Approx. 4 months
Works on northern side of bridge	Approx. 4 months
Works on southeast quay wall*	Approx. 2 months (incl. 4 weeks of pile-driving)
Works on southwest quay wall**	Approx. 2 to 2.5 months (incl. 4 to 6 weeks of pile driving)
Concrete repairs to underside of bridge*	4-6 weeks
Total Construction Phase	**Approx. 9 months**
* These works can be carried out in parallel with the main bridge works ** These works can be carried out following completion of the southeast corner and in parallel with the main bridge widening works	

3. CONTACT SHEETS

Contact details of relevant personnel employed during the construction phase of the proposed development are required to ensure that environmental incidents are competently reported. The contact details should be frequently reviewed to ensure that they are up to date.

Table 3-1, Table 3-2 and Table 3-3 provide examples of how to document the contact details of all relevant main contractor, employer and third-party consultation personnel respectively.

Table 3-1 Main Contractor Contacts (Example)

Position Title	Name	Phone Number	Email Address
Project Manager			
Site Manager*			
Environmental Manager*			
Site Agents			
Forepersons			
Safety Officers*			
Site Emergency Number*			
Other, as appropriate			

***** 24hr contact details are required for persons with this position.

Table 3-2 Employer Contacts (Example)

Organisation	Position Title	Name	Phone Number	Email Address
Project Resident Engineer's Office	Project Resident Engineer			
Other, as appropriate				

Table 3-3 Third-Party Contacts (Example)

Organisation	Position Title	Name	Phone Number	Email Address
Wexford County Council				
Inland Fisheries Ireland				
Waterways Ireland				
National Parks and Wildlife Service				
Office of Public Works				
Environmental Protection Agency				

Organisation	Position Title	Name	Phone Number	Email Address
Local Authority				
Health and Safety Authority				
Emergency Services				
Other, as appropriate				

4. REFERENCE DOCUMENTS

4.1 Scheme Specific Documentation

Scheme specific documentation to be referred to when determining the Environmental Commitments and Requirements for the proposed development include:

- The Contract Documents;
- The Environmental Impact Assessment Report (EIAR);
- The Natura Impact Statement (NIS);
- Schedule of Commitments (Refer to the CEMP);
- Statutory Planning Consent including any additional Environmental commitments (Refer to the CEMP);
- Contractor's Construction Phase Safety and Health Plan.

4.2 General Reference and Guidance Documentation

TII's "Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan" should be referred to when developing the contractors EOP.

The contractor should have regard to guidance and standards set out in the relevant TII/NRA guidelines at https://www.tii.ie/technical-services/environment/construction/ and at https://www.tii.ie/technical-services/environment/planning/ shall be followed.

5. ORGANISATIONAL STRUCTURE/DUTIES AND RESPONSIBILITIES

5.1 Organisational Structure

The successful contractor will provide an organogram in the EOP to assign the duties and responsibilities of their personnel under the EOP.

5.2 Duties and Responsibilities

5.2.1 Project Manager

Name: [To be inserted by successful contractor]

Duties and Responsibilities

The Project Managers main duties and responsibilities in relation to the EOP include liaising with the Project Team in assigning duties and responsibilities in relation to the EOP to individual members of the main contractor's project staff.

It is the responsibility of the Project Manager to approve key personnel required for employment on the project. He/She will liaise with the site Environmental Manager.

The Project Manager will lead the works on site. He/She will be responsible for the management and control of the activities and will have overall responsibility for the implementation of the EOP. He/She will be assisted by the site Environmental Manager who will act as his/her deputy.

5.2.2 Site manager

Name: [To be inserted by successful contractor]

Duties and Responsibilities

The Site Manager's environmental management responsibilities include, but are not limited to:

- Liaise with the site Environmental Manager and the Project Team in assigning duties and responsibilities in relation to the EOP, to individual members of the main contractor's project staff;
- Liaising with Site Manager in preparing, reviewing and updating all site-specific method statements for activities where there is a risk of pollution or adverse effects on the environment;
- Liaising with the site Environmental Manager in agreeing site specific Method Statements with Third Parties;
- Ensuring that all relevant information on project programming, timing, construction methodology, etc., is communicated from the contractor's Project Team, including the Project Manager, to the site Environmental Manager in a timely and efficient manner in order to allow pre-emptive actions relating to the environment to be taken where required;
- ensuring that the risk assessments for control of noise and environmental risk are prepared and effectively monitored, reviewed and communicated on site;
- close liaison with the site Environmental Manager to ensure adequate resources are made available for implementation of the EOP; and

- ensuring that the site Environmental Manager reviews all method statements, performs regular and frequent environmental site inspections and that relevant environmental protocols are incorporated and appended.

5.2.3 Environmental Manager

Name: [To be inserted by successful contractor]

Duties and Responsibilities

In order to ensure the successful development, implementation and maintenance of the EOP, the Contractor will be required to appoint an independent site Environmental Manager to provide independently verifiable audit reports.

The site Environmental Manager must possess sufficient training, experience and knowledge appropriate to the nature of the task to be undertaken, a Level Eight qualification recognised by the Higher Education and Training Awards Council (HETAC), or a university equivalent, or other qualification acceptable to the Employer, in Environmental Science or Environmental Management, Environmental Hydrology, Engineering or other relevant qualification acceptable to the Employer.

Separate from the on-going and detailed monitoring carried out by the contractor as part of the EOP, the EM shall carry out the inspection/ monitoring regime described below, and report to the Contractor. The results will be stored in the site Environmental Manager's monitoring file and will be available for inspection/ audit by the Client, National Parks and Wildlife Service (NPWS) or Inland Fisheries Ireland (IFI) staff. All inspections/ monitoring/ results will be recorded on standard forms.

The responsibilities of the site Environmental Manager include:

Site-Specific Method Statements

- Liaising with the Construction Manager in preparing site-specific Method Statements for all Works activities where there is a risk of environmental damage. These site-specific Method Statements should incorporate relevant Environmental Control Measures and take account of relevant Environmental Control Measure Sheets;
- Liaising with the Construction Manager in reviewing and updating site-specific Method Statements for all Works activities where Environmental Control Measures and Environmental Control Measure Sheets have been altered, and
- Liaising with the Construction Manager where third party agreement is required in relation to site-specific Method Statements, Environmental Control Measures and/or Environmental Control Measure Sheets.

General

- Being familiar with the contents, environmental commitments and requirements contained within the Reference Documents
- Being familiar with baseline data gathered during Environmental Impact Assessment and NIS and during pre-construction surveys;
- Listing all Environmental Commitments and Requirements in an Environmental Commitments Summary Table;
- Assisting the Construction Manager in liaising with the PSDP/Engineer and the provision of information on environmental management to the Engineer during the course of the construction phase, and

- Liaising with the Project Team in assigning duties and responsibilities in relation to the EOP to individual members of the main contractor's project staff.

Third Party Consultations

- Overseeing, ensuring coordination and playing a lead role in third party consultations required statutorily, contractually and in order to fulfil best practice requirements;
- Ensuring that the minutes of meetings, action lists, formal communications, etc., are well documented and that consultation certificates are issued to the Engineer as required;
- Liaising with all prescribed bodies during site visits, inspections and consultations;
- Where new Environmental Control Measures are agreed as a result of third party consultation, ensuring that the EOP is amended accordingly;
- Where new Environmental Control Measures are agreed as a result of third party consultation, the Environmental Manager should liaise with the Construction Manager in updating relevant site-specific Method Statements, and
- Where required, liaising with the Construction Manager in agreeing site-specific Method Statements with third parties.

Licensing

- Ensuring that all relevant works have (and are being carried out in accordance with) the required permits, licences, certificates, planning permissions, etc.;
- Liaising with the designated licence holders with respect to licences granted pursuant to the Wildlife Act, 1976, as amended;
- Liaising with the designated licence holders and "scientific agent" (generally defined in the licence as "the contractor engaged to carry out the scientific direction and monitoring of mitigation measures") with respect to licences granted pursuant to the European Communities (Natural Habitats) Regulations 1997, as amended, and
- Bringing to the attention of the Project, Design and Construction Team any timing and legal constraints that may be imposed on the carrying out of certain tasks.

Waste Management Documentation

- Holding copies of all permits and licences provided by waste contractors;
- Ensuring that any operations or activities that require certificates of registration, waste collection permits, waste permits, waste licences, etc., have appropriate authorisation, and
- Gathering and holding documentation with respect to waste disposal.

Legislation

- Keeping up to date with changes in environmental legislation that may affect environmental management during the construction phase;
- Advising the Construction Manager of these changes, and
- Reviewing and amending the EOP in light of these changes and bringing the changes to the attention of the main contractor's senior management and subcontractors.

Site environmental inspections

- Carrying out regular documented inspections of the site to ensure that work is being carried out in accordance with the Environmental Control Measures and relevant site-specific Method Statements, etc, and
- Appending copies of the inspection reports to the EOP.

Specialist environmental contractors

- Identifying requirements for specialist environmental contractors (including ecologists, waste contractors and spill clean-up specialists) before commencement of the project;
- Procuring the services of specialist environmental contractors and liaising with them with respect to site access and report production;
- Ensuring that specialist environmental contractors are competent and have sufficient expertise to co-ordinate and manage environmental issues, and
- Co-ordinating the activities of all specialist environmental contractors on environmental matters arising out of the contract.

Environmental Induction Training and Environmental Tool Box Talks

- Ensuring that Environmental Induction Training is carried out for all the main contractor's site personnel. The induction training may be carried out in conjunction with Safety Induction Training, and
- Providing toolbox talks on Environmental Control Measures associated with site specific Method Statements to those who will undertake the work.

Environmental Incidents/Spillages

- The Environmental Manager should be notified of all incidents where there has been a breach of agreed environmental management procedures: where there has been a spillage of a potentially environmentally harmful substance; where there has been an unauthorised discharge to ground, water or air; where there has been damage to a protected habitat, etc.;
- The Environmental Manager should prepare and be in readiness to implement at all times an Emergency Response Plan.
- The Environmental Manager is responsible for notifying the relevant statutory authority of environmental incidents, and
- Carrying out an investigation and producing a report regarding environmental incidents. The report of the incident and details of remedial actions taken should be made available to the relevant authority, the Engineer and the Construction Manager.

5.2.4 Design Manager

Name: [To be inserted by successful contractor]

Duties and Responsibilities

The main duties and responsibilities of the Design Manger include:

- Be familiar with the EOP and relevant documentation referred to within;
- Be familiar with the contents, commitments and requirements contained within the reference documents; and

- Participate in Third Party Consultations and liaising with third Parties through the site Environmental Manager.

5.2.5 Site Agents

Name: [To be inserted by successful contractor]

Duties and Responsibilities

The Site Agents are responsible for the following:

- Ensuring Forepersons under his/her control adhere to the relevant Environmental Control measures and relevant site-specific Method Statements, etc.
- Ensuring that the procedures agreed during third party consultations are followed;
- Reporting immediately to the site Environmental Manager any incidents where there has been a breach of agreed environmental management procedures, where there has been a spillage of a potentially environmentally harmful substance, where there has been an unauthorised discharge to ground, water or air, damage to habitat, etc.
- Attending environmental review meeting and preparing any relevant documentation as required by Management.

5.2.6 Forepersons

Name: [To be inserted by successful contractor]

Duties and Responsibilities

The forepersons on site are responsible for the following:

- Ensuring personnel under his/her control adhere to the relevant environmental control measures and relevant site-specific Method Statements;
- Reporting immediately to the site agents and site Environmental Manager any incidents where there has been a breach of agreed procedures e.g. spillages and discharges.

5.2.7 Employer's Representative

Name: [To be inserted by successful contractor]

Duties and Responsibilities

The Employer's Representative (ER) acts on behalf of the Employer in the course of a construction project. The EOP will be audited by the Employer's Representative to ensure that the Contractor is compliant with the environmental provisions of the Contract Documents.

5.2.8 Project Supervisor Construction Stage

The role of the Project Supervisor Construction Stage (PSCS) is to manage and co-ordinate health and safety matters during the construction stage. The PSCS will be appointed before the construction work begins and will remain in that position until all construction work on the project is completed.

It is the responsibility of the PSCS to ensure that the project:

- is designed and is capable of being constructed to be safe and without risk to health;
- is constructed to be safe and without risk to health;
- can be maintained safely and without risk to health during subsequent use; and
- complies in all respects, as appropriate, with the relevant statutory provisions

The PSCS will prepare the Construction Phase Safety and Health Plan in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 (as amended) prior to the commencement of construction work for the project. The Plan should provide the blueprint for managing and co-ordinating safety and health during construction and should explain how the key safety and health issues will be managed.

The PSCS will maintain contact with the Project Supervisor Design Process (PSDP) throughout the construction phase to communicate any health and safety related issues. The PSDP will prepare a written safety file appropriate to the characteristics of the project, containing relevant health and safety information, to be taken into account during any subsequent construction work following completion of the project.

5.2.9 All Project Personnel

Name: [To be inserted by successful contractor]

Duties and Responsibilities

All project personnel have the following responsibilities:

- Reporting any operations and conditions that deviate from the EOP to the Site Agent and site Environmental Manager. Depending on circumstances it may be appropriate for general operatives and machinery operators to report directly to their Foreperson who will then report to the site Environmental Manager and Site Agent;
- taking an active part in site safety and environmental meetings;
- ensuring awareness of the contents of method statements, plans, supervisors' meetings or any other meetings that concern the environmental management of the site; and
- Attend environmental training as required.

5.2.10 Ecological Clerk of Works (ECoW)

Name: [To be inserted by successful contractor]

Duties and Responsibilities

In order to ensure the successful development and implementation of the EOP, the Contractor will appoint an independent Ecological Clerk of Works (ECoW). The ECoW must possess training, experience and knowledge appropriate to the role, including:

- An NFQ Level 8 qualification or equivalent or other acceptable qualification in ecology or environmental biology; and,
- Demonstrable experience in the protection of European sites.

The principal functions of the ECoW are:

- To provide ecological supervision of the construction of the proposed development and thereby ensure the full and proper implementation of all the mitigation measures relating to biodiversity prescribed in the EIAR and NIS;

- To regularly review the outcome of the specialist hydroacoustic monitoring if being undertaken and, on that basis, make any necessary adjustments to the mitigation; and,
- To carry out weekly inspections and reporting on the implementation of the Contractor's Biosecurity Protocol.

During the preparation of the Contractor's EOP, the site Environmental Manager may, as appropriate, assign other duties and responsibilities to the ECoW.

In exercising his/her functions, the ECoW will be required to keep a monitoring file and this will be made available for inspection or audit by the NPWS or IFI at any time.

5.2.11 Project Archaeologist

Name: [To be inserted by successful contractor]

Duties and Responsibilities

A suitably qualitied Project Archaeologist on site is responsible for the following:

- Relevant licences to the Department of Housing, Local Government and Heritage required for the project in advance of any construction work taking place and throughout the project as required
- To supervise works in vicinity of known archaeological sites' and
- To supervise any pre-construction archaeological survey works.

Section 26 of the National Monuments Act 1930 (as amended) requires that excavations for archaeological purposes must be carried out by suitably qualified and experienced archaeologists acting under an excavation licence. Inappropriate excavation of a heritage site could result in damage to, or destruction of, the integrity, setting or historical context of the site, contrary to the public interest.

5.2.12 Other

Subject to the environmental commitments / requirements, other environmental specialists will be employed as required during the construction works.

6. ENVIRONMENTAL COMMITMENTS

The Schedule of Environmental Commitments comprises the mitigation measures as outlined in the Planning Report and Natura Impact Statement and any additional commitments arising up to and including the Oral Hearing and is included in the CEMP, Appendix A contains the Natura Impact Statement mitigation measures and Appendix B contains the Statutory Planning Consent including any additional Environmental commitments.

Relevant environmental legislation prescribes environmental performance criteria. Therefore, in addition to: the Contract documents, the conditions imposed by An Bord Pleanála, the Schedule of Commitments, and relevant environmental legislation all prescribe environmental performance criteria.

The following table lists the complete suite of Environmental Commitments together with the relative specification and evidence of how each commitment will be met. An example of the layout of this table and potential entries is given below.

Table 6-1 Environmental Commitments (Example)

Environmental Commitment	Legislation / Specific Ref.	Action Owner	Evidence	Target Date	Close Date
Biodiversity (Flora and Fauna)	Planning Report: Section 8 Biodiversity	Env. Manager/ Specialist Ecologist/ Env. Designer / Site Agent / Foreman	Method Statement / Ecological Walkover / Pre-surveys / agreement from IFI & NPWS / Site Inspections	Ongoing	End of Contract
Hydrology and Hydrogeology	Planning Report: Section 8 Biodiversity Section 9 Hydrology Section 10 Soils, Geology and Hydrogeology	Env. Manager/ Specialist Ecologist/ Env. Designer / Site Agent / Foreman	Method Statement / Site Inspections / Monitoring Data	Ongoing	End of Contract
Air Quality	Planning Report: Section 12 Air Quality	Env. Manager/ Site Agent / Foreman	Method Statement / Site Inspections / Monitoring Data	Ongoing	End of Contract
Noise and Vibration	Planning Report: Section 13 Noise and Vibration	Env. Manager / Noise Specialist / Env. Designer / Site Agent / Foreman	Method Statement / Site Inspections / Monitoring Data / Environmental Control Measure Sheet	Ongoing	End of Contract
Landscape and Visual	Planning Report: Section 8 Biodiversity Section 11 Landscape and Visual	Env. Manager/ Specialist Ecologist/ Env. Designer / Site Agent / Foreman	Method Statement / Site Inspections /	Ongoing	End of Contract

7. ENVIRONMENTAL CONTROL MEASURES

Environmental Control Measures to meet the Environmental Commitments / Requirements will be identified and implemented by the Contractor, refer to the CEMP for the list of Environmental Commitments / Requirements.

The Contractor will follow the procedure outlined in Figure 7-1 to identify the environmental control measures.

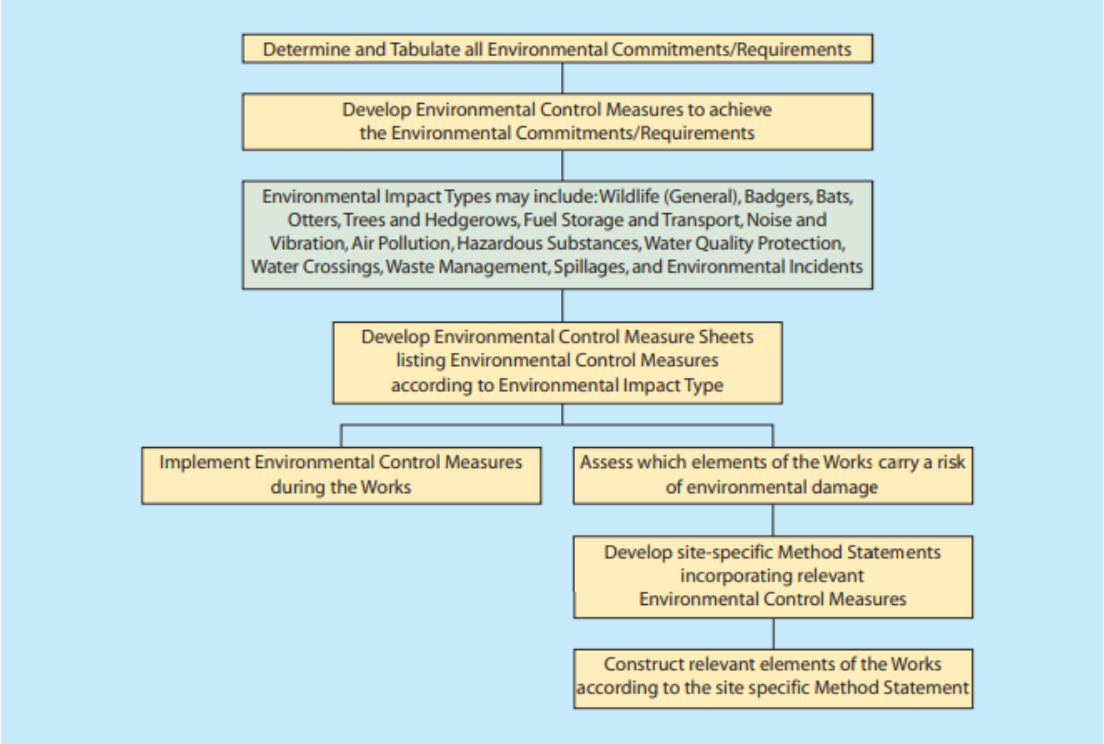


Figure 7-1 Example of Main Steps in Developing and Implementing Environmental Control Measures. Source: *TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan*

As outlined in Figure 7.1, some environmental control measures are generally implemented across all works. However, some construction works may present a risk of environmental damage for which, relevant environmental control measures are required to be incorporated into site-specific method statements.

Environmental Control Sheets will be prepared by the Contractor which will contain the prescribed environmental control measures according to the environmental impact (e.g., impacts on watercourses, bats, badger etc.). It will be the responsibility of the site Environmental Manager to ensure that the identified environmental control measures are sufficient to meet the environmental commitments and that they are brought to the attention of the relevant key personnel.

An example of an Environmental Control Sheet is shown in Figures 7.2 and 7.3 below. For more examples, see Section 7.3 of the TII's *"Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan"*.

Example Environmental Control Measure Sheet – Noise and Vibration (contd.)

Environmental Control Measures – Communication with the Public

- A Public Communications Strategy should be established to promote awareness of measures being taken to restrict noise and vibration to acceptable levels. See Chapter 10.

Environmental Control Measures – Piling and Blasting

- A publicity campaign should be undertaken prior to the commencement of piling and blasting, explaining the work being carried out and the reasons for the work.
- An on-site documented complaints procedure should be implemented.
- Blasting should be carried out at similar times each day to reduce the 'startle' effect.
- Trial blasts should be carried out in less sensitive areas to assist in blast designs and identify potential zones of influence.

Environmental Control Measures – Control of Noise and Vibration (General)

Environmental Control Measures in relation to Noise and Vibration may be split into two categories:

- Control of noise and vibration at source, and
- Controlling the spread of noise and vibration.

Environmental Control Measures – Control of Noise and Vibration at Source

- Where reasonably practicable, noisy plant or processes should be replaced by less noisy alternatives.
- Plant should be properly and regularly maintained.
- Compressors should be 'sound reduced' models fitted with properly lined and sealed acoustic covers which should be kept closed whenever machines are in use and all ancillary pneumatic tools should be fitted with suitable silencers.
- Machinery, which is used intermittently, should be shut down or throttled back to a minimum during those periods when not in use.
- All vehicles and mechanical plant should be fitted with effective exhaust silencers.
- Noise from existing plant and equipment can be reduced by modification or by the application of improved sound reduction methods, but this should only be carried out after consultation with the manufacturer.
- Depending on the nature of the machine and on their ventilation requirements the use of enclosures and acoustic sheds should be considered where their use is reasonably practicable.
- Where deemed reasonably practicable, plant and site equipment should be located away from noise sensitive receptors.
- Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise sensitive receptors.

Environmental Control Measures – Controlling the Spread of Noise and Vibration

At certain times during construction and at particular locations the use of temporary noise attenuating devices should be considered:

- The erection of temporary noise attenuating screens may be required in order to reduce noise levels below the maximum permissible noise levels. Noise-attenuating screens can be made up of formwork panels or constructed from at least 12 mm thick plywood and battens. Plywood may need to be stiffened with additional battens to prevent drumming. The lower edge of the panels should rest on the ground with any gap plugged by spoil, sandbags, etc.
- The use of temporary or the advance construction of permanent berms may be appropriate.
- Site buildings or material stockpiles may be located so as to shield sensitive receptors.

Environmental Control Measures – Construction of Permanent Noise Reducing Measures

Permanent noise mitigating measures installed on national road schemes should achieve the noise design commitments specified in the Contract documents, the EIS, any conditions and/or modifications imposed by ABP and the Schedule of Commitments. It will generally be required that such noise mitigation measures achieve the noise design goal '*performance standard*' of 60 L_{den} as specified in the *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (Revision 1, National Roads Authority, October 2004). In order to demonstrate that these noise design commitments are being achieved, the following Environmental Control Measures should be implemented:

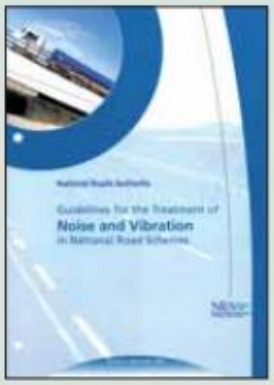
- Documented evidence demonstrating that all noise mitigation measures will achieve the noise design commitments should be attached to the EOP. The Contractor's Designer, as advised by an acoustic specialist, should produce this report. This Environmental Control Measure should be in addition to any contractual requirements for the provision of documented evidence demonstrating that all noise mitigation measures meet the noise design commitments.
- Documented evidence demonstrating that all noise barriers have achieved the performance specified in the Contract in accordance with I.S. EN 1793 – 1:1998, I.S. EN 1793 – 2:1998, I.S. EN 1793 – 3:1998, I.S. EN 1794 – 1:2003 and I.S. EN 1794 – 2:2003 following the specifications outlined in I.S. EN 14388:2005 should be attached to the EOP. This documented evidence should demonstrate how the barriers meet the specified standards and should clearly indicate the absorptive performance (where such barrier is used) and airborne sound insulation categories of the constructed barriers as outlined in I.S. EN 1793 – 1:1998 and I.S. EN 1793 – 2:1998. This Environmental Control Measure should be in addition to any contractual requirements for the provision of such documented evidence.

Responsibility

- The Site Agent should be familiar with the noise sensitive receptors and alert the Environmental Manager in good time prior to work commencing in these areas.
- The Environmental Manager should develop site-specific Method Statements in conjunction with the Construction Manager.

References

Guidelines for the Treatment of Noise and Vibration in National Road Schemes (Revision 1, National Roads Authority, October 2004).



BS 5228: *Noise and vibration control on construction and open sites*.

ISO1996-1 1982 *Acoustics – Description and measurement of environmental noise – Part 1: Basic quantities and procedures*.

Figure 7-2 **Example of an Environmental Control Sheet for Noise and Vibration. Source Box 19 *TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan***

Example Environmental Control Measure Sheet – Otters

Environmental Control Measures – Pre-Construction Ecological Walkover

- The Environmental Manager should ensure that signs of otter activity are assessed during the Pre-Construction Ecological Walkover.

Environmental Control Measures – Consultation

Prior to their commencement, all works impacting on otters and their breeding or resting places should be agreed and documented in consultation with the relevant statutory authority:

- National Parks and Wildlife Service (NPWS) of the Department of the Environment, Heritage and Local Government.

Such consultation should take place at the earliest opportunity in order to avoid any delay in obtaining licences or disruption to the works programme.

Environmental Control Measures – Compliance with relevant Licences, Approvals and Legislation

All works impacting on otters and their breeding or resting places should be carried out in accordance with relevant licences, approvals and legislation.

- Otters, along with their breeding and resting places, are protected under the provisions of the Wildlife Act, 1976, as amended by the Wildlife (Amendment) Act, 2000. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Directive, which is transposed into Irish law in the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997), as amended.

- The removal of otters from affected holts, and the subsequent destruction of these holts, must be conducted under a Regulation 25 derogation under the 1997 Habitats Regulations. The National Parks and Wildlife Service (NPWS), of the Department of the Environment, Heritage and Local Government, is responsible for processing these licences. An application for a Regulation 25 derogation should be submitted to the NPWS along with the relevant ecological information from otter surveys. At least three weeks is normally required to process a derogation application. Conditions will usually be attached to each derogation granted in respect of otters and operations at holts or in their vicinity. Closure of holts requires a monitoring period to ensure that there is no current otter activity at the holt. Derogations may not be provided by the NPWS for the closure of holts containing a breeding female or young otters. Derogations may also be required for any works likely to cause disturbance (e.g. piling and blasting) to active breeding holts (when present within c.150m of a scheme).

Environmental Control Measures – Otter Holt Protection

- A map (at an appropriate scale) should be attached to the Environmental Operation Plan showing the general locations of otter holts and otter crossing-points, where applicable. The map should be available to Site Agents, Forepersons and Monitoring Staff.

Site-specific Method Statements – Otters

Site-specific Method Statements should be drawn up for the following Works:

- The exclusion of otters from holts;
- The destruction of holts;
- The construction of otter ledges on culverts and bridges;
- The construction of otter underpasses;
- The construction of mammal resistant fencing;
- The construction of culverts and bridges known to contain otters, and
- Site works in the vicinity of otter holts.

Environmental Control Measures – Post-Construction Monitoring and Mitigation

- Quarterly monitoring of mitigation measures should take place after completion of construction. Monitoring should be continued for at least one year after construction work ceases.

Responsibility

The Environmental Manager is responsible for ensuring:

- That third party consultations take place;
- Liaison with the Designated Licence Holders and ensuring that the removal of otters from affected holts and subsequent destruction of these holts is conducted under licence;
- That a pre-construction survey is carried out;
- Environmental Control Measures are drawn up;
- Site Agents and Forepersons are made aware of requirements, and
- Post-mitigation monitoring takes place.

References

Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (National Roads Authority, 2006).

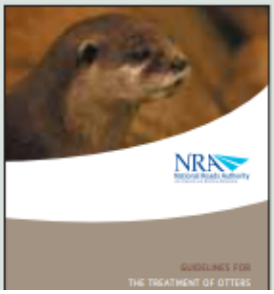


Figure 7-3 **Example of an Environmental Control Sheet for Otters. Source Box 19 *TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan***

8. SITE SPECIFIC METHOD STATEMENTS

A Method Statement may be defined as a statement of the construction methods and resources to be employed in executing construction work. Method Statements can cover numerous works activities, however where there is a risk of environmental damage, site- specific method statements must be prepared for the construction works. The Method Statement should be prepared by the Contractor with assistance from the site Environmental Manager who will identify which elements of the works have the potential to significantly impact the environment.

The Method Statement should refer to relevant Environmental Control Measure Sheets and incorporate relevant Environmental Control Measures. The Method Statement should include:

- The proposed method of construction and how impacts shall be mitigated;
- Contingency plans and emergency plans to limit damage caused by accidents, spills or other unforeseen events: and
- Notification procedures to the relevant Authorities, Utilities and Service Providers.

There may be a requirement for method statements to be reviewed and / or approved by third party consultees (where applicable) prior to their finalisation.

A template of the site-specific method statements is provided in Figure 8.1 below.

Site-Specific Method Statement: Demolition of the Building at Chainage 13+00 LHS	
A. Resource Required	
Labour	
1	Site Agent
2	Forepersons
3	Machine Operators (as necessary)
4	General Operatives
5	Safety Officer
6	Environmental Manager
Plant & Equipment	
1	Teleporter with cradle.
2	20/30 tonne excavators.
3	Dumptruck (as necessary).
B. Material & Supplies	
Not Applicable.	

2.	Main contractor's Engineer to survey and inspect the building to ensure that no hazardous materials are present and that all services are disconnected.	Site Engineer	Site Engineer	01/06/06	No hazardous materials were present. All services have been disconnected. See survey report attached.
3.	Ensure that Scientific Agent (listed in the Licence) examines building prior to demolition.	Environmental Manager	Environmental Manager	02/06/06	Building contained roosting bats as indicated in the EIS. Bats are inaccessible and the exclusion procedure must be followed. Scientific Agent
4.	Install one-way valves over suitable access points as per the advice of the Scientific Agent.	Environmental Manager	Environmental Manager	02/06/06	One-way valves installed in accordance with best practice. Scientific Agent
5.	Allow a sufficient period for bats to be excluded from the building as per the advice of the Scientific Agent.	Environmental Manager	Environmental Manager	06/06/06	Four day exclusion period required in accordance with best practice. Scientific Agent

C. Staff Responsibilities	
Position Title	Responsibility
Environmental Manager	
Site Agent	
Foreperson	
Safety Officer	Ensure compliance with the Health and Safety Plan.

D. Environmental Control Measure Sheets
Environmental Control Measure Sheet – Wildlife (General)
Environmental Control Measure Sheet – Bats
Environmental Control Measure Sheet – Trees and Hedgerows

E. Health and Safety Risk Assessment

F. Method					
	Operation	**Person Responsible**	**Signature**	**Date**	**Comment**
1.	Obtain copy of Licence issued by NPWS.	Environmental Manager	Environmental Manager	01/06/06	Copy of licence received from the Engineer. See attached licence.

Figure 8-1 **Example of a Site-Specific Method Statement for Demolition Works. Source: *TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan***

9. ENVIRONMENTAL AWARENESS TRAINING

9.1 EOP, Planning Report, NIS and Contractual Requirement Briefing

The site Environmental Manager will brief the Contractor's senior personnel, namely the Project Manager, Site Manager, Design Engineers, Site Agents, PSCS and any other key personnel on the EOP and the Environmental Commitments/ Requirements that must be met during the construction phase.

9.2 Site induction

All employees and subcontractors involved on site will be given a comprehensive induction prior to commencement of the works. The environmental training and awareness procedure will ensure that staff are familiar with the principles of the CEMP, the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

This environmental training can be run concurrently with safety awareness training. Training will include:

- Overview of the Environmental Policy and Construction Environmental Management Plan, goals and objectives;
- Awareness in relation to risk, consequence and methods of avoiding environmental risks as identified within the Register of Aspects and with the planning conditions;
- Awareness of roles and individual environmental responsibilities and environmental constrains to specific jobs;
- Location of and sensitivity of Special Area of Conservations, Special Protection Areas, protected monuments, structures etc.
- Location of habitats and species to be protected during construction, how activities may affect them and methods necessary to avoid impacts.

A record will be kept of a signed register on the project files of all attendees of the environmental induction.

Toolbox talks based on specific activities being carried out will be given to personnel by the nominated project representative. These will be based on specific activities being carried out and will include environmental issues particular to the project, including the impact on bird populations and water quality namely:

- Oil/Diesel spill prevention and safe refuelling practice;
- Storage of materials including oil/diesels and cement;
- Emergency response processes used to deal with spills;
- Minimising disturbance to wildlife;
- Emergency response to include water pollution hotline to the EPA for regulator response. Identification of registered / accredited spill cleanup company for oil etc.; and
- Consideration of importance of containment of vehicle washing, containments of concrete /cement / grout washout etc, bank protection using hessian to prevent excessive scour and mobilisation of suspended solids, maintenance of vegetation corridors etc.

9.3 Specific training and awareness

A project specific training plan that identifies the competency requirements for all personnel allocated with environmental responsibilities will be produced by the Contractor. Training will be provided by the Contractor to ensure that all persons working on site have a practical understanding of environmental issues and management requirements prior to commencing activities. A register of completed training is to be kept by the site Environmental Manager. The Site Manager will ensure that environmental emergency plans are drawn up and the site Environmental Manager will conduct the necessary training/inductions.

10. COMMUNICATION

10.1 External Communication

A Stakeholder Management and Communication Plan (SMCP) will be prepared by the contractor. The Employer will appoint a Public Liaison Officer, or equivalent, who will be consulted in the preparation of the Plan as well as its maintenance and implementation. The SMCP will provide the means of the stakeholder and members of the public to communicate with the project team, and for the project team to communicate relevant information of the scheme.

- The principal component of a Stakeholder Management and Communication Plan will include:
- Details of general construction process / phasing will be communicated to the relevant stakeholders and members of the public prior to implementation to ensure local residents and businesses are fully informed of the nature and duration of construction works.
- Details of a contact name and number for any complaints that may arise during such works.

A complaints register will be developed as part of the Plan to efficiently record any complaints made. Environmental related complaints will be initially directed to the site Environmental Manager. A template for an environmental complaints register is provided in Figure 10.1 below as an example.

Environmental Complaints Register

Form 4

Title:	Environmental Complaints Register				
Page:	Page 1 of 1	Ref. No.:		Issue No.:	
Issued by:		Approved by:		Date:	

Date	__/__/__
Complaint received by:	
Complaint recorded by:	
Complaint made by:	
Name:	
Address:	
Telephone:	
Email Address:	
Nature of the complaint:	
Weather conditions at time of complaint:	
Complaint reported to:	
Action taken:	
Was there a follow up call to complainant?	YES/NO
Use additional sheets if required	

Figure 10-1 Template of an Environmental Complaints Register. Source: Form 4 in *TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan*

10.2 Internal Communication

Environmental issues and performance aspects will be communicated to the workforce on a regular basis. Weekly project meetings, which follow a set agenda incorporating Environment, will be held alongside overall management meetings.

All staff and sub-contractors involved in all phases of the project will be encouraged to report environmental issues.

The PSCS will maintain contact with the PSDP throughout the works to communicate any health and safety related issues. The PSDP will prepare a written safety file appropriate to the characteristics of the project, containing relevant health and safety information, to be taken into account during any subsequent construction work following completion of the project.

11. INSPECTIONS, AUDITING AND MONITORING COMPLIANCE

11.1 Inspections

The appointed site Environmental Manager will carry out environmental inspections at appropriate intervals. The site Environmental Manager will be accompanied by a qualified and accredited environmental specialists (ecologists, landscape architects and noise specialists etc.) when appropriate and where required during inspections.

The site Environmental Manager will append the reports from environmental inspections to this EOP.

11.2 Monitoring

The Planning Report may require the execution of certain types of monitoring e.g., related to noise and vibration, water quality air quality, etc.

The appointed site Environmental Manager will prepare a schedule of monitoring required, detailing the type of report to be prepared and to whom it should be send to. All of the monitoring is to be carried out by competent experts. A template of a monitoring schedule is provided in Figure 11.1 below as an example.

Monitoring Schedule

Form 5

Title:	Monitoring Schedule				
Page:	Page 1 of 1	Ref. No.:		Issue No.:	
Issued by:		Approved by:		Date:	

Location	Parameters	Frequency	By whom	Report type	Distribution to

Figure 11-1 Template of Monitoring Schedule. Source: Form 5 in *TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan*

11.3 Audits

11.3.1 Audit by the Environmental Manager

The EOP will be audited by the site Environmental Manager in conjunction with the Site Manager annually or as agreed at the start of the contract to ensure that the appointed Contractor is in compliance with all environmental commitments / requirements. Should there be a need to revise the EOP, the site Environmental Manager will make all the necessary changes to the EOP and inform the key personnel of such changes. The EOP should only be revised by the site Environmental Manager and approved by the Site Manager.

A template containing an auditing format is provided in Figure 11.2 below as an example.

Audit Format

Form 6

Title:	Audit Format				
Page:	Page 1 of 1	Ref. No.:		Issue No.:	
Issued by:		Approved:		Date:	

No.	Query	Outcome	Action required	Date for completion
1	Has the EOP been created, maintained and implemented?			
2	Has the EOP being submitted to the Engineer at appropriate intervals?			
3	Has an Environmental Manager, having sufficient training, experience and knowledge appropriate to the nature of the task to be undertaken, been appointed by the main contractor?			
4	Have General Project Details been included within the EOP?			
5	Have Contact Details of relevant persons and bodies been incorporated and updated within the EOP?			
6	Has an up-to-date and appropriate Reference Document Section been included within the EOP?			
7	Has the main contractor's organisational structure been illustrated within the EOP?			
8	Have duties and responsibilities been satisfactorily assigned under the EOP?			
9	Have all the Environmental Commitments and Requirements been identified and documented?			
10	Have all Environmental Control Measures necessary to comply with the Environmental Commitments and Requirements been developed and documented?			
11	Have all site-specific Method Statements been developed for Works activity where a risk of environmental damage is present?			
12	Has Environmental Awareness Training been adequately carried out? Are records of training available and attached to the EOP?			
13 14	Is the complaints register being filled in? Do minutes of meetings show environmental issues on the agenda?			
15	Has the Environmental Manager carried out regular environmental inspections? Have the reports of the inspections been appended to the EOP?			
16	Has an appropriate schedule of monitoring been drawn up? Where monitoring falls outside of the range contractually required, has the Environmental Manager initiated and reported on corrective action?			
17	Have the Environmental Manager and Construction Manager audited the EOP on an annual basis?			

Figure 11-2 Template of an Audit Format. Source: Form 6 in *TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan*

11.3.2 Audit by the Employer's Representative

The EOP will be audited by the Employer's Representative to ensure that the Contractor is compliant with the environmental provisions of the Contract Documents.

12. HANDOVER OF THE FINAL EOP

Two copies of the final and complete EOP should be supplied to the Employer's Representative / PSDP immediately following the end of the defect's notification period.

APPENDIX D

Incident Response Plan

Prepared by
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O'Hanrahan Bridge Widening

Incident Response Plan

March 2023

Client:
Kildare County Council

ROD
ROUGHAN & O'DONOVAN

O'Hanrahan Bridge Widening

Incident Response Plan

TABLE OF CONTENTS

1.0 INTRODUCTION

This Incident Response Plan (IRP) describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts are prompt, efficient, and appropriate to particular circumstances. It has been developed to provide the information that each employee may need in order to respond to an emergency and to handle it effectively.

2.0 OBJECTIVE OF PLAN

The primary objective of this document is to:

- Ensure the health and safety of workers and visitors at and in proximity to the site.
- Minimise any impacts to the environment and to ensure protection of the water quality and the aquatic species dependant on it.
- Protect property and operations at the proposed site and to minimise the impact on the continuity of business.
- Establish procedures that enable personnel to respond to incidents with an integrated multi-departmental effort and in a manner that minimises the possibility of loss and reduces the potential.

3.0 RESPONSIBILITY

It is the responsibility of the Site Environmental Manager to maintain and update this IRP as required.

This IRP will be reviewed on an ongoing basis and amended, as necessary, when one or more of the following occur:

- Applicable regulations are revised.
- The Plan fails in an emergency.
- The project changes in its design, construction, operation, maintenance, or other circumstance in a way that materially increases the potential for impacts on the environment, workers or visitors to the site; and/or.
- Amendments are required by a regulatory authority.

4.0 OTHER PLANS

In 2019, Health Service Executive (HSE) prepared an Emergency Plan for the South East Region in accordance with the Government's Major Emergency Management Framework which include counties of Carlow, Kilkenny, Tipperary, Wexford and Waterford. This plan is available ONLINE at:

https://www.hse.ie/eng/services/list/3/emergencymanangement/area-mep/hse-emergency-management-area-5-emergency-plan.pdf

It details the initial contact that should be made in case of an emergency incident as well as those responsible for following up once an emergency event is declared. This plan may be referred to during both the construction and operation phases.

5.0 RESPONSE PLANNING

5.1 Incident Response Plan

The Contractor's Environmental Operating Plan (EOP) will include an Incident Response Plan, which will detail the controls to be adopted to manage the risk of pollution incidents and procedures to be followed in the event of any pollution incidents.

The Incident Response Plan will include the following, as appropriate:

- Reference to the Method Statements and Management Plans for other construction activities, insofar as they are relevant for the purposes of mitigating against health and safety and pollution incidents.
- Procedures to be adopted to contain, limit and mitigate any adverse effects, as far as reasonably practicable, in the event of a health and safety or pollution incident.
- Details of spill clean-up companies appropriate to deal with pollution incidents associated with the materials being used or stored on site.
- Procedures to be followed and appropriate information to be provided in the event of any incident, such as a spillage or release of a potentially hazardous material.
- Procedures for notifying appropriate emergency services, authorities, the Employer's Representative and personnel on the construction site.
- Procedures for notifying relevant statutory bodies, environmental regulatory bodies, local authorities and local water and sewer providers of pollution incidents, where required.
- Maps showing the locations, together with address and contact details, of local emergency services facilities such as police stations, fire authorities, medical facilities and other relevant authorities.
- Contact details for the persons responsible on the construction site and within the Contractor's organisation for pollution incident response.

5.2 Monitoring

The Contractor will investigate and provide reports on any health and safety or pollution incidents to the Employer's Representative, including, as appropriate:

- A description of the incident;
- Contributory causes;
- Adverse effects;
- Measures implemented to mitigate adverse effects; and,
- Effectiveness of measures implemented to prevent pollution.

The Contractor will undertake appropriate monitoring of the procedures and measures set out in the management plans for construction activities required to prevent health and safety or pollution incidents to ensure they are being adequately implemented.

The Contractor will monitor the effectiveness of the procedures and measures implemented in the event of an incident and the effectiveness of the response procedures set out in the Incident Response Plan to identify any areas where improvement is required.

6.0 OUTLINE INCIDENT RESPONSE PLAN

Name and address of the Client:

Kildare County Council

National Roads Office

Maudlins, Naas

Co. Kildare

The contact within the Client organisation: _____ tel no:_____

Site Location:

Overview of the activities on site:

The construction programme for the proposed development is approximately 36 weeks (9 months).

- Site Setup and establishment of construction compound;
- Ground Investigations (GI);
    - GI works will be undertaken in the area of the southeast and southwest quay wall to inform the design of the proposed sheet pile wall. The works will consist of a trial pit (TP01) and three river boreholes (BH01, BH02 and BH03).
- Widening of the bridge deck (southern side);
    - The widening of the southern side of the bridge will consist of approx. 1m wide reinforced concrete cantilever slab that will be made integral with the existing deck slab. The cantilever slab will include an upstand edge beam to support the proposed new N2 parapet.
- Widening of the quay/wing walls (south-east corner);
    - The quay wall will be extended by up to 2m on the south-east corner to facilitate the transition from the widened southern part of the bridge to the existing quay wall on the eastern side of the bridge. A sheet pile wall will be installed up to 2m from the face of the existing quay wall. Installation of the sheet piles will be completed via a piling rig from a river barge. The existing flood defence wall will be taken down below footway level and the space between the sheet pile wall and the front face of the existing quay wall will be filled with compacted fill material.
- Widening of the quay/wing walls (south-west corner);
    - The quay wall will be extended by approximately 1m on the south-west corner to facilitate the transition from the widened southern part of the bridge to the existing quay wall on the western side of the bridge. A sheet pile wall will be installed 1m from the face of the existing southern wingwall. Installation of the sheet piles will be completed via a piling rig either from the landside or from a river barge. The existing flood defence wall will be taken down below footway level and replaced by a matching flood defence wall along the line of the widened quay wall. These will be supported by a new reinforced concrete capping beam on the sheet piles. The new sheet piled wing wall will be tied back to the existing and backfilled with compacted fill material.
- Replacement of northern parapet;
    - The existing parapets are approximately 1m high and will be replaced with 1.4m high N2 containment level parapets in accordance with DN-REQ-03034. The parapet edge beam on the northern side of the bridge will be reconstructed to facilitate the higher containment parapet.
- Resurfacing and waterproofing of bridge deck;
    - To facilitate the waterproofing of the bridge deck, the existing road surface will be excavated to expose the top of the bridge deck. The deck surface will be prepared, and multiple layers of waterproofing membrane will be applied to the surface. New road surfacing material will be laid, and footpaths will be reconstructed.
- Installation of expansion joints;

- Concrete repairs to underside of the bridge;
- Relocation of underground utilities, where required;
- All ancillary works.

Description of the proposed development and surrounding area:

The proposed development is located along O'Hanrahan Bridge in the urban centre of New Ross, Co. Wexford. O'Hanrahan Bridge carries the R273 Regional Road over the River Barrow. The river forms the boundary between County Wexford and County Kilkenny for the most part. The land adjacent to the bridge is predominantly of commercial and residential use. The bridge is surrounded by a mix of historic buildings and structures, tourism sites and commercial properties on the eastern side, and residential, commercial, and industrial properties on the western side. The aim of the proposed development is to provide a shared pedestrian and cycleway from the New Ross Quay to Rosbercon Quay over the O'Hanrahan Bridge.

O'Hanrahan Bridge is a 9-span post-tensioned concrete beam and reinforced concrete slab bridge over the River Barrow in New Ross town, Co. Wexford. The overall length of the bridge is 175m with an out-to-out width of 11.6m. The proposed works aim to widen the O'Hanrahan bridge deck by approx. 1m in order to accommodate an enhanced combined pedestrian and cycleway. The widening works are to take place on the southern side of the bridge. In order to tie the new widened section into the quays at the eastern end and ensure continuity of the new cycleway, the scheme requires for an approx. 20m long section of the existing quay wall on the south-east corner of the bridge to be reconstructed up to 2m out from the existing quay wall. This section will require working instream. Similarly, approx. 60m section of the south-west corner of the bridge will require widening works by approximately 1m out from the existing wall; of which 5m will be directly instream. The remaining 55m will be in the embankment area. The length of new sheet piles in front of the wingwalls will be approximately 19m, of which 5m will be located directly in the river. The remaining 41m of new wall will be constructed in front of the existing flood wall, all driven at the top of the embankment above the water level.

Furthermore, concrete repair works will be undertaken on the existing bridge in areas where minor concrete defects are identified.

Potential Incidents:

Potential incidents requiring emergency response procedures:

- Fuel and oil spills;
- Road traffic accidents involving chemical or biological spills;
- Earth slippages;
- Extreme rainfall events, causing swelling of the River Barrow;
- Fires;
- Activities resulting in noise and vibration, air pollution, hazardous substances or impacts on water;
- Working within and in vicinity of River Barrow;
- Waste management; and,
- Discharge of effluent.

The Contractor will update the list of potential incidents based on their proposed construction methods and programme for the O'Hanrahan Bridge Widening and include, as a minimum, the following:

- The measures to be taken to reduce the risk potential;
- Procedures to be put in place to deal with the risk;
- Person responsible for dealing with incidents;
- Procedures for alerting key staff;
- Standby/rota systems;
- Clearly defined roles and responsibilities;
- Names of staff and contractors trained in incident response;

- The types and location of emergency response equipment available and appropriate personal protective equipment to be worn;
- A system of response coordination;
- Off-site support; and,
- Particular emergency service or persons to be notified in case of incident.

Date and version of the plan:	**Name or position of person responsible for compiling/approving the plan:**
Review Date:	**Date of next review:**

Objectives of the IRP:

To ensure works are carried out in such a way as to avoid injury, health hazards or pollution incidents, however, should any such incident occur, procedures and measures will be implemented to contain, limit and mitigate the effects as far as reasonably practicable.

List of external organisations consulted in the preparation of the IRP:

TBC by Contractor when preparing IRP

Distribution of the IRP

Recipient	No. of copies	Version

7.0 EXTERNAL CONTACTS

External Contacts		
Contact	**Office Hours**	**Out of Hours**
New Ross Fire Station	(051) 421 777	(051) 421 777
Gardaí: Emergency	999 / 112	999 / 112
Gardaí: New Ross Garda Station	(051) 426 030	(051) 426 030
Gardaí: New Ross Headquarters Garda Station	(051) 426 037	(051) 426 037
Gardaí: Wexford Divisional Headquarters Garda Station	(053) 916 5211	999 / 112
Community Hospital New Ross	(051) 421 305	999 / 112
Wexford Hospital	(053) 915 3000	(053) 915 3000 / (053) 915 3313
EPA Headquarters, Co. Wexford	(053) 916 0600	-
Waterford City and County Council Emergency Planning Department	076 102020	0761 102020
ESB Networks	(021) 238 6555	1800 372 999
Bord Gáis / Gas Networks	1850 20 50 50	1850 20 50 50
Waste Management Contractor	TBC	
Specialist Advice	TBC	-
Specialist Clean up Contractor	TBC	-
Wexford County Council	053 919 6000	053 919 6000
Kildare County Council, National Roads Office (Naas)	(045) 980 425 / (045) 988 900	1800 500 444
New Ross Municipal District	(053) 919 6700 / (051) 421 284	
Kilkenny County Council	0818 399399	0818 399399
Inland Fisheries Ireland	(01) 884 2600	To be agreed with IFI
National Parks & Wildlife Service	(01) 888 3200	To be agreed with NPWS

8.0 INTERNAL (CONTRACTORS) CONTACTS

Internal Contacts		
Contact	**Office Hours**	**Out of Hours**
Names and positions of staff authorised / trained to activate and coordinate the IRP	TBC	
Other Staff	TBC	
Managing Director	TBC	
Site Manager	TBC	
Health & Safety Manager	TBC	
Site Environmental Manager	TBC	

9.0 CHEMICAL PRODUCT AND WASTE INVENTORY

Inventory of Chemical Products and Wastes						
Trade Name / Substance	**Solid / liquid / gas or powder**	**UN number**	**Maximum amount**	**Location marked on site plan**	**Type of containment**	**Relevant health and environmental problems**

10.0 POLLUTION PREVENTION EQUIPMENT INVENTORY

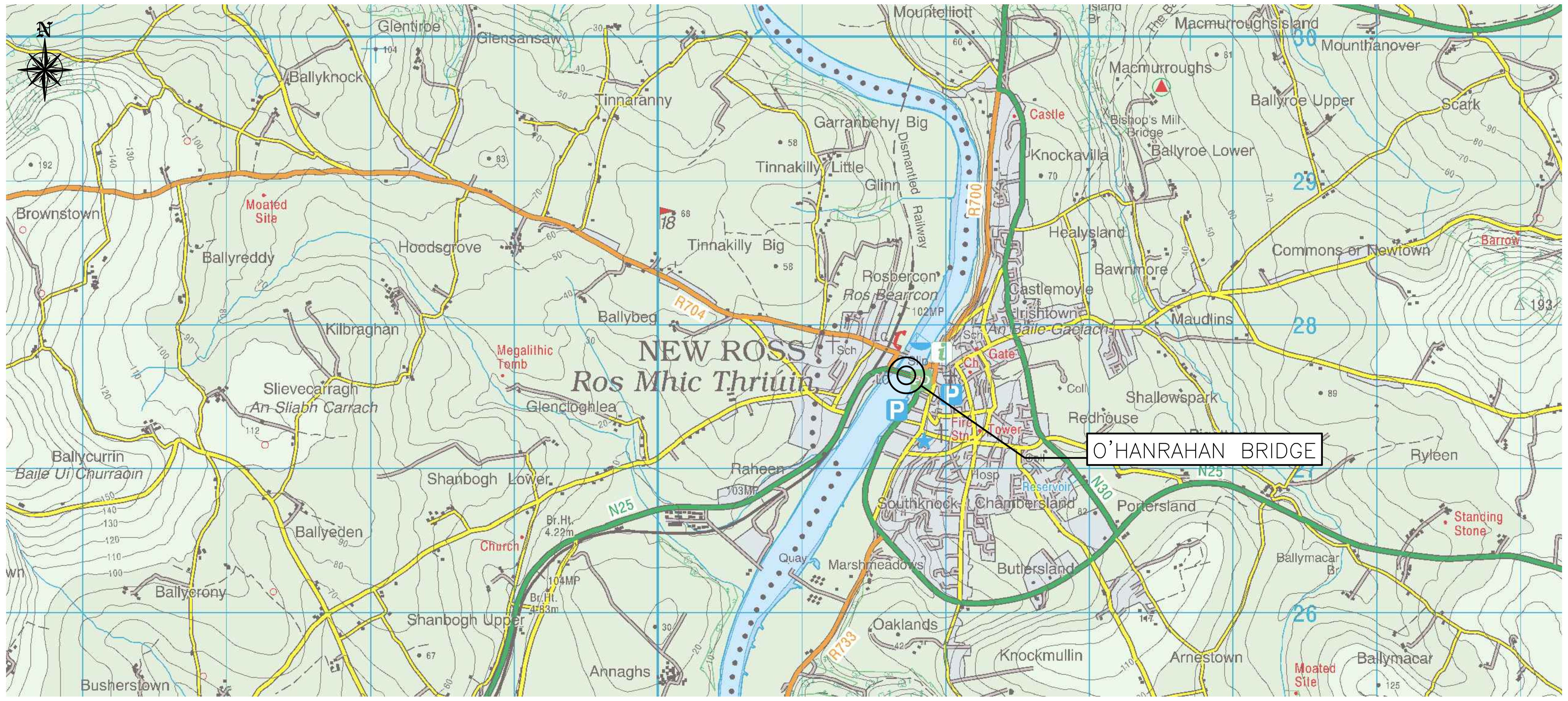
Inventory of Pollution Prevention Equipment (on- and off-site resources)			

11.0 DRAWINGS

Drawings of the proposed development are included in **Appendix A**.

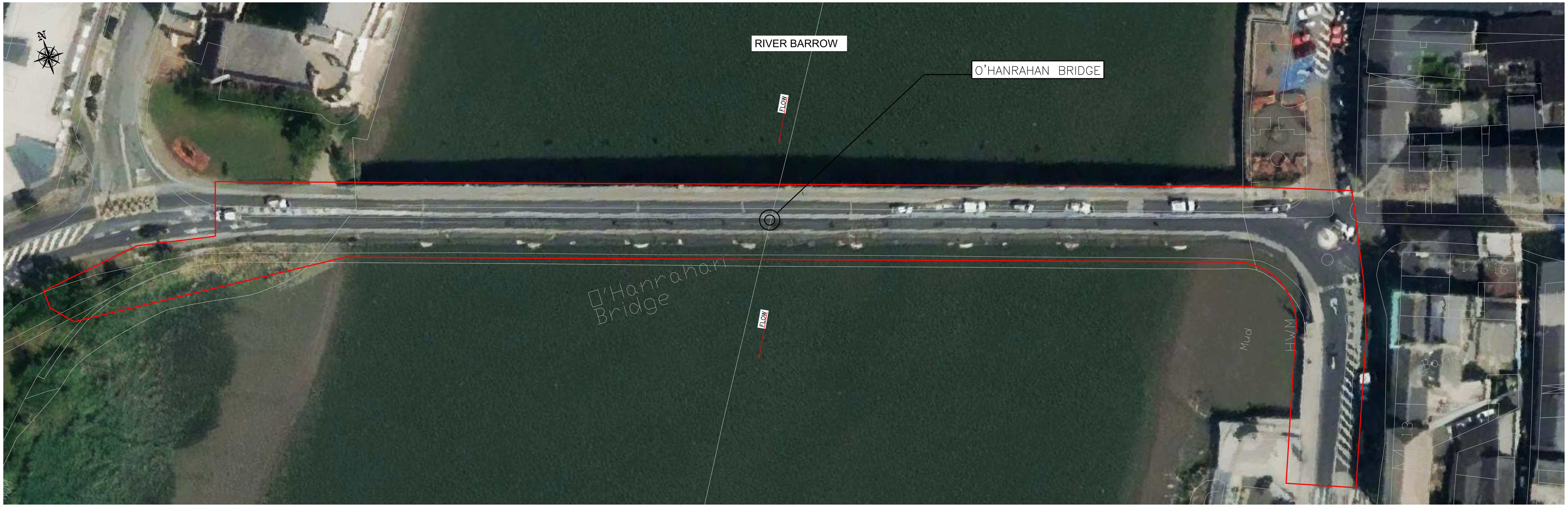
Site Plan
WBRC-ROD-ENV-S101-DR-CB-30001- Location Plan of Proposed Development

APPENDIX A



SITE LOCATION PLAN

A1 SCALE 1:25,000
A3 SCALE 1:50,000



SITE LAYOUT

A1 SCALE 1:400
A3 SCALE 1:800

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM AT MALIN HEAD.
3. ALL CO-ORDINATES ARE TO IRISH TRANSVERSE MERCATOR.
4. EXTENT OF SITE AREA PROVIDED BY THE EMPLOYER EXCLUDES AREA WHICH MAY BE TEMPORARY OCCUPIED SUBJECT TO TRAFFIC SAFETY AND MANAGEMENT AND DIVERSIONS.
5. THE CONTRACTOR IS REQUIRED TO PROVIDE ACCESS THROUGH THE EXTENT OF SITE AND AREA PROVIDED BY THE EMPLOYER IN ACCORDANCE WITH THE SPECIFICATION.
6. THE EXISTING POSITION AND LEVEL OF SERVICES SHOWN TO BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR SHALL PROVIDE PROTECTION TO EXISTING SERVICES

LEGEND:

DEVELOPMENT BOUNDARY

Comhairle Contae Loch Garman
Wexford County Council

Kildare NRO National Roads Office

No.	Revision	Date	By	Chk'd	App'd

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Drawn	Designed	Checked	Approved	Suitability Code - Description
ZZX	CH	MR	JK	S4 - Stage Approval

Project Stage	Preliminary
Project Title	O'Hanrahan Bridge Widening Project
Drawing Title	Location Plan of Proposed Development
Drawing Number	Project WBRC - Originator ROD - Volume ENV - Location S101 - Type DR - Role CB - Number 30001
Scale (A1)	As Shown
Date:	MAY 2022
Job No:	21.143
Rev:	P0

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

24 October 2022 15:50:50 J:\2021\21143\21143-02_WIP\08 MODELS\01 CAD\01 DWG\01 STG 1 - PRELIMINARY\ENVIORNMENTAL DRAWINGS\WBRC-ROD-ENV-S101-DR-CB-30001.DWG

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