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NATURA IMPACT STATEMENT

PROVISION OF INFORMATION
FOR AN APPROPRIATE ASSESSMENT
OF THE DUNKETTLE INTERCHANGE IMPROVEMENT SCHEME,
CO. CORK

Prepared for
JACOBS ENGINEERING LTD

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1 Introduction

It is necessary that the application for the proposed development complies with the requirements of Article 6 of the European Union (EU) Habitats Directive (EC/92/43) as amended and transposed in Ireland.

It is the responsibility of the competent authority, in this case An Bord Pleanála (ABP), to undertake screening of the proposed development to determine if Appropriate Assessment (AA) is required. Screening determines if proposed developments would be likely to significantly affect European Sites¹ in view of their conservation objectives, either alone or in combination with other plans or projects.

In advance of ABP undertaking screening for AA for this development, Scott Cawley has screened the development on behalf of the National Roads Authority and concluded that an AA will be required. Scott Cawley has documented the results and conclusions of this screening exercise, and provided this information in this report to assist ABP in undertaking AA screening. In addition, Scott Cawley has prepared a Natura Impact Statement (NIS) which is being furnished to ABP to assist it in undertaking an AA of the proposed development, should ABP determine that one is required.

The information in this NIS forms part of, and should be read in conjunction with the documentation being submitted to ABP in connection with the proposed development.

1.1 AA Screening

Prior to undertaking an AA it is necessary to determine whether in fact an AA is required; this is referred to as AA Screening. Applying the precautionary principle², it is suggested that due to a range of potentially significant impacts upon the Cork Harbour SPA, it is not possible to rule out significant impacts in view of the site's conservation objectives; and therefore it is our view that an Appropriate Assessment is required as set out in this NIS. Potential impacts to other European Sites are in our view ruled out, and the justification for this provided in this NIS.

2 Methodology

2.1 Guidance and Approach

This NIS has been prepared with regard to the following guidance documents where relevant:

- *Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities.* (Department of Environment, Heritage and Local Government, 2010 revision).
- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.* Circular NPW 1/10 & PSSP 2/10.
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (European Commission Environment Directorate-General, 2001); hereafter referred to as the *EC Article 6 Guidance Document*. (The guidance within this document provides a non-mandatory methodology for carrying out assessments required under Article 6(3) and (4) of the Habitats Directive.)

¹ The term European Site is as defined in the Planning and Development Act, 2000 as amended (in particular by the Planning and Development (Amendment) Act 2012).

² European Court of Justice C-127/02 – Reference for a Preliminary Ruling under Article 234 EC "It follows from the precautionary principle that where the most reliable information available leaves obvious doubt as to the absence of possible significant adverse effects on the ecosystem, the benefit of the doubt will favour conservation".

- *Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (EC Environment Directorate-General, 2000); hereafter referred to as MN2000.*
- *Guidelines for Good Practice Appropriate Assessment of Plans Under Article 6(3) Habitats Directive (findings of International Workshop on Assessment of Plans under the Habitats Directive, Oxford 2010)*

Guidance which has been followed in determining magnitude and significance of impacts, as well as in proposing mitigation measures, where relevant to European Site qualifying interests, include:

- *Environmental Assessment and Construction Guidelines Series (NRA 2005-2009);*
- *Guidelines for Ecological Impact Assessment in the United Kingdom (Institute of Ecology and Environmental Assessment, 2006)*
- *Guidelines for Ecological Impact Assessment in Britain and Ireland - Marine and Coastal (Institute of Ecology and Environmental Assessment, 2010)*

2.2 Site Surveys

This NIS was based on a desktop study as well as site surveys on various dates between December 2010 and May 2012 as outlined in Table 1.

A suite of ecological surveys were undertaken as shown in the Table 1. Habitat, wintering bird, benthic, and water quality surveys were undertaken to inform an assessment of potential impacts to Qualifying Interests of European Sites within the Zone of Influence (Zol) of the proposed development. The Zol of the proposed development on different receptors with potential connectivity to European Sites is outlined in Section 4.2 below. A map of named and referenced intertidal areas is provided in Figure 5.1.1.

Survey data on benthic communities in intertidal areas within the Zol of the proposed development was undertaken by the Aquatic Services Unit of University College Cork in March-April 2012. The results of these surveys have been included where relevant.

Table 1 Surveys Undertaken for the Appropriate Assessment		
Survey	Survey Extent	Date(s)
Habitats	Zone of Influence of Proposed Development (wooded, grassland, coastal and intertidal areas) – See Section 5.2	16-17 th December 2010, 10 th March 2011, 7 th April 2011, 10 th -12 th May 2011, 21 st -22 nd July 2011, 14th May 2012
Birds (Wintering wetland)	Zone of Influence of Proposed Development (intertidal and coastal Areas) – See Section 5.2	16-17th December 2010, 18-19th January 2011, 16th February 2011, 10th March 2011
Birds (Breeding)	Zone of Influence of Proposed Development – See Section 5.2	6-7th April 2011, 11-12th May 2011, & 20-21st July 2011
Benthic Surveys	Zone of Influence of Proposed Development (Intertidal Areas) – See Section 5.2	21st and 26th March, 2012, 9th, 10th, 18th and 26th April 2012
Fisheries Surveys	Zone of Influence of Proposed Development (Intertidal Areas and freshwater features) – See Section 5.2	2nd-6th April 2012
Air Quality Surveys	Zone of Influence of Proposed Development – See Section 5.2	October 2011-January 2012
Sediment Chemistry and Granulometric Analysis	Sediments in three of four waterfeatures known to currently receive surface water from the existing interchange (WF1, 2, 3), in addition to sediments in areas receiving proposed outfall locations	18th April 2012
Water Quality Sampling	Zone of Influence of Proposed Development (Intertidal areas including proposed surface water outfall points) – See Section 5.2	21st-22nd March 2012

2.3 Desktop Study

Sources of Desktop Data relied upon are listed below.

- *Online data available on European Sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie.*
- *Information on water quality in the area available from www.epa.ie, and from the applicant's design team*
- *Information on the South Western River Basin District from www.wfdireland.ie*
- *Information on soils, geology and hydrogeology in the area available from www.qsi.ie*
- *Information on the location, nature and design of the proposed development supplied by the project design team.*
- *Information in the Constraints, Route Corridor Selection, and Environmental Impact Statement reports for the proposed development*

- *Status of EU Protected Habitats in Ireland. (National Parks & Wildlife Service, 2008)*
- *Status of EU Protected Habitats in Ireland - Backing Documents, Article 17 forms & Maps Volumes 1, 2 & 3 (National Parks & Wildlife Service, 2007)*
- *Records from the Birdwatch Ireland and British Trust for Ornithology Bird Atlas 2007-2011 online database. Available online at <http://blx1.bto.org/atlas/main/data-home.jsp?Refresh=true>. Accessed on 17/04/2012*
- *Irish Wetland Bird Survey (I-WeBS) data 2004-2008 for relevant subsites in Cork Harbour SPA*
- *Unpublished I-WeBS Data 1991-2004 for areas outside I-WeBS count areas provided by Dr. Tom Gittings*
- *Environmental Impact Statement for Dunkettle & Balinglanna Lands (Chapter 7 – Ecology) (O'Flynn Construction, 2007)*

Key Cumulative Impact Assessment Sources in Relevant Planning Documents

- *National Biodiversity Plan, 2011-2016.*
- *Cork County Development Plan 2009 (2nd Edition)*
- *Blarney Electoral Area Local Area Plan 2011*
- *Draft Cork Harbour Study 2010*
- *County Cork Biodiversity Action Plan 2009-2014*
- *Cork City Biodiversity Action Plan 2009 – 2014*

Further sources of cumulative impact are provided in Table 2 Consultation and where relevant in other sections of this report.

2.4 Consultation

A consultation letter was sent to the Development Applications Unit (Department of Arts, Heritage and the Gaeltacht) on the 28th February 2012. There is currently no active local NPWS Ranger for east Cork City; however the retired ranger was consulted informally by telephone on several occasions in 2011 in order to discuss the scope of works and the ecological condition of the surrounding area. Data request forms were sent to the NPWS on two occasions in 2012 to seek records of rare and protected species and habitats from their database. Responses were received on 12/01/2012 and 14/06/2012, and any relevant data received has been included in this NIS. An extensive consultation exercise was undertaken for the proposed development, due to the proximity of the Cork Harbour SPA, and presence of nationally designated (Dunkettle Shoreline proposed Natural Heritage Area), and undesignated intertidal areas with a potential supporting role to Qualifying Interest wintering birds within the Cork Harbour SPA.

- *The following organisations with relevance to ecology were consulted:*
- *An Taisce;*
- *BirdWatch Ireland;*
- *Coastwatch;*
- *Coillte;*
- *Cork County Council Heritage Officer;*
- *Department of Environment, Heritage and Local Government;*
- *Department of Arts, Heritage and the Gaeltacht;*
- *Inland Fisheries Ireland*
- *Irish Peatland Conservation Council;*
- *Irish Wildlife Trust;*

- *NPWS local and regional staff; and*
- *The Botanical Society of British & Ireland (BSBI) Vice County recorder (Co Cork).*

In addition to written correspondence, meetings were held with NPWS district and regional staff on the 1st April and 15th July 2011, and Inland Fisheries Ireland on the 8th May 2012 to discuss the results of the ecological field survey work as well as the likely significant impacts of the proposed development. Responses of relevance to European Sites and therefore this NIS are summarised in Table 2, which includes consultees not affiliated with the specific organisations listed above.

Please note that responses relevant to the Little Egret *Egretta garzetta* and Grey Heron *Ardea cinerea* colony within the Dunkettle Shore pNHA are included in the table below to illustrate that detailed assessment was made of this breeding site. However, it should be noted that this breeding population is not directly relevant to the NIS because neither Little Egrets or Grey Herons are Qualifying Interests of any relevant SPAs (wintering population of Grey Heron are noted as additional species of interest on the Cork Harbour SPA Natura 2000 Standard Data Form, but are not listed as Qualifying Interests).

Table 2 Summary of Consultation Responses relevant to the NIS

Consultee	Date of Response	Comments
Inland Fisheries Ireland (IFI) (Southwestern Regional Fisheries Board)	14/01/2010	IFI provided SWRFB Cork Harbour Survey Report which includes a link to the online resource at http://corkharbourbirds.ucc.ie/ . The report contains summarised results of a suite of marine surveys in the wider Cork Harbour area including fish species lists (Twaite Shad noted), seal haul-out area survey data (dates unspecified), Cormorant/Little Egret/Grey Heron/Little Grebe/Tern fishing and breeding survey data (2006), reared Salmon survey data (2005-2006), and phytoplankton data (2006). A range of freshwater and marine species are present in the Glashaboy and Harbour (Sea Trout, Brown Trout, Lamprey, Mullet).
	8/05/2012	The IFI were not concerned about operational impacts but requested that the construction sequencing be looked at to minimise sediment release.
National Parks & Wildlife Service – Mid Southern District Conservation Officer (Cyril Saich)	14/01/2010 and 1/02/2010	NPWS's main concern is likely to be the Cork Harbour SPA and the high tide waterfowl roost near the Jack Lynch Tunnel. Little Egret are breeding in the Dunkettle shore pNHA in woodland on lands belonging to the Pfizer factory. The Local Ranger for Dunkettle area is now retired and has not been replaced. There is no known formal monitoring or management of the Dunkettle pNHA. The Environmental Impact Statement (EIS) for the Dunkettle House & Balinglanna Lands development (O'Flynn, 2007) is a key reference source for ecological data.
Pat Smiddy (Retired NPWS Local Conservation Ranger)	1/11/2010	Little Egrets and Grey Heron are breeding in the Pfizer Facility woodland (Total of 20 pairs in 2010). Several similarly-sized Little Egret colonies occur in the wider area (Fota Wildlife Park, Atlantic Pond and Middleton). There are no Kingfisher breeding sites likely in brackish riparian estuarine stretches or backwaters, but a nest is known from the Glashaboy River 2km to the north of the existing Dunkettle Interchange. [Note from author – Breeding Little Egret and Kingfisher are

Table 2 Summary of Consultation Responses relevant to the NIS		
Consultee	Date of Response	Comments
		not Qualifying Interests of any relevant European Site]
Dr. Geoff Oliver (Comharchumann Chléire Teo, Cape Clear Island)	6/4/2011	The Jack Lynch tunnel tidal polder was not included in the formal NPWS survey of Irish coastal lagoons. The feature may not qualify as a lagoon if it does not retain significant water at low tide.
National Parks & Wildlife Service (Jervis Good Divisional Ecologist; Cyril Saich District Conservation Officer)	06/04/2011	<p>Detailed Meeting Minutes are in Appendix 2</p> <p>The NIS should cover the following items:</p> <ul style="list-style-type: none"> Undertake bird counts in the Cork Harbour SPA in the winter during medium to low tide; Contact Tom Gittings (Chairman of Cork Branch of Irish Wildlife Trust) for SPA bird counts; Check the Appropriate Assessment for Dunkettle House & Balinglanna Lands development ; This project should aim for no net loss of bird foraging habitat plus a disturbance buffer zone; Cork Harbour Study 2010 (out for Public Consultation) Contact Cork County Council in relation to this study Include cumulative impacts & check the draft Carrigaline and Midleton Local Area Plans Look out for Short-Eared Owl in September and October frequenting the Cork Harbour SPA Consider 'train' system for design of surface water drainage system, for treatment of road run-off i.e. interceptor, attenuation and reedbeds/wetlands. NPWS gave various references for publications on the issue. If there needs to be a choice, minimise the impact on the SPA over the pNHA <p>[Note from author – Breeding Little Egret is a not Qualifying Interest of any relevant European Sites]</p>
Sean Runnane (MSc Student, University College Cork)	7/4/2011	Unable to survey Egret colony at Pfizer woodland during field work for Master's Thesis on Egrets in Cork due to access restrictions.
Dr. Tom Kelly (Mammal ecologist, UCC)	7/4/2011	The Egret/Grey Heron Colony at Atlantic Pond is protected from human disturbance by water, and this or another barrier to human presence near the colony is likely to make a colony more favourable. Lighting of the colony may be an important impact, as several species of roosting birds use woodland sites in darkness.
Dr. Tom Gittings (Entomologist, UCC and organizer of IWeBS counts at Dunkettle)	19/4/2011	Recorded 100 Black-tailed Godwit in large intertidal mudflat to east of interchange. These areas used to be grassland fields, but were converted to intertidal areas by construction of road.
National Parks & Wildlife Service (Jervis Good Divisional Ecologist; Cyril Saich District Conservation Officer)	15/7/2011	<p>Detailed Meeting Minutes in Appendix 2. Summarised below:</p> <ul style="list-style-type: none"> NPWS stressed the sensitivity of the Jack Lynch tunnel tidal 'lagoon' on SPA features Concerned about a walkway/cycleway near the high tide roost in the north west corner of the SPA and suggested that any pedestrian/cycle route should be routed to the

Table 2 Summary of Consultation Responses relevant to the NIS		
Consultee	Date of Response	Comments
		<p>north of the railway line/scheme</p> <ul style="list-style-type: none"> Liaison with Port of Cork is needed regarding potentially significant cumulative impacts (particularly via roads through or infilling of Jack Lynch tunnel tidal 'lagoon') Liaise with Sharon Casey of Cork County Council regarding Dunkettle House EIS Confirm aggregate source for road surfaces is from licensed quarry free from invasive material Impacts on the nearby Great Island Channel (1058) SAC could be screened out due to distance from the scheme Cumulative effects may be significant and need to be addressed; including assessment of loss of wetland habitat due to existing road in addition to this scheme (Harper's Island compensation may be relevant here) and import/export impacts (e.g. source for aggregates?)
Cork County Council Planning Department	17/04/2012	Blarney Local Area Plan contains an Appropriate Assessment and Environmental Report. The Dunkettle and Balinglanna Lands housing development is still an objective of the Blarney LAP. A Park & Ride proposal for the nearby Train Station was refused, but the site is still zoned for a Park & Ride within Little Island. The Port of Cork proposal to move the Tivoli container terminal to Ringaskiddy was refused. The Cork Harbour Study is a broad, indicative proposal only. The proposal for an access route to the Tivoli terminal, to run adjacent to the SPA (& high tide bird roost) is indicative only, and there is no certainty it would be built.
Inland Fisheries Ireland (IFI) Michael McPartland	08/05/12	<p>IFI confirmed that within the exception of the Glashaboy, the intertidal areas affected are not considered to be a fishery, and have little or no fisheries potential.</p> <p>Notwithstanding this sediment control and release/suspended solids must be controlled during construction and the construction phasing should be such that it minimises the potential for an increase in suspended solids.</p>

Overview of Receiving Environment

2.5 Brief Site Description

The proposed development is located at the site of the existing Dunkettle Interchange in east County Cork. The footprint of the proposed development is predominantly characterised by the existing interchange infrastructure, associated semi-mature plantation woodland, and pockets of inland intertidal wetland habitats with fringing saltmarsh vegetation which are adjacent to busy slip roads and roundabouts. Access to these wetlands is mostly limited by the existing road infrastructure, although some are accessed for grazing of horses, or by local residents. Despite the existing interchange and N8 providing round-the-clock disturbance from noise, light, and surface water discharges, there is a range of habitats and species in close proximity to the existing roadway.

The coastal waters within the vicinity of the proposed development are part of Upper Cork Harbour and include the intertidal zone of Mahon Lough (Water Framework Directive code SW_060_0750) to the north west of Little Island and to a lesser extent the lower reach of the Glashaboy Estuary (code SW_060_0800). With the exception of the Glashaboy and the western shore of Little Island, the intertidal areas within the study area have weak linkage to Lough Mahon, all being connected to same via culverts. These poorly connected highly modified intertidal areas that are separated from Lough Mahon by culverts comprise the bulk of the study area. These mudflats are of little fisheries value given that they hold little or no water at low tide. These intertidal Water Features (WF), and the three fresh/brackish water features in the area referred to in this document are shown on Figure 5.1.1. Water features are numbered in this drawing (WF0-WF15) and, this numbering system is used throughout this NIS.

2.6 Location of European Sites

There is no overlap between any European Sites, and the proposed development. The Cork Harbour SPA (Site Code 4030) is located adjacent to the southwestern corner of the proposed development. The Great Island Channel cSAC is located c. 2.5km to the east of the proposed development and is only connected to it indirectly via the open bay of Lough Mahon. There are no other European Sites within 14km of the site. This NIS addresses the potential supporting role that two proposed Natural Heritage Area sites may provide to the Cork Harbour SPA qualifying interest bird populations as feeding/roosting areas. The Douglas River Estuary pNHA (Site code 1046) is located 0.3km south of the proposed development on the southern shore of Lough Mahon, and is coincident with the Cork Harbour SPA boundary there. The proposed development is located within intertidal mudflats that are designated as the Dunkettle shore pNHA (NPWS Site Code 1082). The pNHA boundary partially coincides with the Cork Harbour SPA in estuarine and coastal areas adjacent to the footprint of the development. The Dunkettle shore pNHA also includes woodland on the steep banks of the Glashaboy River 0.2km to the northwest of the proposed development, and plantation woodland at Pfizer containing a Little Egret *Egretta garzetta* and Grey Heron *Ardea cinerea* colony on lands in the townland of Inchera owned by the Pfizer Pharmaceutical Company. Although Little Egret is an Annex I species under the Birds Directive, this colony is not of relevance to this NIS as neither breeding population is a qualifying interest of the Cork Harbour SPA. Potential impacts on these two species have been addressed in the Flora and Fauna Chapter of the N8/N25 Dunkettle Interchange Improvement Scheme EIS.

2.7 Wetland Habitats (Including part of Cork Harbour SPA)

This section should be read with Figures 5.1.1, 5.1.5 and 5.1.6. Figure 5.1.1 shows the map of numbered intertidal wetlands and other water features within the Zol.

As noted previously, relevant non-designated intertidal areas have been considered in the Appropriate Assessment, as a potentially important feeding/roosting resource to SPA Qualifying Interest bird species; their loss could reduce numbers of Cork Harbour SPA bird populations, whose

size may be sustained by areas (and types) of habitat outside the SPA boundary. For instance, a portion of SPA populations feeding within the SPA boundary may roost outside of the SPA, or viceversa. The following text describes both designated and undesignated intertidal areas used by SPA populations in the Zol of the proposed development.

In total, there are 13 distinct, but interconnected intertidal habitat areas within and adjacent to the proposed development (WF0-9, WF11-12, WF14). Three water features within the Zol which are within the Cork Harbour SPA (WF0, WF1, WF9), and these are also designated as the Dunkettle Shore pNHA. Only WF3 and WF4 are outside the Cork Harbour SPA but within the Dunkettle Shore proposed Natural Heritage Area. The interconnectivity of saline habitats is defined under the Zone of Influence in Section 5.2.

Freshwater features within the Zol are limited to one stream (WF10 in Figure 5.1.1) that discharges into the North Esk Intertidal Mudflat West (WF3), a brackish drainage ditch (WF15) receiving a mix of freshwater and saline inputs located on the lands of the BASF Detergent Chemical Plant at Little Island (hereafter 'BASF lands'), and an artificial freshwater lake adjacent to the Little Island Industrial Estate (WF13).

Lower and upper saltmarsh habitats occur on the fringes of the intertidal mudflats in many areas, but are often poorly developed and/or include the non-native invasive species Cord Grass *Spartina anglica*. Cord Grass is listed on Schedule 3 to the Birds and Natural Habitats Regulations 2011 (S.I. 477 of 2011.), under which it is an offence to "plant, disperse, allow or cause to disperse, spread or otherwise causes to grow" the species.

The Jack Lynch Tunnel Intertidal Polder (WF1) is within the Cork Harbour SPA, and occurs along the Dunkettle shore immediately southwest of the proposed development and is an important feature for SPA Qualifying Interest wintering bird species. It is flanked by the Cork-Midleton train line to the north, the active Tivoli container terminal to the west, the Jack Lynch Tunnel to the east, and a seawall/open shoreline to the south. The feature (WF1) was originally open coast before the sea wall was built when Cork County Council planned to reclaim the area for the industrial expansion of the Dunkettle area. When the wall was built, the feature became a lagoon, which was permanently wet, with tidal influence from spring tides and sea spray. The Local Authority then installed culverts in the sea wall to allow the feature to drain fully at low tide to reduce the risk of flooding of the adjacent train line. The feature is currently unique in the locality as it offers a secluded high tide roost habitat in its northwestern corner (inaccessible by foot). The Glashaboy River Estuary (WF9 in Figure 5.1.1) occurs c.120m to the west of the proposed development and is fully tidal as far north as Glanmire Village. All sections of the Glashaboy River within the Zol are estuarine. The Glashaboy River rises in the hills just north of Glashaboy South in County Cork and follows a clear north west to south-east line until it meets the sea at Lough Mahon approximately 150m south of the N8 Dunkettle Roundabout Bridge, where the estuary discharges to Upper Cork Harbour. Mud substrates exposed at low tide provide valuable foraging resources to wetland birds. The Estuary is up to 140m at its widest point near the Dunkettle roundabout.

2.8 Grassland and Woodland Habitats (None within European Sites)

None of these habitats are located within European Site.

2.9 Invasive Species with Potential to Spread to European Sites

Six species recorded within the Zol are listed on Schedule 3 to the Birds and Natural Habitats Regulations (S.I. 477 of 2011.), under which it is an offence to "plant, disperse, allow or cause to disperse, spread or otherwise causes to grow" these species (Common Cord Grass *Spartina anglica*, Sea buckthorn *Hippophae rhamnoides*, Japanese Knotweed *Fallopia japonica*, Rhododendron *Rhododendron ponticum*, Spanish Bluebell *Hyacinthoides hispanica* (and hybrid *H. x massartiana*), and Three-Cornered Garlic *Allium triquetrum*). Invasive species recorded within the Zol are summarised in Table 3. With the notable exception of Cord Grass, none of the species below would

pose significant threat to the nearby Cork Harbour SPA whose Qualifying Interests are all intertidal saline habitats. Cord Grass is already established within the SPA at the Jack Lynch Intertidal Polder (WF1).

Table 3 Summary of Invasive Species recorded within the Zol with Potential to Spread to European Sites				
Common Name	Scientific Name	Invasive Species Ireland (ISI) Status	Offence to Spread under Schedule 3 to Bird & Habitat Regulations 2011	Location at Dunkettle
Cherry Laurel	Prunus laurocerasus	Invasive Species Ireland (ISI) Amber	No	Dominant or frequent understorey species in Pfizer woodland and woodlands in Dunkettle Estate and shoreline.
Common Cord Grass	Spartina anglica	ISI Most Unwanted & Problematic Plant	Yes	Dominant in intertidal mudflats at North Esk and Jack Lynch Tunnel Intertidal Mudflat, and scattered throughout other intertidal areas.
Japanese Knotweed	Fallopia japonica	ISI Most Unwanted & Problematic Plant	Yes	Recolonising Bare Ground and wayside areas by the Pfizer woodland edge, and the Iarnrod Eireann storage yards (both North Esk, and north of Tidal Channel 2). Also occurs at the Gate Lodge by the N8 in the northeast of Dunkettle Estate.
Rhododendron	Rhododendron ponticum	ISI Most Unwanted & Problematic Plant	Yes	Frequent in Dunkettle Woodlands and estate
Sea Buckthorn	Hippophae rhamnoides	ISI Amber	Yes	Only present in northern boundary hedge at Jack Lynch Tunnel roundabout grassland.
Snowberry	Symphoricarpos albus	ISI Amber	No	Locally dominant in hedge in Iarnrod Eireann, along the R623/shoreline by the Jack Lynch Tunnel, in the Dunkettle Estate and roadsides by Bury's roundabout
Spanish Bluebell & Hybrids	Hyacinthoides hispanica & H. x massartiana	ISI Amber	Yes	Frequent in woodland throughout Dunkettle Estate
Sycamore	Acer pseudoplatanus	ISI Amber	No	Frequent in woodland, hedgerows and treelines throughout, and often planted
Three-Cornered Garlic	Allium triquetrum	None	Yes	Occasional in treeline along local road west of R623, and streamside of WF10 below the Gaelscoil. Frequent on roadsides by Bury's Roundabout.

2.10 Qualifying Interests of Cork Harbour SPA within the Zol & Supporting Role of Undesignated Wetlands

2.10.1 Data from Irish Wetland Birds Surveys (2004-2009)

Irish Wetland Bird Survey data (IWeBS) for the Dunkettle count sector of Cork Harbour SPA and for the entire Cork Harbour SPA is included in Appendix 1. The IWeBS Dunkettle count sector includes the Glashaboy estuary (WF9), the Jack Lynch Intertidal Polder (WF1), and areas of the Tivoli and Little Island coastline outside the Zol of the proposed development. Several Annex 1 bird species regularly occur within intertidal areas at Dunkettle as indicated below. Surveys have shown that these occur within the Zol at the Jack Lynch Tunnel Intertidal Polder (WF1). Bar-tailed Godwit is the only Annex 1 Qualifying Interest of the SPA occurring within the Zol.

Table 4 shows that 19 of the 23 Qualifying Interests of the SPA, and three Annex 1 Birds Directive species have been recorded in the Dunkettle IWeBS count sector, and are potentially within the Zol for indirect impacts from the proposed development. Table 4 below indicates the % importance of each population at Dunkettle relative to the total Cork Harbour SPA populations.

Table 4 Irish Wetland Birds Survey Data for the Dunkettle Count Sector (2004-2009)					
Common Name	Conservation Importance			Peak Count in IWeBS Dunkettle Sub-site (2004 - 2009)	% Cork Harbour SPA Population
	Annex 1	Cork Harbour SPA Qualifying Interest	BoCCI Red-list		
Bar-tailed Godwit	✓	✓	Amber	82	182%
Black-headed Gull		✓	-	271	29%
Black-tailed Godwit		✓	Amber	192	47%
Common Gull		✓	-	1	0%
Cormorant		✓	-		14%
Curlew		✓	Red	232	17%
Dunlin		✓	Amber	385	8%
Great Crested Grebe		✓	-	0	65%
Grey Heron		✓	-	29	78%
Lapwing		✓	Amber	210	6%
Lesser Black-backed Gull		✓	-	620	238%
Little Egret	✓		Amber	0	NA%
Little Grebe		✓	-	6	9%
Mediterranean Gull	✓		Amber	0	NA
Oystercatcher		✓	-	163	21%
Red-Breasted Merganser		✓	-	0	0%
Redshank		✓	Amber	82	5%
Shelduck		✓	Amber	6	0%

Table 4 Irish Wetland Birds Survey Data for the Dunkettle Count Sector (2004-2009)					
Common Name	Conservation Importance			Peak Count in IWeBS Dunkettle Sub-site (2004 - 2009)	% Cork Harbour SPA Population
	Annex 1	Cork Harbour SPA Qualifying Interest	BoCCI Red-list		
Teal		✓	-	14	2%
Tufted Duck		✓	-	0	0%
Wigeon		✓	-	58	3%

2.10.2 Data from Natura Impact Statement Surveys (2010/2011)

Full species lists of birds recorded from surveys undertaken in 2010/2011 are provided in Appendix 3 which includes both common and scientific names. Summary data for Qualifying Interests and Annex 1 species is shown in Table 5.

As might be expected, the data showed that undesignated areas outside the SPA were of limited importance for Cork Harbour SPA Qualifying Interests. All peak counts of SPA Qualifying Interests were recorded within the SPA; within the Jack Lynch Tunnel Intertidal Polder (WF1). Exceptions to this included small numbers of Little Grebe, Teal, and Wigeon in the Eastgate Pond (WF 13), and moderate numbers of Black-Tailed Godwit in the Iarnród Éireann Intertidal Mudflat East (WF8).

Portions of the Dunkettle Shore pNHA are outside the SPA (WF3 and WF4), but these were found to have a significant supporting role (feeding resource) for only one SPA population (Black-tailed Godwit) as discussed below.

Most peaks were recorded in the Jack Lynch Tunnel Intertidal Polder (WF1), which currently contains the only known high tide roost habitat in the Zol, in its northwestern corner which is inaccessible by foot. The roost consists of a small rank grassland area flanked by rock armour protection upon which mud-feeding birds rest at High Tide. On a rising tide it also offers mud feeding habitat when the neighbouring coastal muds are covered due to the delay of incoming waters through culverts in the sea wall. The high tide roost is the only significant high tide roost known within the Zol. Surrounding areas offer little roost habitat as they are open and fully tidal, and closer to areas of human disturbance. Small numbers of Cormorant and Oystercatcher roost on the sea wall of WF1 (Peak of 15 Cormorant).

Table 5 NIS Wintering Bird Survey Data (2010/2011) – See Appendix 3					
(Surveys included a significant area, but not all of the IWeBS Dunkettle count sector)					
Common Name	Conservation Importance			Peak Count within Survey Area (& % Cork Harbour SPA Population)	Location within the Zol
	Annex 1	Cork Harbour SPA Qualifying Interest	Red-list		
Bar-tailed Godwit	✓	✓	Amber	115 (255%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Black-headed Gull		✓		203 (21)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Black-tailed Godwit		✓	Amber	80 (19%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Common Gull		✓		37 (1%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Cormorant		✓	-	74 (21%)	Glashaboy Estuary (WF9) roost in Glanmire Wood pNHA
Curlew		✓	Red	288 (21%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Dunlin		✓	Amber	1027 (21%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Great Crested Grebe		✓		7 (8%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Grey Heron		✓		1 (3%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Lapwing		✓	Amber	32 (1%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Lesser Black-Backed Gull		✓	-	11 (4%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Little Egret	✓		Amber	2 (NA)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Little Grebe		✓	-	2 (3%)	Eastgate Pond (WF13 outside SPA)

Table 5 NIS Wintering Bird Survey Data (2010/2011) – See Appendix 3 (Surveys included a significant area, but not all of the IWeBS Dunkettle count sector)					
Common Name	Conservation Importance			Peak Count within Survey Area (& % Cork Harbour SPA Population)	Location within the Zol
	Annex 1	Cork Harbour SPA Qualifying Interest	Red-list		
Mediterranean Gull	✓		Amber	1 (NA)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Oystercatcher		✓	Amber	68 (9%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Red-Breasted Merganser		✓	-	4(4%)	Lough Mahon Open water (within SPA)
Redshank		✓	Amber	55 (3%)	Jack Lynch Intertidal Polder (WF1) (within SPA)
Shelduck		✓	Amber	40 (3%)	J Jack Lynch Intertidal Polder (WF1) (within SPA)
Teal		✓	-	11 (1%)	Iarnrod Eireann Intertidal Mudflat Large(WF8)
Tufted Duck		✓	Amber	7 NA)	Eastgate Pond (WF13)
Wigeon		✓	-	7(<1%)	Iarnrod Eireann Intertidal Mudflat Large (WF8)

As noted above, most peaks were recorded exclusively within the SPA at the Jack Lynch Tunnel Intertidal Polder (WF1), and the supporting role of undesignated areas is limited. Table 6 presents the small counts of species from intertidal areas outside the SPA. Medium sized flocks of Black-Tailed Godwit were recorded in North Esk Intertidal East (WF4) Mudflats (Dunkettle Shore pNHA), with numbers reaching 11% of the Cork Harbour SPA population. The freshwater pond at Eastgate (WF13) holds a small population of freshwater duck species, of which Tufted Duck is notable as an Amber-listed and SPA Qualifying Interest species (3% of SPA). None of the undesignated wetlands with a supporting role to SPA populations will be directly impacted by the proposed development. There is therefore no potential for adverse effects on Cork Harbour SPA site integrity via a decrease in favourable conservation status of SPA populations arising from loss of undesignated mudflats.

Table 6 Wintering Bird Data for Areas with Potential Supporting Role to Cork Harbour SPA (2010/2011)						
Common Name	Conservation Importance			Peak Count in undesignated intertidal areas (& % Cork Harbour SPA Population)	Location	Peak Count within Footprint
	Annex 1	Cork Harbour	Red-list			
Black-tailed Godwit		✓	Amber	40-45 (c.11%)	Iarnrod Eireann Intertidal Mudflat Large (WF8) and North Esk Intertidal Mudflat East (WF4)	No
Common Gull		✓		1 (<%)	Pfizer Intertidal Mudflat East (WF6)	Yes
Curlew		✓	Red	14 (1%)	Pfizer Intertidal Mudflat East (WF6)	Yes
Grey Heron		✓		1 (3%)	Pfizer Intertidal Mudflat West (WF5)	Yes
Little Grebe		✓		2 (3%)	Eastgate Pond (WF13)	No
Redshank		✓	Amber	7 (<1%)	North Esk Intertidal Mudflat West (WF3)	No
Teal		✓		11 (1%)	Eastgate Pond (WF13)	No
Tufted Duck		✓	Amber	3 (3%)	Eastgate Pond (WF13)	No
Wigeon		✓		7(<1%)	Eastgate Pond (WF13)	No

2.11 Non-Qualifying Interest Natura 2000 Species within the Zol

Several other Habitats Directive Annex II/IV and Birds Directive Annex I species feed, breed or overwinter within the Zol of the proposed development, however none of these are Qualifying Interests for any Relevant European Sites, and these are not further assessed in this NIS. An Ecological Impact Assessment has addressed potential impacts to all these species within the Environmental Impact Statement for the proposed development.

2.12 Summary of Natura 2000 Species within the Zol

There is no overlap of the development with any European Sites so no Qualifying Interest habitats occur within the footprint.

The undesignated intertidal and freshwater areas outside the Cork Harbour SPA are not important for SPA Qualifying Interests, with the exception of the North Esk Intertidal Mudflat East (WF4) and

Iarnrod Eireann Intertidal Mudflat Large (WF8) which occasionally hold medium sized flocks of Black-tailed Godwit. Neither of these wetlands will be directly impacted by the proposed development.

The primary area within the Zol of importance for the SPA is the Jack Lynch Intertidal Polder (WF1) which is within the SPA but outside of the footprint of the proposed development. This area provides mudflat foraging habitat for a large number of SPA Qualifying Interests in addition to an important high tide roost located in its northwestern corner.

There are several other non-Qualifying Interest Natura 2000 species within the Zol including at least two Birds Directive Annex 1 Birds directive species, and at least five fish/mammals listed on Annex II of the Habitats Directive. As none of these species are Qualifying Interests of Relevant European Sites, they are excluded from further assessment in this NIS however have been assessed in the Flora and Fauna Assessment of the Dunkettle Interchange Improvement Scheme EIS

2.13 Features in the Surrounding Environment

Designated and undesignated Intertidal and freshwater features are described in detail in Sections 2.6 and 2.7. Other notable features in the surrounding environment include the existing Dunkettle Interchange, N8, M8, N25 and N40 which currently discharge unattenuated and untreated road run-off into Cork Harbour via the Jack Lynch Intertidal Polder (WF1), the Jack Lynch Tunnel Tidal Inlet (WF0), and the Jack Lynch Tunnel Intertidal Mudflat (WF2).

The Little Island Industrial Estate is a hub for heavy Pharmachem type industries, and is located southeast of the proposed development. The Cork sewage network discharges effluent, including discharge from the industrial hub of Cork to Cork Harbour, and all Waste Water Treatment Works in the catchment are operating at capacity. Lough Mahon/The River Lee Estuary has a shipping channel located within it, allowing large ocean going vessels access to the Port of Cork.

Dunkettle Estate is located immediately northwest of the proposed development and includes occupied dwellings, a large estate house, wooded grounds, and pastoral grassland. The Cork-Midleton Train line passes east-west through the middle of the proposed development and along the northern edge of the Cork Harbour SPA at the Jack Lynch Tunnel Intertidal Polder (WF1).

3 Description of the Proposed Development

The scheme relates to the proposed provision of an improved interchange at the location of the existing Dunkettle Interchange at the intersection of the N8, the N25 and the N40 in the townland of Dunkettle, Co. Cork. The scheme comprises a series of direct road links between the above existing elements of road infrastructure and also provides links to the R623 Regional Road in Little Island and Bury's Bridge in Dunkettle. In particular, the proposed development includes direct road links for northbound traffic exiting the Jack Lynch Tunnel to access the N25 in the East and for southbound traffic on the N8 to access the Jack Lynch Tunnel southbound and vice versa. The scheme also includes a direct link for N8 traffic heading east towards the existing Dunkettle Interchange to gain access onto the M8 Northbound or directly under the existing N8 to access Bury's Bridge. Other links are also provided. Figure 2.1.1 presents the proposed development. An additional junction arrangement is included at the existing N25 approximately 650m to the east of the existing Dunkettle Interchange, which links the townlands of Little Island and Dunkettle. The scheme also includes pedestrian and cyclist facilities.

4 Definition of 'Relevant' European Sites and 'Zone Of Influence' of Proposed Development and AA Screening

European Sites are considered 'relevant' where a source-pathway-receptor link exists between the proposed development and the European Site.

4.1 Understanding of the Receiving Waters Environment

In accordance with NRA (2009) Guidelines, the Zol is an important term to define the receiving environment for the activities associated with the project and the biophysical changes that are likely

to occur. The Zol is the 'effect area' over which change is likely to occur. The Zol will evidently differ for different species and habitats, due to varying abilities to disperse.

In order to understand the Zol of the proposed development with regard to European Sites, it is useful to explain the hydrological interconnectivity of the numerous intertidal areas within the vicinity of the proposed development. A map of named and referenced intertidal areas is provided in Figure 5.1.1.

Together with the western shore of Little Island, a freshwater stream (WF10), a brackish drainage ditch (WF15), and the Glashaboy Estuary (WF9), the study area comprises a complex of intertidal mudflats linked by channels and culverts.

The area referred to as the Jack Lynch Tunnel Intertidal Mudflat (WF2) is connected to Lough Mahon via a 1.8m culvert located under a local road between the Dunkettle Interchange and the industrial area at the west of Little Island. From the Jack Lynch Tunnel Intertidal Mudflat (WF2), water passes through a single 1.8m culvert under the N25. This culvert leads to the North Esk Intertidal Mudflats East (WF3) and West (WF4). WF3 is linked to WF4 via three 1.5m culverts and one 1.8m culvert under an old disused road that separates these mudflats. WF4 is in turn connected to the Pfizer Intertidal Mudflat West (WF5) to the south of the N25 via a 1.2m culvert. WF5 is linked to the Pfizer Intertidal Mudflat East (WF6) by a 1.2m culvert. WF5 is at a higher elevation compared to WF6. WF6 is linked to a tidal channel on its north side (WF11) but has no direct link to an area of saltmarsh to the east (WF14). This areas are apparently connected via underground percolation.

North Esk Intertidal Mudflat (WF4) is connected to another tidal channel (WF12) which drains the Iarnrod Eireann Intertidal Mudflat East (WF8). WF12 flows through a culvert as it is crossed by the Dunkettle Road south of Bury's roundabout before joining the eastern end WF4. WF12 is connected to WF7 by a sluice gate. This sluice gate is positioned so that the mudflat floods with the rising tide and hold back water with the falling tide. This sluice gate was not functioning properly at the time of the survey as water was flowing out of the mudflat to WF12.

The freshwater stream by Gaelscoil Ui Drisceoil (WF10) is a 1st order watercourse of approximately 1.7km long that flows through the townland of Kilcoolishal. It meets the sea at the northern end of the North Esk Intertidal Mudflat West (WF3), to the north east of the existing Dunkettle Interchange. WF10 passes through two culverts in its lower reaches, one under an old disused road and another under the Dunkettle Road.

4.2 Potential Zone of Influence on Qualifying Interests of 'Relevant' European Sites

The Zol over which the proposed development may impact upon European Sites and their Qualifying Interests will differ for different ecological receptors, depending on the pathway for any potential impact(s), and the mobility of the Qualifying Interests.

There are no European Sites within the footprint of the development, and therefore no Qualifying Interest habitats will be subject to direct impacts. Therefore, the Zol for impacts to habitats within potentially 'Relevant' European Sites extends only via various indirect linkages.

Indirect water pollution impacts may occur via hydrological pathways (e.g. tides, groundwater flows) from potential impact sources (e.g. road run-off) to Qualifying Interest species (e.g. wetland birds), or Qualifying Interest wetland habitats (e.g. saltmarsh and intertidal habitats). These impacts can occur at significant distance from the impact source. The proposed road development will indirectly discharge surface water run-off to Lough Mahon Bay (i.e. Cork Harbour) via a series of outfall points to intertidal areas. The distances over which water-borne pollutants are likely to remain in sufficient concentrations to have a significant impact on receiving waters is difficult to quantify and highly site-specific. Evidently, it will depend on volumes of tidal waters receiving discharges, concentrations and types of pollutants discharged (in this case grit, hydrocarbons, and heavy metals), and sensitivity of receiving waters. As a precautionary measure, the distance over which surface water discharges could have a significant impact on the marine receiving waters is considered to be at least 1km. This is a considered a conservative estimate, an effects may be at much smaller distances. The Great

Island Channel (2km from development) is considered to fall outside the Zol, as discussed with the NPWS in July 2011 (Appendix 2).

The Zol of potential air quality impacts upon potentially 'relevant' European Sites is conservatively assessed as 3km due to the presence of heavy industry in accordance with NRA Guidelines. Deposition of air-borne contaminants during construction and operation (particularly Nitrogen Oxides) may impact upon the ecological functioning of habitats (e.g. plant respiration). Impacts of deposition will evidently be greatest in immediate proximity to the proposed development.

The Zol for significant impacts to fauna Qualifying Interests of potentially 'relevant' European Sites depends on the type of impact pathway. In contrast to Qualifying Interest habitats which are all outside the footprint of the proposed development, fauna species are mobile and may be subject to direct or indirect disturbance either within, in flight over or adjacent to the footprint. The major sources of impact from the proposed development are primarily from physical disturbance to fauna species from light, noise and earthworks during construction. Noise and other human disturbance impacts are not expected to extend for more than 200m from the impact source (e.g. location of blasting activity or paths of human movements). Light spill is likely to be significant within a shorter distance (c. 100m).

4.3 Identification of 'Relevant' European Sites within Zone Of Influence of Proposed Development

Designated sites within 1km of the proposed development are shown in Figure 5.1.5. Designated sites within 15km of the proposed development site are shown in Figure 5.1.6.

'Relevant' sites where potentially significant source-pathway-receptor links between the proposed development and European Sites exist are highlighted in grey rows in Table 7. In other words, where the European Site(s) in question fall within the 'Zone of Influence' of potential impacts which could lead to adverse effects to site integrity.

Table 8 shows the Qualifying Interests, underpinning conditions, and threats for the only 'relevant' European Site (Cork Harbour SPA).

Table 7 All European Sites within 15km of the Development and Identification of 'Relevant' Sites to the Proposed Development (In Grey Rows)			
candidate Special Areas of Conservation (cSAC)			
Site Name and Code	Distance from Proposed Development	Reasons for designation	Do any potential source-pathway-receptor links exist between the proposed development and the European Site?
Great Island Channel cSAC (1058)	2km E	<ul style="list-style-type: none"> Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] 	<p>No. Potential water pollution impacts via a hydrological pathway from the source (road run-off), to the receptor (the cSAC) via tidal marine waters are deemed non-significant due to the large separation distance between source and receptor, over which significant mixing and dispersion of potential pollutants would occur.</p> <p>Potential air quality impacts have been ruled out due to distance following analysis of modelled increases in NO_x levels from the proposed development. The data was compared with the published thresholds above which further investigation by an ecologist are required in The NRA (2009) <i>Guidelines on for the Treatment of Air Quality During the Planning and Construction of National Road Schemes</i>. All NO_x levels were below this threshold. No significant impacts are predicted.</p>
Blackwater River cSAC (2170)	14km N	<ul style="list-style-type: none"> Freshwater pearl mussel (<i>Margaritifera margaritifera</i>) [1029] White-clawed crayfish (<i>Austropotamobius pallipes</i>) [1092] Sea lamprey (<i>Petromyzon marinus</i>) [1095] Brook lamprey (<i>Lampetra planeri</i>) [1096] River lamprey (<i>Lampetra fluviatilis</i>) [1099] Allis shad (<i>Alosa alosa</i>) [1102] Twaite shad (<i>Alosa fallax fallax</i>) [1103] Salmon (<i>Salmo salar</i>) [1106] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Perennial vegetation of stony banks [1220] 	No, there are no links with this site.

Table 7 All European Sites within 15km of the Development and Identification of 'Relevant' Sites to the Proposed Development (In Grey Rows)			
		<ul style="list-style-type: none"> Salicornia and other annuals colonizing mud and sand [1310] Atlantic salt meadows (Glaucopuccinellietalia maritima) [1330] Otter (<i>Lutra lutra</i>) [1355] Mediterranean salt meadows (Juncetalia maritimi) [1410] Killarney fern (<i>Trichomanes speciosum</i>) [1421] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation [3260] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in British Isles [91A0] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) [91E0] <i>Taxus baccata</i> woods of the British Isles [91J0] 	
Special Protection Areas (SPA)			
Cork Harbour SPA (4030)	0km W	<ul style="list-style-type: none"> >20,000 wintering waterfowl. Internationally important populations of Redshank and Black-tailed Godwit Nationally important populations of Eighteen species Regularly occurring populations of five species 	Yes : <ul style="list-style-type: none"> Disturbance from noise, physical disturbance and human presence during construction could displace wetland birds away from favoured roost or feeding areas (particularly from the Jack Lynch Tunnel Tidal Polder, and the high tide roost there). Surface water run-off during construction and operation could carry sediment or pollutants into the SPA via undesignated intertidal areas, the Glashaboy Estuary and Lough Mahon/The River Lee Estuary. Surface water run-off during construction and operation could carry invasive cord Grass seeds or plant fragments from locations within the development footprint where the plant is already established into new areas of Cork Harbour where it may result in loss of intertidal muds

Table 7 All European Sites within 15km of the Development and Identification of 'Relevant' Sites to the Proposed Development (In Grey Rows)			
		<p><i>listed on Annex I of the EC Birds Directive</i></p> <p><i>(Whooper Swan, Golden Plover, Bar-tailed Godwit, Ruff, Common Tern)</i></p>	<p>No significant air quality impacts are predicted based on the following data provided by AWN consulting, based on NOx modelling for the proposed development in 'Opening Year' (2016) and 'Design Year' (2031) and the NRA Air Quality Guidelines: "The predicted increase in NOx levels in Cork Harbour SPA is only 0.7 µg/m3 which is significantly lower than the 2 µg/m3 increase stipulated in the NRA guidelines for meriting further investigation by an ecologist. More importantly, the increase on the NO2 Dry Deposition rate in the Cork Harbour SPA is only 0.03 Kg(N)/ha/yr in 2016 which reaches only 0.3% of the critical load for coastal habitats of 10 – 20 Kg(N)/ha/yr. The NO2 dry deposition rate in the Cork harbor SPA is decreased with the proposed scheme in place in 2031. " (AWN Consulting, 2012).</p>

Table 8 Underpinning Conditions and Threats to Qualifying Interests of Relevant European Sites			
Site Name and Code	Qualifying Interests	Underpinning Conditions	Threats to Irish Wintering Populations (Except Common Tern) (Birdlife, 2012)
Cork Harbour SPA (4030)	<p><u>Over-wintering populations of international importance:</u></p> <ul style="list-style-type: none"> • Redshank <i>Tringa totanus</i> <p><u>Over-wintering populations of national importance:</u></p> <ul style="list-style-type: none"> • Great Crested Grebe <i>Podiceps cristatus</i> • Cormorant <i>Phalacrocorax carbo</i> • Shelduck <i>Tadorna tadorna</i> • Wigeon <i>Anas penelope</i> • Gadwall <i>Anas strepera</i> • Teal <i>Anas crecca</i> • Northern Pintail <i>Anas acuta</i> • Northern Shoveller <i>Anas clypeata</i> • Red-breasted Merganser <i>Mergus serrator</i> • Oystercatcher <i>Haematopus ostralegus</i> • Lapwing <i>Vanellus vanellus</i> • Dunlin <i>Calidris alpina</i> 	<p><u>All Wintering Species:</u></p> <ul style="list-style-type: none"> • Food availability (intertidal & pastoral fauna, and fish in marine waters) • Flooding regime of coastal grasslands. • Availability of undisturbed coastal roosting sites close to feeding areas. • Availability of unpolluted Coastal Waters for foraging <p><u>Terns:</u></p> <ul style="list-style-type: none"> • Availability of nest sites safe from predation by corvids, gulls or mammals. 	<p><u>All species:</u></p> <ul style="list-style-type: none"> • Climate change altering breeding/wintering habitat and feeding resources • Habitat Loss (particularly reclamation of coastal areas) • Flood Alleviation measures leading to changes in tidal regime • Water Pollution • Coastal barrage construction • Human disturbance including construction, vehicles, walkers and dogs • Over-fishing • Soil erosion • Extreme weather events and cold temperatures • Hunting • Windfarm collisions • Avian Botulism <p><u>Species-specific:</u></p> <ul style="list-style-type: none"> • Thinning of egg shells due to chemical pollution (Common Tern); • Egg predation by rats, Peregrine Falcon <i>Falco peregrinus</i> and foxes <i>Vulpes vulpes</i> (Common Tern); • Persecution by aquaculture industry (Cormorant & Grey Heron); • Over-fishing of Benthic shellfish (Oystercatcher).

	<ul style="list-style-type: none">• <i>Black-tailed Godwit</i> <i>Limosa limosa</i>• <i>Curlew Numenius arquata</i>• <i>Greenshank Tringa nebularia</i>		
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4.4 Summary of AA Screening Conclusions

Impacts to all sites other than the Cork Harbour SPA were screened out. However, in the absence of mitigation, it is not possible to rule out the likelihood of significant effects on the Cork Harbour SPA from the following sources:

- Disturbance from noise, physical disturbance and human presence during construction could displace wetland birds away from favoured roost or feeding areas (particularly from the Jack Lynch Tunnel Tidal Polder (WF1)).
- Run-off of sediment or pollutants into Lough Mahon/Glashaboy Estuary/River Lee Estuary during the construction phase
- Spread of invasive Cord Grass into new areas of the SPA resulting in loss of intertidal muds with loss of bird feeding habitat

5 Stage Two: Provision of information for an Appropriate Assessment

According to *Managing European Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC* (EC Environment Directorate-General, 2000);,

"The integrity of a site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives. paragraph 4.6(3)"

Within this stage of the summary assessment, the potential impact of the proposed development on the integrity of the European Site is examined with respect to the conservation objectives of the European Site and to its general structure and function.

Stage two entails five steps as follows:-

- Step One: Information checklist
- Step Two: Impact prediction
- Step Three: Conservation objectives
- Step Four: Mitigation measures
- Step Five: Outcomes (this stage is completed by the competent authority)

Step one is presented in Table 9 overleaf

Table 9 Information Checklist for the Appropriate Assessment		
• Information about the Project		
	Known or available ☒ or ☑	Details
Full Characteristics of the project which may affect the European Site	☑	See Section 3
The total range or area the project will cover	☑	See Section 3 and Figure 5.1.5
Size and other specifications of the project	☑	It is proposed to reconfigure the existing Dunkettle Interchange to a free flowing interchange <i>i.e.</i> an interchange whereby traffic movements are not conflicted by opposing traffic movements either by yielding or stopping at traffic signals, as is the case with the existing interchange. The proposed development is depicted in Figure 2.1.1. Full descriptions of the proposed road development are set out in the Project Description of the EIS; Chapter 2. The construction period is predicted to be approximately 24 months. Intertidal flood compensatory areas will be created in existing scrub, and wet grassland habitats, where intertidal mudflats and saltmarsh habitats will be recreated. These will serve a dual function of flood alleviation and habitat creation.
The characteristics of the existing, proposed, or other approved projects which may cause interactive or cumulative impacts with the project being assessed and which may affect the European Site.	☑	<p>Zoning - Zoning for the localities around the scheme were also examined to assess the likely existing and future development pressures on the locality. The lands within large areas of the Zone of Influence of the proposed development are unzoned. This includes lands at Inchera and Little Island which are local industrial hubs in this part of East Cork. Zonings relevant to different sources of impact are discussed in their relevant section below.</p> <p>Water & Sediment Pollution –The potential cumulative impact of existing plans and projects is best demonstrated by examining the current coastal water status in the Owenacurra Water Management Unit (SWRBD, 2009). Within this WMU, the Glashaboy Estuary and nearby Lough Mahon are both intermediate, while 95% of river waters in the WMU are of poor or moderate status. There are several noteworthy existing projects which may be significant contributors to this moderate water quality status. The road infrastructure of the existing Dunkettle Interchange, the N8, the N25 and other</p>

Table 9 Information Checklist for the Appropriate Assessment

		<p>secondary roadways may be the source of elevated concentrations of some contaminants based on sediment analysis at several locations including a number of known outfall points for the existing interchange). Overall most of the contaminants tested for on most of the sites indicated that contaminant concentrations are below the Marine Institute's Lower guidance level. This means that the sediment is considered uncontaminated. The only consistent exception to this is copper which fell between the Lower and Higher levels in WF1 and WF3-WF8. These sediments in the case of copper would be classified by the Marine Institute (Cronin et al., 2006) as 'marginally contaminated' (Data from Sediment Analysis undertaken by Aquatic Services Unit at Dunkettle in April 2012).</p> <p>Other sources of water contamination that may act in combination with the proposed development include sewage effluent from existing residential, commercial, and industrial infrastructure, and oil pollution from shipping in Cork Harbour which is known to be a general threat (Kelly et al., 2009).</p> <p>There is significant heavy industry within the vicinity of the proposed development at Little Island Industrial estate including the Pfizer Pharmaceuticals Plant (now disused) and adjacent BASF Detergent Plant at Little Island. None of these facilities are known to discharge effluent into local watercourses or intertidal areas. However, in combination with domestic/commercial sewage these and other industrial plants in Cork City, they have historically discharged effluent to the municipal network for treatment at Waste Water Treatment Works (WwTW) in the catchment. All receiving WwTWs within the Owenacurra Water Management Unit are operating above capacity and WwTWs account for 20% of sectoral Phosphorous Sources in the WMU (SWRBD, 2009). WwTW discharges are the second-most important source of Phosphorous pollution in the WMU after agriculture, while unsewered discharges account for a further c. 20%.</p> <p>The Draft Cork Harbour Study 2010 includes proposals for a strategic brownfield site in the former Mitsui Denman site at Little Island which may result in further loading on the sewerage network and Cork Harbour. In the absence of mitigation, all these sources of water contamination are likely to act in combination with the proposed development to cumulatively result in negative, indirect, long-term, reversible, decreases in coastal water</p>
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Table 9 Information Checklist for the Appropriate Assessment		
		<p>quality significant at County levels.</p> <p>Annex 1 Intertidal Habitat Loss</p> <p>The draft Cork Harbour Study (Cork County Council, 2010) includes proposals for vehicular and pedestrian access ways that could potentially result in loss of intertidal mudflat along the northern boundary of the SPA at the Jack Lynch Intertidal Mudflat. The proposal by Cork County Council for the Northern Ring Road to link the N22 Ballincollig Bypass to the N8 Glanmire Bypass could also cumulatively impact upon Annex 1 estuarine, intertidal mudflat or woodland habitats. However this latter project is currently stalled (NRA website, 2012). There are no other known projects which may cumulatively act to reduce areas of Annex 1 intertidal habitats in the locality. Winter Bird survey data (2010/2011) indicates that undesignated areas of mudflat within the development footprint do not have a significant supporting role in providing feeding areas to SPA populations. Therefore no significant cumulative mudflat loss impacts are predicted.</p> <p>Impacts to Fauna</p> <p>The proposal for vehicular and/or pedestrian access ways within the SPA in the draft Cork Harbour Study (Cork County Council, 2010) would likely result in significant long-term disturbance of the wintering bird high tide roost or feeding flocks in the Jack Lynch Tunnel Intertidal mudflat. This could act in combination with short-term construction disturbance or long-term operational impacts from the proposed development to result in long-term, negative, indirect disturbance impacts significant at local-national levels.</p> <p>Any works in intertidal areas may facilitate the spread of Cord Grass seed or plant fragments to mudflat areas of the SPA where it is currently not established. This may act in combination with the current project to result in cumulative loss of bird feeding habitat.</p>
The relationship between the project and the European Site	<input checked="" type="checkbox"/>	See Figures 5.1.5 and 5.1.6.
The information requirements of the authorisation body.	<input checked="" type="checkbox"/>	See Section 2.4 Consultation, and Appendix 2

Table 9 Information Checklist for the Appropriate Assessment		
• Information about the Site		
The reasons for the designation of the European Site.	<input checked="" type="checkbox"/>	See Section 4.3, Table 8 & Appendix 1 (Cork Harbour SPA)
The conservation objectives of the European Site and the factors that contribute to their conservation value.	<input checked="" type="checkbox"/>	See Table 8 and Sections 4.3 and 5.2
The conservation status of the habitats (favourable or otherwise)	<input checked="" type="checkbox"/>	All Cork Harbour SPA Qualifying Interests (22 Wintering Bird species and 1 breeding species -Common Tern) are of Least Concern Internationally, according to the IUCN (Birdlife, 2012). Status in Ireland for wintering populations varies for species with most of Medium Conservation Concern, several of Low Conservation Concern (e.g. Common Gull and Lesser Black-backed Gull), and only three species of High Conservation Concern (Curlew, Pintail, Shoveler). Only one of the species of High Conservation Concern is known to occur within the ZOI (Curlew).
The existing baseline condition of the European Site	<input checked="" type="checkbox"/>	The NPWS Natura site synopsis is included in Appendix 1. Threats are also listed in Table 8.
The key attributes of any Annex I habitats or Annex II species in the European Site	<input checked="" type="checkbox"/>	Refer to information included in Appendices 1 and 2.



5.1 Step Two: Impact Prediction

An analysis of impact assessment typically requires the identification of the type and magnitude of potential impacts; direct and indirect; short and long term; construction, operational and decommissioning effects; and isolated, interactive and cumulative effects. In this instance the assessment requires the identification of the construction and operation related impacts on the European Site. These are described below in Table 10.

Note that Table 10 describes impacts in the absence of mitigation. Table 11 describes the mitigation measures that avoid, reduce / minimise or remediate the significance of the potential impact.

The site is outside the boundaries of the European Sites, and therefore there will be no direct impacts on the site. Indirect impacts refer to the potential for contaminated surface water runoff or foul water to reach the European Sites.

Based on EC (2000) and IEEM guidelines *Guidelines for Ecological Impact Assessment* (IEEM, 2006), impacts are assessed using a combination of professional judgement and criteria or standards where available,

Duration is quantified as follows (EPA, 2002):

- *Temporary: up to 1 year,*
- *Short-term: from 1-7 years,*
- *Medium-term: 7-15 years,*
- *Long-term: 15-60 years,*
- *Permanent: over 60 years*



Table 10 Impact Prediction (In absence of Mitigation)		
Parameter	Indirect effects during the Construction Phase	Indirect effects during the Operational Phase
Disturbance to feeding/roost wetland birds from noise, physical disturbance and human presence during construction	<p>Potential, cumulative, short-term (< 2years), displacement of bird populations with potential adverse effects to site integrity</p> <p>Noise and disturbance from human presence, machinery, and intrusive earthworks (e.g. piling) are likely to flush wetland birds from mudflat feeding areas and/or the high tide roost in the Jack Lynch Tunnel Intertidal Polder (WF1). This is likely to be most significant during the non-breeding season (September- March) when migratory wintering populations are present in greatest numbers. The magnitude of this impact will be limited by the short duration of the impact (<2 years), but may result in locally significant losses of 'fitness' in affecting bird populations, and consequently a deviation from favourable conservation status (i.e. bird populations may be unable to maintain populations due to reduced reproductive output).</p> <p><i>Likelihood = Medium-High</i></p>	Not Applicable (Non-significant)
Run-off of sediment/ pollutants into the Lough Mahon and Glashaboy Estuary (Cork Harbour)	<p>Potential, cumulative, short-term, displacement of bird populations with potential adverse effects to site integrity</p> <p>Surface waters generated during construction may carry silts, oils, cements or other toxic chemicals overland or by the local drainage network and into Lough Mahon in Upper Cork Harbour. In the absence of mitigation, contaminants discharged to these areas during the construction period could reduce biological and chemical water quality status in designated receiving waters, thereby burying and/or contaminating mud-dwelling invertebrates, with indirect impacts to foraging birds. These estuarine habitats are regularly exposed to turbid water so that a certain amount of increased suspended solids during construction will have little impact on the communities in each of the water features. Nevertheless, excessive sedimentation, in particular over extensive areas of the intertidal mud-flats, could lead to</p>	<p>No significant impact</p> <p>During the operation of the development, surface water runoff will be passed through a train system of petrol interceptor, attenuation pond, and constructed wetland prior to discharge directly into the estuary. The design of the treatment system has taken account of the size of catchment drained, and the types of contaminants (grit, heavy metals, and hydrocarbons). There will be four outfall points for surface waters during site operation. One outfall will be to the freshwater stream (WF10) below Gaelscoil Ui Drisceoil which will discharge to the North Esk Intertidal Mudflat East (WF4). A second outfall will be into the Pfizer Intertidal Mudflat East (WF6). The final two outfalls are both into the Jack Lynch Tunnel Intertidal Mudflat (WF2).</p>


Table 10 Impact Prediction (In absence of Mitigation)

Parameter	Indirect effects during the Construction Phase	Indirect effects during the Operational Phase
	<p>smothering of burrowing infauna. Furthermore, due to its connection with the wider Cork Harbour, excessive silt release could also impact on the wider inner harbour area.</p> <p>Magnitude of impacts will vary depending on volumes of sediment/pollutants released which will dictate the area of mudflat bird feeding resource impacted. The likelihood of sediment escape during construction is high due to the large areas of mudflat displaced for road embankments (at least 1ha – all outside the SPA), particularly across WF5 and WF6 in the Pfizer Intertidal Mudflats West and East. If this mud were to deposit within the SPA (WF0, WF1, or WF9) or elsewhere, it could smother benthic invertebrates with significant loss of feeding resources to wintering birds. Affected bird populations could be displaced to alternative feeding areas outside of the SPA <i>e.g.</i> on inland grassland feeding sites.</p> <p>Desktop and field data for the Dunkettle area indicates significant populations of 9 or 10 Qualifying Interests could be displaced outside the SPA for several years ('significant' here indicates populations of 10% or more of total SPA population likely to occur within ZoI of pollution impacts). Depending on volumes of pollutants discharged, this could constitute a negative, indirect, short-term (1-5 years), reversible impact and a deviation from favourable conservation status of wetland habitats (i.e. the ecological factors necessary for long-term maintenance of the habitat may no longer exist). A deviation from favourable conservation status of Qualifying Interest bird species may also occur (i.e. via a reduction in their range). The proposed development may act in combination with existing and proposed surface water run-off impacts from existing road infrastructure, industry and other sources in Table 9 Adverse effects to site integrity may result.</p> <p><i>Likelihood = Medium-High</i></p>	<p>All receiving waters will eventually discharge to Lough Mahon within the SPA. Residual contaminants discharged to the Cork Harbour SPA are considered non-significant due to the efficiency of the attenuation and treatment system design, and the dilution and dispersal of residual contaminants by large volumes of tidal waters in inland intertidal areas and in Lough Mahon.</p>



Table 10 Impact Prediction (In absence of Mitigation)		
Parameter	Indirect effects during the Construction Phase	Indirect effects during the Operational Phase
Accidental spillage of oil or other pollutants into Lough Mahon & Glashaboy Estuary (Cork Harbour)	<p>Not Applicable (Likelihood Low)</p> <p>In the absence of mitigation, accidental spillages of oils, cement or toxic substances during the construction process could be carried into designated intertidal areas overland or through surface water drains. If contaminated land is exposed during the site clearance, it is also possible that it may reach the surface water drainage system and flow into the SPA.</p> <p>Depending on the scale of the incident, it is possible that it could result in a short-term (1-5 years) negative impacts upon wintering birds directly or indirectly via pollution of their intertidal feeding habitats in the SPA. Birds could be displaced or injured by the contamination of mud infauna. The Likelihood of adverse impacts to integrity is elevated by the proximity of the SPA to the proposed development. Magnitude of impact will vary depending on volumes of pollutants spilled which could be considerable for a major road scheme.</p> <p>Cumulative effects potentially apply from existing road infrastructure, industry and other sources in Table 9. Potential, cumulative, short-term, displacement of bird populations may be significant with potential adverse impacts to site integrity.</p> <p><i>Likelihood = Low-Medium</i></p>	<p>Not Applicable (Likelihood Very Low)</p> <p>The hydrology chapter of the EIS for the proposed development has concluded as follows:</p> <p><i>"The probability of accidental spillage has been calculated for each link using the Highways Agency Method D Spillage Risk Assessment and the outputs [see Appendix 4]. Prior to the inclusion of mitigation measures the probability was calculated as 2.7×10^{-4}. This is less than 0.5% (0.027%) therefore, the likelihood of a serious pollution incident is low and measures are not required to further reduce the risk of a serious pollution incident"</i></p> <p><i>Likelihood = Very Low</i></p>
Disturbance to wintering birds from light spill	<p>Non- significant impact</p> <p>Lighting will not be continuous throughout the 2 year construction period, as construction activity and associated vehicular/working area lighting will be reduced outside of daylight hours. Light spill impacts will be short-term (<2 years). Some displacement of birds may initially occur in the short-term, but the majority of the population is likely to habituate, and readily return to the feeding/roost areas in the Jack</p>	<p>Not Applicable.</p> <p>There will be no change to the existing lighting which already exists in the areas immediately adjacent to WF1 (i.e. to the north and east of this feature).</p>



Table 10 Impact Prediction (In absence of Mitigation)		
Parameter	Indirect effects during the Construction Phase	Indirect effects during the Operational Phase
	Lynch Intertidal Polder..	
Spread of Cord Grass resulting in loss of mud feeding habitat for wintering birds	<p>Potential, cumulative, long-term loss of bird feeding habitats with potential adverse effects to site integrity</p> <p>Cord Grass is the only invasive species recorded which threatens intertidal mudflat and saltmarsh habitats, as all other recorded invasives will not establish in saline environments.</p> <p>Cord Grass spreads by seeds that float to new localities or are carried there by wading birds or other animals. It also spreads by fragments that develop into rapidly radiating clonal tussocks that may annually increase in diameter by 30cm. Tussocks may fuse to form extensive meadows (Minchin, 2008), resulting in decreases in extent of mud dwelling invertebrates which are a prime wintering bird feeding resource. During construction, site clearance in undesignated intertidal areas outside the SPA (e.g. WFs 2-6), and movement of construction staff and vehicles may spread invasive Cord Grass plant material to new areas, or accelerate its spread in areas where they are already established within the SPA such as at WF1. Taking into account the Poor conservation status of intertidal mudflats (Mudshore LS4) and Saltmarsh habitats in Ireland (NPWS, 2008), potential impacts of Cord Grass spread to these habitats are indirect, negative, long-term, and reversible potential impacts to site integrity via deviation from favourable conservation status of wetland habitats (i.e. decrease in range of intertidal mudflats).</p>	<p>Not applicable.</p> <p>There will be no works in intertidal areas during site operation and no possibility for spread of aquatic invasive material</p>

5.2 Step Three: Conservation Objectives

It is necessary to assess whether or not the identified potential impacts will adversely affect the integrity of the site as defined by the conservation objectives.

Conservation objectives for Natura 2000 sites in Ireland are now generic for cSACs, and SPAs, applying to all Qualifying Interests for each respective site.

The Conservation objectives for cSACs are:

'To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected: [Qualifying Interests listed]'

The Conservation objectives for SPAs are:

'To maintain or restore the favourable conservation condition of bird species listed as Special Conservation Interests for this SPA: [Qualifying Interests listed]'

The EC guidance documentation includes a list of criteria to interpret the meaning of 'integrity' of a European Site, and to assess the potential for adverse effects to integrity. Some of these are listed below. For example, will the proposed development:

- Cause delays in progress towards achieving the conservation objectives of the site?
- Disrupt those factors that help to maintain the favourable conditions of the site?
- Reduce the area of key habitats?
- Reduce the population of key species?
- Result in disturbance that could affect population size or density or the balance between key species?
- Result in fragmentation?

This initial assessment of effects to integrity should be carried out without any consideration of mitigation. If the answer to any of these questions is yes, then it can be concluded that the proposed development would be likely to lead to negative impacts to integrity upon a European Site, and that mitigation measures would be required to neutralise the identified risks.

Several potential impacts could adversely effect site integrity as noted above. It is therefore possible that the scheme could cause some of the impacts noted above (e.g. reduce the populations of key species). Therefore, it is necessary to continue to Step 4 and include mitigation measures.

5.3 Step Four: Mitigation Measures

Upon establishing the risk of adverse effects that the proposed development could have upon site integrity in view of the conservation objectives for the European Site, wherever a potential impact is identified, mitigation measures need to be proposed to neutralize these risks. Detailed mitigation measures have been proposed and are summarised below in Table 11.

Table 11 excludes certain mitigation measures which have already been integrated into the design of the proposed development. These are design rather than mitigation measures, for example the use of a three stage water treatment system combining petrol interceptors, attenuation ponds, and constructed wetlands for carriageway runoff treatment prior to discharge.

The Hydrology Chapter of the EIS describes this system as follows:

"Consultation on the drainage system for the proposed development was carried out with the NPWS on the 1st April and 15th July 2011. In view of this consultation a three stage attenuation system is proposed for the new development consisting of:

- *Oil/petrol Interceptor;*
- *Initial Attenuation Pond; and*
- *Constructed Wetland.*

An oil/petrol interceptor will be provided between the carriageway drainage outfall and the attenuation pond within each drainage network. These will also serve to buffer any potential impacts of accidental spillage on the road from entering a watercourse, allowing time to organise remedial measures.

Attenuation ponds are considered an appropriate method for providing suitable storage and a controlled means of discharge. The attenuation ponds will store the runoff, allow a degree of settlement to occur and control the discharge into the receiving environment to that of the "greenfield" run-off rate. An additional benefit of attenuation ponds is that they can also provide a degree of protection against accidental spillage on the road from entering a receiving watercourse, giving the relevant authority time to organise appropriate remedial measures.

Carriageway runoff may contain pollutants that can have an adverse effect on the quality of the water within the receiving watercourse or waterbody and therefore it is important that the drainage system proposed would provide a form of treatment to ensure that any negative impact is reduced. It is therefore proposed to provide constructed wetland systems in tandem with the attenuation ponds to ensure the quality of the runoff at the outfall locations.

The constructed wetland systems will provide mitigation against the impact of carriageway runoff. Constructed wetland systems have been shown to remove high percentages of suspended solids, phosphorous and metals. They can also reduce the Biological Oxygen Demand of stormwater runoff. Pollutant removal is achieved through actions of both filtration and biological activity; they achieve this by adhesion to aquatic vegetation and aerobic decomposition. The wetlands shall each have a permanent pool of water at varying depths, and shall 'drain down' additional runoff water in no less than 24 hours for treatment while discharging into the receiving watercourse.

Typical expected treatment values are as follows for the attenuation pond/wetland system³:

- *70% to 95% for total suspended solids (TSS);*
- *50% to 85% for hydrocarbons;*
- *40% to 75% for various metals; and*
- *up to 40% for the dissolved metal fraction. "*

³ EPA (2000) Impact Assessment of Highway Drainage on Surface Water Quality 2000-MS-13-M2 Main Report. The following report is also cited, Mudge, G. and Ellis, J. (2001). Guidelines for the Environmental Management of Highways. Technical report, Chapter 4, 67-102, The Institution of Highways and Transportation, London, UK.



Table 11 Mitigation Measures				
Proposed Mitigation Measures	How will the mitigation measures avoid and / or reduce adverse effects on the integrity of the cSAC?	How will the mitigation measures be implemented, when and by whom?	What is the degree of confidence in the likely success of the mitigation measures?	What proposed monitoring of the mitigation measures?
Measure 1: Screening of Working Area beside WF1 during Construction				
Prior to commencement of construction, 3m high solid hoarding will be erected along the southwestern boundary along the length of proposed Link B (Ch. 0-300). The hoarding will remain in place for the duration of construction. No movement of construction staff or vehicles will be permitted south of the hoarding on the existing track that forms the perimeter of WF1.	Minimise potential for short-term disturbance leading to loss of fitness of wintering birds	Required as part of contractor's responsibilities.	With correct implementation of the measures confidence is high	None required
Measure 2: Construction Phasing				
A construction phasing of the proposed development (in terms of work locations, creation of new storage/intertidal areas, temporary and permanent culverts) will be established to maintain connectivity through the intertidal areas during construction, and requires that compensatory flood areas are created prior to any existing areas being lost.	Minimise potential for range reductions in SPA populations feeding/roosting outside the SPA during construction, for instance via drying out of intertidal muds and reduced availability of benthic fauna.	Required as part of contractor's responsibilities.	With correct implementation of the measures confidence is high	None required



Table 11 Mitigation Measures				
Proposed Mitigation Measures	How will the mitigation measures avoid and / or reduce adverse effects on the integrity of the cSAC?	How will the mitigation measures be implemented, when and by whom?	What is the degree of confidence in the likely success of the mitigation measures?	What proposed monitoring of the mitigation measures?
Measure 3: Erosion and sediment/silt control Plan				
<p>Prior to commencement of construction, the contractor will implement the following measures through a Construction Method Statement (CMS).</p> <p>These measures are based on the following best practice guidelines to ensure that water bodies are adequately protected during construction work:</p> <ul style="list-style-type: none"> • Construction Industry Research and Information Association CIRIA C648: Control of water pollution from linear construction projects: Technical guidance (Murnane et al. 2006) • CIRIA C648: Control of water pollution from linear construction projects: Site guide (Murnane et al. 2006) • DMRB HD33/06: Surface and sub-surface drainage systems for highways. Design Manual for Roads and Bridges. Volume 4: 2, (2006). • NRA (2005a). Guidelines for the crossing of watercourses during the construction of National Road Schemes. • SRFB (2007). Maintenance and Protection of the 	<p>Minimise potential for adverse effects on Cork Harbour SPA site integrity via deviation from favourable conservation status of wetland habitats and Qualifying Interest bird populations</p>	<p>Required as part of contractor's responsibilities.</p>	<p>With correct implementation of the measures confidence is high.</p>	



Table 11 Mitigation Measures				
Proposed Mitigation Measures	How will the mitigation measures avoid and / or reduce adverse effects on the integrity of the cSAC?	How will the mitigation measures be implemented, when and by whom?	What is the degree of confidence in the likely success of the mitigation measures?	What proposed monitoring of the mitigation measures?
<p>Inland Fisheries Resource during Road Construction and Improvement Works. Requirements of the Southern Regional Fisheries Board.</p> <p>The construction contractor will implement the following mitigation measures, via the CMS, for release of sediment/silt control:</p> <ul style="list-style-type: none"> • Provision of measures to prevent the release of sediment over baseline conditions to Lough Mahon during the construction work. Baseline conditions will be established in accordance with details provided in Section 6.2.9 (a)(i) of the Environmental Impact Statement for the proposed development. These measures will include but not be limited to silt fences, silt curtains, settlement lagoons, filter materials, and stockpile seeding; • Provision of measures to minimise the release of sediment from the newly excavated flood compensation areas to Lough Mahon and the North Esk Intertidal Mudflat (WF4) These measures will include but not be limited to silt 				



Table 11 Mitigation Measures				
Proposed Mitigation Measures	How will the mitigation measures avoid and / or reduce adverse effects on the integrity of the cSAC?	How will the mitigation measures be implemented, when and by whom?	What is the degree of confidence in the likely success of the mitigation measures?	What proposed monitoring of the mitigation measures?
<p>fences, silt curtains, settlement lagoons, filter materials, and stockpile seeding;</p> <ul style="list-style-type: none"> • Provision of measures to minimise the displacement and subsequent erosion and release of soft sediment, particularly from WF6, WF5, WF7 and WF4. These measures will include but not be limited to silt fences, silt curtains, settlement lagoons, filter materials, and stockpile seeding; • Provision of measures to handle, store and re-use where feasible material removed from the intertidal mudflats; • Provision of measures to minimise any run-off into the Jack Lynch Tidal Polder (WF1), by diverting drainage into WF2 instead; • Provision of exclusion zones and barriers (sediment fences) between earthworks, stockpiles and temporary surfaces and watercourses to prevent sediment washing into the watercourses; • Excavated sediment/materials from Pfizer Intertidal Mudflat West (WF5) and East (WF6) will be retained and re-used within flood compensation intertidal areas; 				



Table 11 Mitigation Measures				
Proposed Mitigation Measures	How will the mitigation measures avoid and / or reduce adverse effects on the integrity of the cSAC?	How will the mitigation measures be implemented, when and by whom?	What is the degree of confidence in the likely success of the mitigation measures?	What proposed monitoring of the mitigation measures?
<ul style="list-style-type: none"> • Temporary construction surface drainage and sediment control measures will be in place before earthworks commence; • Pouring of cementitious materials for the works will be carried out in the dry and allowed to cure for 48 hours before re-flooding. Pumped concrete will be monitored to ensure no accidental discharge. Mixer washings and excess concrete will not be discharged to surface water; • No storage of hydrocarbons or any polluting chemicals will occur within 50 m of a watercourse. Fuel storage tanks will be bunded to a capacity at least 110% of the volume of the storage tank. Re-fuelling of plant will not occur within 50 m of any watercourse and only in bunded refuelling areas; • Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures; • Implementation of measures to minimise waste and ensure correct handling, storage and disposal of waste (most notably wet concrete, pile arisings and asphalt); • Response measures to potential pollution 				



Table 11 Mitigation Measures				
Proposed Mitigation Measures	How will the mitigation measures avoid and / or reduce adverse effects on the integrity of the cSAC?	How will the mitigation measures be implemented, when and by whom?	What is the degree of confidence in the likely success of the mitigation measures?	What proposed monitoring of the mitigation measures?
<p>incidents;</p> <ul style="list-style-type: none"> • Methods to stabilise watercourse banks that have been cleared of vegetation; • Maintenance of machinery to be used in-stream; • Removal and replacement of stream bed material in diverted watercourses; • Any contaminated land will be managed in accordance with Made Ground Management/Mitigation Measures in Section 12.5.1. 				
Measure 4 Control of Invasive Cord Grass during Construction				
<p>An Invasive Species Management Plan (ISMP) will include Cord Grass and will be implemented prior to commencement of construction to allow time to adequately control all invasive populations within the ZOI of the proposed development before works commencing. The timings/seasonality of control measures are detailed in the NRA Guidelines 2010.</p> <p>As species may have spread or changed distribution between habitat surveys for this EIS ending in July</p>	<p>Minimise potential for loss of intertidal mudflat within the SPA with subsequent loss of wetland bird feeding habitat.</p>	<p>Required as part of the contractor's responsibilities. Plan to be drawn up by a qualified ecologist in consultation with the NPWS, and implemented by a specialist contractor.</p>	<p>With correct implementation of the measures confidence is high.</p>	<p>The Invasive Species Management Plan will include regular monitoring during site operation to ensure success of the control program. The NPWS should be</p>



Table 11 Mitigation Measures				
Proposed Mitigation Measures	How will the mitigation measures avoid and / or reduce adverse effects on the integrity of the cSAC?	How will the mitigation measures be implemented, when and by whom?	What is the degree of confidence in the likely success of the mitigation measures?	What proposed monitoring of the mitigation measures?
<p>2011 and commencement of construction. The implementation of the Invasive Species Management Plan will include re-survey (pre-construction) of the zone of influence. Appendix 1 of the NRA 2010 guidelines provides an assessment and management plan template. In accordance with the NRA guidance this survey will include accurate 1:5,000 scale mapping for the precise location of invasive species. The pre-construction surveys will be undertaken by suitable experts with competence in identifying these species and ability to separate them from other species appearing similar to a non professional.</p> <p>The goal of the ISMP will be eradication of all Cord Grass populations in intertidal muds/sediments within the working area of the proposed development. A map of Cord Grass populations as mapped in 2011 is indicated in Figure 5.1.8.</p> <p>All plants within the working area will be dug out at low tide (Minchin, 2008), and removed to licensed landfill.</p>				consulted regarding any monitoring measures.

5.4 Residual Impact

Based on the correct implementation of mitigation measures, Table 12 re-assesses the potential impacts of the proposed development upon the integrity of the European Sites.

With the implementation of mitigation as there are no likely significant residual negative impacts, it can be concluded that the proposed development will not have any adverse effects on the integrity of the Cork Harbour SPA, or any other European Sites.

Table 12 Site Integrity in Relation to Residual Impacts		
Does the project have the potential to:	Yes or No	Details
Cause delays in progress towards achieving the conservation objectives of the site?	No	No significant residual negative impacts
Interrupt progress towards achieving the conservation objectives of the site?	No	No significant residual negative impacts
Disrupt those factors that help to maintain the favourable conditions of the site?	No	No significant residual negative impacts
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	No	No significant residual negative impacts
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	No	No significant residual negative impacts
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No	No significant residual negative impacts
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No	No significant residual negative impacts
Reduce the area of key habitats?	No	No significant residual negative impacts
Reduce the population of key species?	No	No significant residual negative impacts
Change the balance between key species?	No	No significant residual negative impacts

Table 12 Site Integrity in Relation to Residual Impacts

Does the project have the potential to:	Yes or No	Details
Reduce diversity of the site?	No	No significant residual negative impacts
Result in disturbance that could affect population size or density or the balance between key species?	No	No significant residual negative impacts
Result in fragmentation?	No	No significant residual negative impacts
Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc.)?	No	No significant residual negative impacts

6 Conclusions of Assessment Process

Due to the proximity of the proposed development site to the Cork Harbour SPA, and the potential for significant impacts upon this European Site during the construction and operation of the proposed development, it is our view that the proposal should be subject to an Appropriate Assessment in accordance with Article 6 of the Habitats Directive (92/43/EEC) as amended and transposed in Ireland. This Natura Impact Statement has been produced to inform the Appropriate Assessment process which we believe should be undertaken by the Competent Authority (in this case, An Bord Pleanála).

As a result of the appropriate design of the proposed development and proposed mitigation measures, this report has concluded that the proposed development will have not result in impacts on the integrity of any European Sites.

7 Photographs

Plate 1 - Invasive Cord Grass *Spartina anglica* occurs throughout intertidal mudflats within the footprint, and is already established within the SPA as shown below (Jack Lynch Tunnel Intertidal Polder - WF1).



Plate 2 - View westwards from the eastern shore of WF1 within Cork Harbour SPA. This shows the high tide roost located at Irish National Grid Reference W728 726



Plate 3 - Aerial Photograph of WF1 showing High Tide roost location on rough grassland (purple). Proposed Development route is indicated in green.



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Figure 5.1.1
Named and Referenced Intertidal Areas

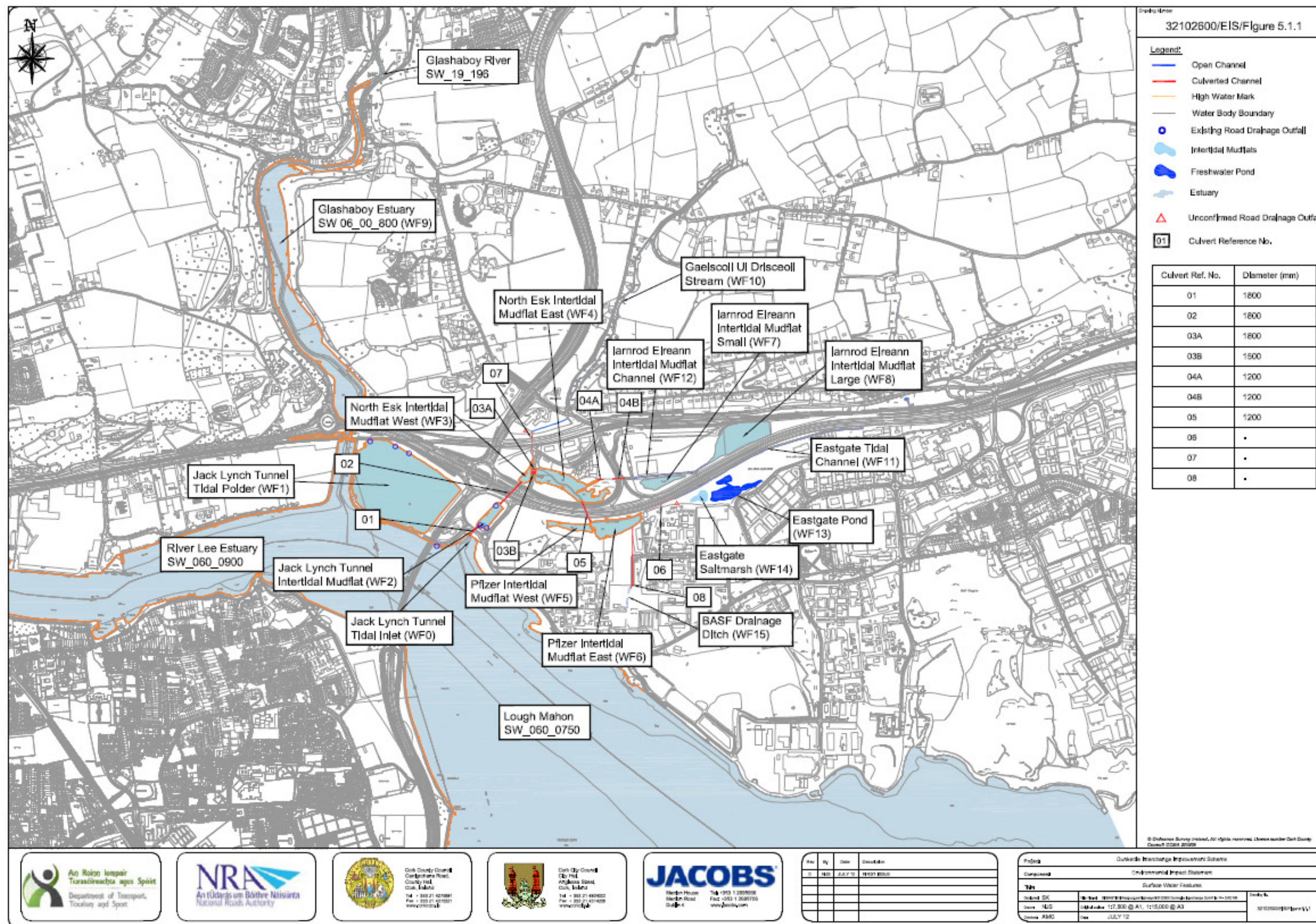




Figure 5.1.5
Designated sites within 1km of the Proposed Development

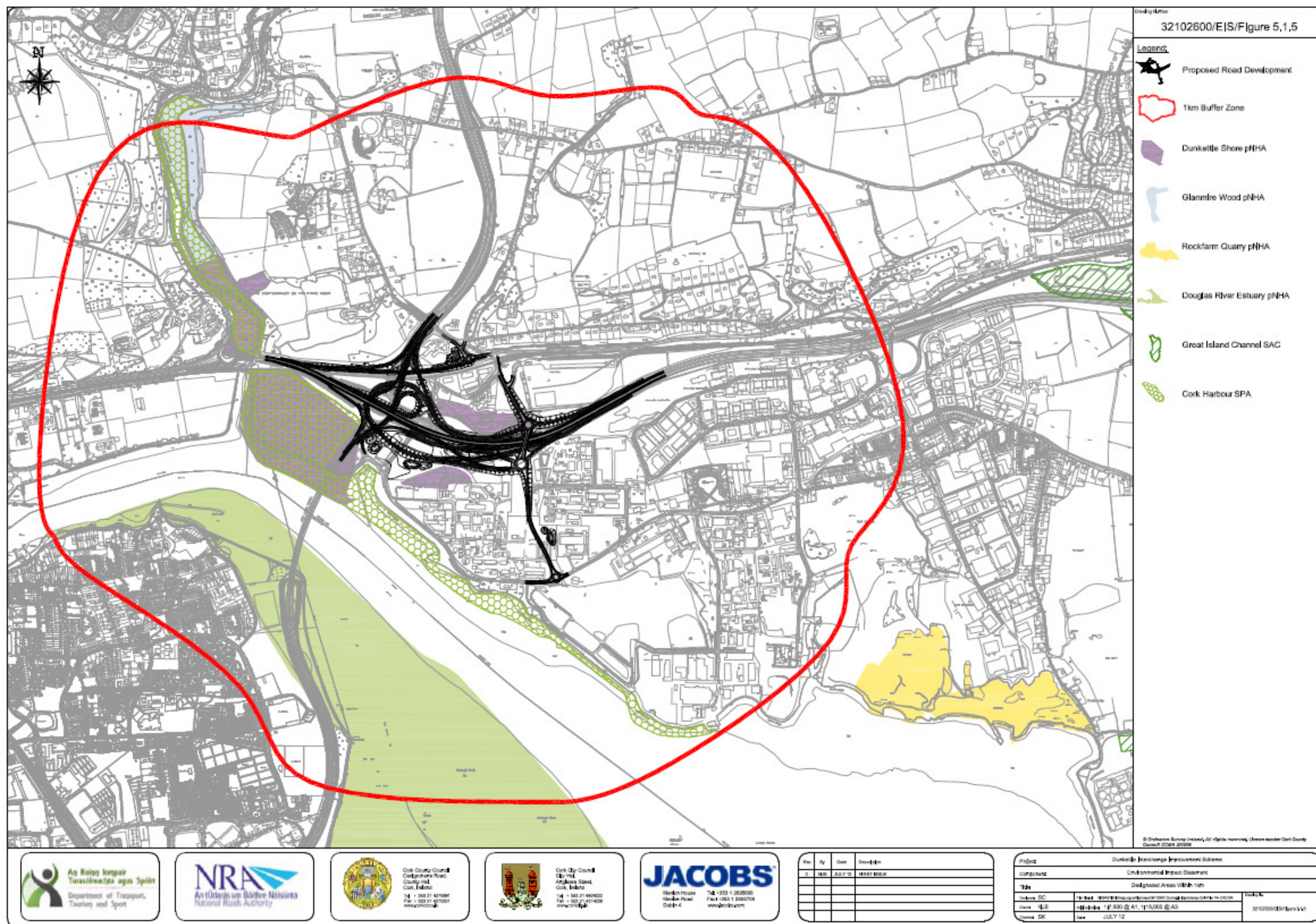




Figure 5.1.6
Designated sites within 15km of the proposed development



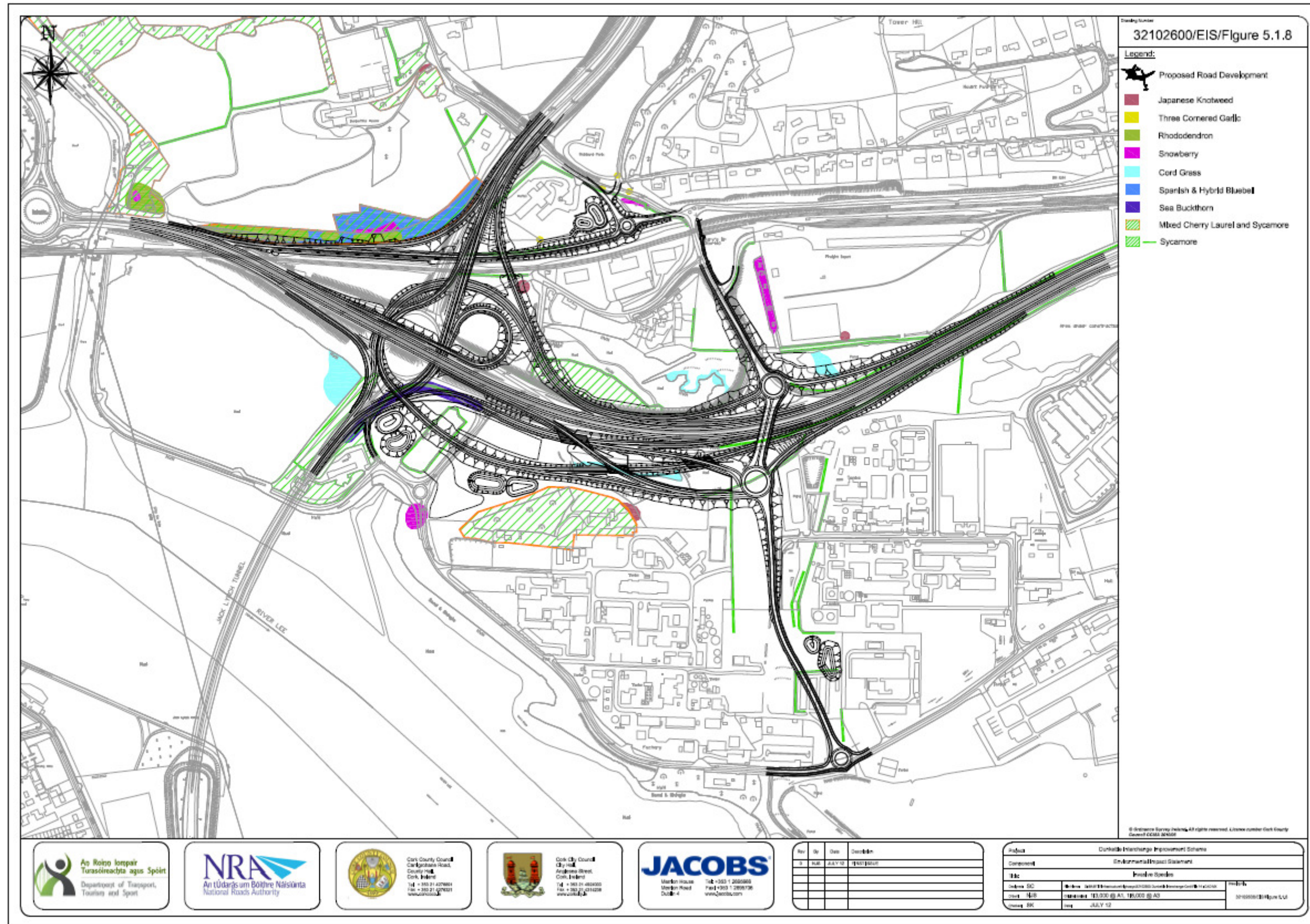


Figure 2.1.1
Proposed Development





Figure 5.1.8
Invasive Species - Cord Grass Location





APPENDIX 1
Site Synopsis
Cork Harbour SPA

SITE SYNOPSIS

SITE NAME: CORK HARBOUR SPA

SITE CODE: 004030

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas and Owenacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas Estuary, inner Lough Mahon, Lough Beg, Whitegate Bay and the Rostellan inlet.

Owing to the sheltered conditions, the intertidal flats are often muddy in character. These muds support a range of macro-invertebrates, notably *Macoma balthica*, *Scrobicularia plana*, *Hydrobia ulvae*, *Nephtys hombergi*, *Nereis diversicolor* and *Corophium volutator*. Green algae species occur on the flats, especially *Ulva lactuca* and *Enteromorpha* spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially where good shelter exists, such as at Rossleague and Belvelly in the North Channel. Salt marshes are scattered through the site and these provide high tide roosts for the birds. Salt marsh species present include Sea Purslane (*Halimione portulacoides*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Plantain (*Plantago maritima*), Lax-flowered Sea-lavender (*Limonium humile*) and Sea Arrowgrass (*Triglochin maritima*). Some shallow bay water is included in the site. Cork Harbour is adjacent to a major urban centre and a major industrial centre. Rostellan lake is a small brackish lake that is used by swans throughout the winter. The site also includes some marginal wet grassland areas used by feeding and roosting birds.

Cork Harbour is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl, for which it is amongst the top five sites in the country. The five-year average annual core count for the entire harbour complex was 34,661 for the period 1996/97-2000/01. Of particular note is that the site supports an internationally important population of Redshank (1,614) - all figures given are average winter means for the 5 winters 1995/96-1999/00. A further 15 species have populations of national importance, as follows: Great Crested Grebe (218), Cormorant (620), Shelduck (1,426), Wigeon (1,750), Gadwall (15), Teal (807), Pintail (84), Shoveler (135), Red-breasted Merganser (90), Oystercatcher (791), Lapwing (3,614), Dunlin (4,936), Black-tailed Godwit (412), Curlew (1,345) and Greenshank (36). The Shelduck population is the largest in the country (9.6% of national total), while those of Shoveler (4.5% of total) and Pintail (4.2% of total) are also very substantial. The site has regionally or locally important populations of a range of other species, including Whooper Swan (10), Pochard (145), Golden Plover (805), Grey Plover (66) and Turnstone (99). Other species using the site include Bat-tailed Godwit (45), Mallard (456), Tufted Duck (97), Goldeneye (15), Coot (77), Mute Swan (39), Ringed Plover (51), Knot (31), Little Grebe (68) and Grey Heron (47). Cork Harbour is an important

site for gulls in winter and autumn, especially Common Gull (2,630) and Lesser Black-backed Gull (261); Black-headed Gull (948) also occurs.

A range of passage waders occur regularly in autumn, including Ruff (5-10), Spotted Redshank (1-5) and Green Sandpiper (1-5). Numbers vary between years and usually a few of each of these species over-winter.

The wintering birds in Cork Harbour have been monitored since the 1970s and are counted annually as part of the I-WeBS scheme.

Cork Harbour has a nationally important breeding colony of Common Tern (3-year mean of 69 pairs for the period 1998-2000, with a maximum of 102 pairs in 1995). The birds have nested in Cork Harbour since about 1970, and since 1983 on various artificial structures, notably derelict steel barges and the roof of a Martello Tower. The birds are monitored annually and the chicks are ringed.

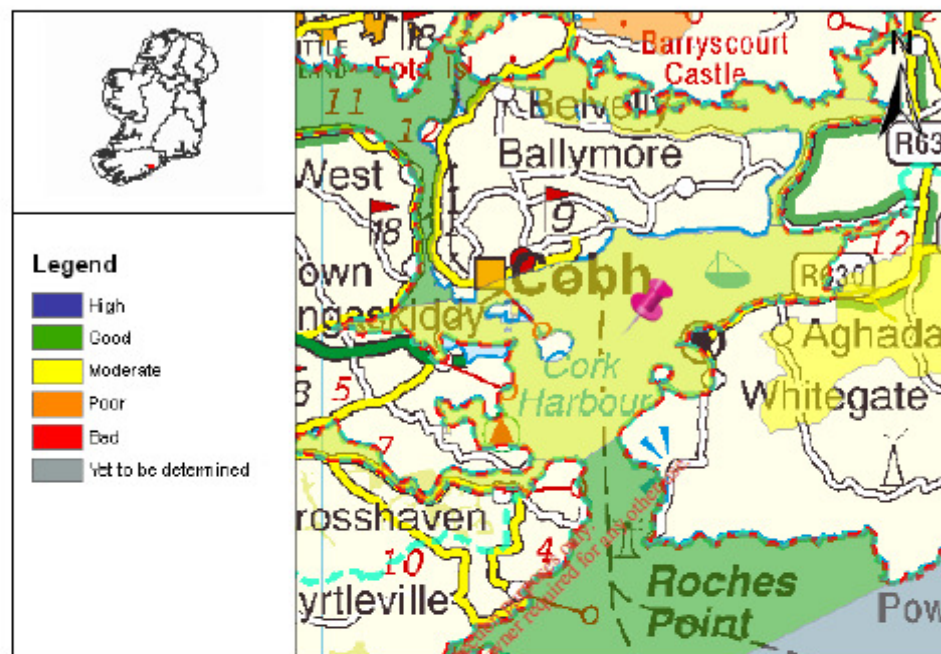
Extensive areas of estuarine habitat have been reclaimed since about the 1950s for industrial, port-related and road projects, and further reclamation remains a threat. As Cork Harbour is adjacent to a major urban centre and a major industrial centre, water quality is variable, with the estuary of the River Lee and parts of the Inner Harbour being somewhat eutrophic. However, the polluted conditions may not be having significant impacts on the bird populations. Oil pollution from shipping in Cork Harbour is a general threat. Recreational activities are high in some areas of the harbour, including jet skiing which causes disturbance to roosting birds.

Cork Harbour has is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000) and also for its population of Redshank. In addition, there are at least 15 wintering species that have populations of national importance, as well as a nationally important breeding colony of Common Tern. Several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover, Bar-tailed Godwit, Ruff and Common Tern. The site provides both feeding and roosting sites for the various bird species that use it.

4.7.2004



Full Report for Waterbody Cork Harbour



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Date Report Created 02/06/2009

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Summary Information:

WaterBody Category: Coastal Waterbody
WaterBody Name: Cork Harbour
WaterBody Code: IE_SW_060_0000
Overall Status: Moderate
Overall Objective: Restore
Overall Risk: 1a At Risk
Applicable Supplementary Measures: Urban & Industrial;
Report data based upon Draft RBMP, 22/12/2008.



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Status Report

WaterBody Category: Coastal Waterbody

WaterBody Name: Cork Harbour

WaterBody Code: IE_SW_060_0000

Overall Status Result: Moderate



	Status Element Description	Result
EX	Status from Monitored or Extrapolated Waterbody	True
General Conditions		
DIN	Dissolved Inorganic Nitrogen	Moderate
MRP	Molybdate Reactive Phosphorus	Good
DO	Dissolved Oxygen as percent saturation	Good
BOD	Biochemical Oxygen Demand	High
T	Temperature	Pass
Biological Elements		
PB	Phytoplankton - Phytoplankton	Good
PBC	Phytoplankton - PhytoBiomass (Chlorophyll)	Good
MA	Macroalgae	
RSL	Reduced Species List	Good
SG	Angiosperms - Seagrass and Saltmarsh	
BE	Benthic Invertebrates	
FI	Fish	
HydroMorphology		
HY	Hydrology	
MO	Morphology	Good (pHMWB)
Specific Pollutants		
SP	Specific Relevant Pollutants (Annex VII)	Pass
Conservation Status		
CN	Conservation Status (Expert Judgement)	Moderate
Protected Area Status		
PA	Overall Protected Area Status	Less than good

Date Reported to Europe: 22/12/2008

Date Report Created 02/06/2009

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Heavily Modified Waterbodies

HY	HydroMorphology for Heavily Modified Waterbodies	Moderate
IS	Interim Status (physico-chemical, biological) for Heavily Modified Waterbodies	Moderate
EP	Overall Ecological Potential for Heavily Modified Waterbodies	Moderate
Overall Status		
ES	Ecological Status	Moderate
CS	Chemical Status	Fail
O	Overall Ecological Status	Moderate

Date Reported to Europe: 22/12/2008

Date Report Created 02/06/2009

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Risk Report

WaterBody Category: Coastal Waterbody

WaterBody Name: Cork Harbour

WaterBody Code: IE_SW_060_0000

Overall Risk Result: **1a** At Risk



Risk Test Description	Risk
Point Risk Sources	
CP1 WWTPs (2008)	1a At Risk
CP2 CSOs	
CP3 IPPCs (2008)	2b Not At Risk
CP4 Section 4s (2008)	2b Not At Risk
CPO Overall Risk from Point Sources - Worst Case (2008)	
Morphological Risk Sources	
MOR Overall Morphological Risk - Worst Case	1a At Risk
Marine Direct Impacts	
MDI1 Dangerous Substances	1a At Risk
MDI2 OSPAR	x
MDI3 UWWT Regs Designations	x
MDI Marine Direct Impacts Overall - Worst Case	1a At Risk
O Overall Risk	
CP Worst case of Point and Marine Direct Impacts Overall (2008)	1a At Risk
RA Coastal Risk Overall - Worst case (2008)	1a At Risk

Date Reported to Europe: 22/12/2008

Date Report Created 02/06/2009

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Objectives Report

WaterBody Category: Coastal Waterbody

WaterBody Name: Cork Harbour

WaterBody Code: IE_SW_060_0000

Overall Objective: **Restore**



Objectives Description	Result
Objectives	
OB1 Objective 1 - Protected Areas	Restore
OB2 Objective 2 - Protect High and Good Status	Not Applicable
OB3 Objective 3 - Restore Less Than Good Status	Not Applicable
OB4 Objective 4 - Reduce Chemical Pollution	Restore
OBO Overall Objective	Restore
Deadline	
YR Default Year by which the objective must be met	2015
OBO Overall Objective and Deadline	Restore - 2015

Date Reported to Europe: 22/12/2008

Date Report Created 02/06/2009

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Basic Measures Report

WaterBody Category: Coastal Waterbody
WaterBody Name: Cork Harbour
WaterBody Code: IE_SW_060_0000



	Basic Measures Description	Applicable
	Key Directives	
BA	Bathing Waters Directive	No
BI	Birds Directive	Yes
HA	Habitats Directive	No
DW	Drinking Waters Directive	No
SEV	Major Accidents and Emergencies (Seveso) Directive	Yes
EIA	Environmental Impact Assessment Directive	Yes
SE	Sewage Sludge Directive	Yes
UW	Urban Waste Water Treatment Directive	No
PL	Plant Protection Products Directive	Yes
NI	Nitrates Directive	Yes
IP	Integrated Pollution Prevention Control Directive	Yes
	Other Stipulated Measures	
CR	Cost recovery for water use	Yes
SU	Promotion of efficient and sustainable water use	No
DWS	Protection of drinking water sources	No
AB	Control of abstraction and impoundments	No
PT	Control of point source discharges	Yes
DI	Control of diffuse source discharges	Yes
GWD	Authorisation of discharges to groundwater	No
PS	Control of priority substances	Yes
MOR	Control of physical modifications to surface waters	Yes
OA	Controls on other activities impacting on water status	Yes
AP	Prevention or reduction of the impact of accidental pollution incidents	Yes

Date Reported to Europe: 22/12/2008

Date Report Created 02/06/2009

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Urban and Industrial Discharges Supplementary Measures Report

WaterBody Category: Coastal Waterbody
WaterBody Name: Cork Harbour
WaterBody Code: IE_SW_060_0000



	Point discharges to waters from municipal and industrial sources	Result
PINDDIS	Is there one or more industrial discharge (Section 4 licence issued by the local authority or IPPC licence issued by the EPA) contained within the water body?	Yes
PINDDISR	Are there industrial discharges (Section 4 licence issued by the local authority or IPPC licence issued by the EPA) that cause the receiving water to be 'At Risk' within the water body?	No
PB1	Basic Measure 1 - Measures for improved management.	Yes
PB2	Basic Measure 2 - Optimise the performance of the waste water treatment plant by the implementation of a performance management system.	No
PB3	Basic Measure 3 - Revise existing Section 4 license conditions and reduce allowable pollution load.	No
PB4	Basic Measure 4 - Review existing IPPC license conditions and reduce allowable pollution load.	No
PB5	Basic Measure 5 - Investigate contributions to the collection system from unlicensed discharges.	Yes
PB6	Basic Measure 6 - Investigate contributions to the collection system of specific substances known to impact ecological status.	Yes
PB7	Basic Measure 7 - Upgrade WWTP to increase capacity.	Yes
PB8	Basic Measure 8 - Upgrade WWTP to provide nutrient removal treatment.	No
PS1	Supplementary Measure 1 - Measures intended to reduce loading to the treatment plant.	Yes
PS2	Supplementary Measure 2 - Impose development controls where there is, or is likely to be in the future, insufficient capacity at treatment plants.	Yes
PS3	Supplementary Measure 3 - Initiate investigations into characteristics of treated wastewater for parameters not presently required to be monitored under the urban wastewater treatment directive.	No
PS4	Supplementary Measure 4 - Initiate research to verify risk assessment results and determine the impact of the discharge.	No
PS5	Supplementary Measure 5 - Use decision making tools in point source discharge management.	No
PS6	Supplementary Measure 6 - Install secondary treatment at plants where this level of treatment is not required under the urban wastewater treatment directive.	No
PS7	Supplementary Measure 7 - Apply a higher standard of treatment (stricter emission controls) where necessary.	No

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PS8	Supplementary Measure 8 - Upgrade the plant to remove specific substances known to impact on water quality status.	No
PS9	Supplementary Measure 9 - Install ultra-violet or similar type treatment.	No
PS10	Supplementary Measure 10 - Relocate the point of discharge.	No

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Date Report Created 02/06/2009

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Map 38a: Rostellan North

1:25,000

Designated Shellfish Water

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Date: December 2008

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Map 38b: Rostellan South

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Date: December 2008

1:25,000

☐ Designated Shellfish Water



APPENDIX 2
Consultation
NPWS Notes of Meeting

Meeting Notes

Merion House
Merion Road
Dublin 4
+353.(0)1.269.5666 Fax +353.(0)1.269.5497

Meeting Location	NPWS Corl	Client	NRA
Meeting Date/Time	06.04.2011	Project	N8/N25 Dunkettle Interchange
Subject	Meeting to introduce N8/N25 Dunkettle Improvement Scheme to NPWS	Project No.	
Participants	Norita Casey (Jacobs Engineering) Cyril Saich (NPWS) Jervis Goode (NPWS)	Notes Prepared By	Norita Casey

Notes	Action
<p>NPWS suggested the following:</p> <ul style="list-style-type: none"> Undertake bird counts in SPA in winter during medium to low tide Contact Tom Gittings (Chairman of Cork Branch of Irish Wildlife Trust) for SPA bird counts – 086 3470366 Check AA for Dunkettle House development This project should aim for no net loss of foraging habitat Compensation habitat may be required depending on impacts to habitats Take a look at Cork Harbour Study 2010 (out for Public Consultation) Call Nicholas Mansergh (Senior Planner) from Cork County Council (021 4285951) or (086 601 5510) in relation to this study and the Dunkettle Project It may be worth finding a location for compensatory habitat within the options It may be necessary to recreate foraging habitat or rule out impacts in the AA It is possible to look as far as Mahon for compensatory habitat? It will be necessary to include the cumulative impacts – check the draft Carrigaline and Middleton LAP, look at other developments The Harpers island case is unrelated here Look out for short-eared owl in Sept and October frequenting the SPA If there needs to be a choice, minimise the impact on the SPA more than the Pfizer pNHA 	SC/JE

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Jacobs_MeetingNotes_A4.doc

Meeting Notes

Merion House
Merion Road
Dublin 4
+353.(0)1.269.5666 Fax +353.(0)1.269.5497

Meeting Location	NPWS, Cork	Client	NRA
Meeting Date/Time	15.07.11 @ 11.00	Project	N8/N25 Dunkettle Improvement Scheme
Subject	Meeting to discuss Ecological Scope of the N8/N25 Dunkettle Improvement Scheme EIS	Project No.	
Participants	Robert Fennelly (Scott Cawley) Aebhin Cawley (Scott Cawley) Norita Casey (Jacobs Engineering) Cyril Saich (NPWS) Jervis Goode (NPWS)	Notes Prepared By	Norita Casey

Notes	Action
<p>NPWS commented as follows on <u>Harper's Island</u></p> <ul style="list-style-type: none"> The Cork Harbour Study had compensatory habitat on Harper's Island There are ongoing talks between the County Manager and NPWS Director to discuss ownership of the land on Harper's Island Explore Harpers Island as compensatory measure for loss of intertidal habitat 	JE/SC
<p><u>Traffic Volumes</u> EIS should assess impact of increased traffic volumes that the scheme will lead to (e.g. increased fauna mortalities) or if no net increase in traffic volumes as a result of scheme alone (i.e. scheme only aims to manage existing traffic better) then state this in EIS (NPWS).</p>	JE/SC
<p><u>Bird Surveys</u> SC explained scope of full wintering bird survey programme undertaken within SPA and portions of wetlands, during high and low tide; bird counts were undertaken between December 2010 and March 2011. SC noted there will be no loss of wintering bird grassland feeding grounds in EclA. NPWS were content with the scope of the bird surveys.</p>	
<p><u>Otters</u></p> <ul style="list-style-type: none"> NPWS require DMRB Guidance Note 10 on Otters to be followed for Otter mitigation If otter derogation required then this must be submitted to NPWS before EIS is published Liase with Sharon Casey of Cork Co. Co regarding otter mortality database Include Otter underpasses on existing road in EclA mitigation and detailed notes on otter field signs in EclA to appease objectors. Confirm nature of works at Glanmire Roundabout close to confirmed 	<p>JE/SC</p> <p>JE</p> <p>SC</p> <p>SC</p>

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Meeting Notes

(Continued)

Page 2 of 2

breeding holt.	JE
<p><u>Bats</u></p> <p>NPWS queried if there will be increases in bat mortality due to the scheme? SC described scope of bat survey and will take light meter readings of existing road to inform bat mitigation and impacts</p> <p>NPWS were content with the scope of the bat surveys.</p>	SC
<p><u>Additional NPWS survey requests</u></p> <p>NPWS suggested invertebrate surveys (requiring three invertebrate specialists):</p> <ul style="list-style-type: none"> • Marine Benthic invertebrate surveys • Water Beetle surveys • Non-marine molluscan surveys <p>NPWS also suggested brackish Lepidoptera should be surveyed as part of the ecological surveys.</p>	JE/SC
<p>NPWS noted:</p> <ul style="list-style-type: none"> • Impacts and mitigation for amphibians should be addressed in EIS. • In-combination/cumulative effects may be significant and need to be addressed in the EIS; including assessment of loss of wetland habitat due to existing road in addition to this scheme (Harper's Island compensation may be relevant here) and import/export impacts (e.g. AA of source for aggregates?) • Examples of Little Egret sites next to roads were given; R666 Rosslare to Kilmurry road at Kimurry (3-5 pairs nesting in Norway Spruce within 10m of road); Fota Island (24 pairs recorded in 2005 adjacent to railway station) • Planting trees on road verge and in-between Pfizer woodland and road may help mitigation for Little Egret/Heron fledgling mortalities • NPWS did not feel that presence of little egret is a major consideration for the scheme but felt concerned about a walkway/cycleway near the high tide roost in the north west corner of the SPA were a bigger issue and suggested that any pedestrian/cycle route should be routed to the north of the railway line/scheme • Consider 'train' system for design of surface water drainage system, for treatment of road run-off i.e. interceptor, attenuation and reedbeds/wetlands. NPWS gave various references for publications on the issue. • Liason with Port of Cork is needed regarding potentially significant cumulative impacts (particularly via roads through or infilling of Jack Lynch tunnel tidal 'lagoon') • Liase with Sharon Casey of Cork Co Co regarding Dunkettle House EIS • Confirm aggregate source for road surfaces is from licensed quarry free from invasive material • NPWS stressed the sensitivity of the Jack Lynch tunnel tidal 'lagoon' on SPA features <p>Impacts on the nearby SAC could be screened out due to distance from the scheme</p> <p>NPWS are planning on submitting formal comments on Cork Harbour Study</p>	JE/SC



APPENDIX 3
Irish Wetland Bird Survey Data (2004-2009) and
Complete Wintering Bird Survey Data (2010-2011)

A. Irish Wetland Bird Surveys Data (2004-2009)



Dunkettle, Cork Harbour

Species	1% National	1% International	2004/05	2005/06*	2006/07	2007/08	Mean	Peak
Mute Swan	110					2	1	2
Shelduck	150	3,000			2	6	3	6
Wigeon	820	15,000	40		15	58	38	58
Gadwall	20	600			5		2	5
Teal	450	5,000				10	3	10
Mallard	380	20,000	2			14	5	14
Red-breasted Merganser	35	1,700	4		3	12	6	12
Common Loon	140	1,200	50	24	29	27	35	50
Little Egret		1,300	1		6	4	4	6
Grey Heron	30	2,700	29		22	18	23	29
Oystercatcher	680	10,200	125	163	80	88	100	163
Lapwing	2,100	20,000	210		85	50	115	210
Dunlin	880	13,300	357		10	385	251	385
Snipe		20,000	1		5		2	5
Black-tailed Godwit	140	470	38	65	130	182	120	182
Bar-tailed Godwit	160	1,200			6	82	28	82
Curlew	550	8,500	88	99	232	228	185	232
Greenshank	20	2,300	5		2	15	7	15
Redshank	310	3,800	83		82	57	67	82
Turnstone	120	1,500	1		6	4	4	6
Black-headed Gull		20,000	271		200		157	271
Common Gull		18,000	1				0	1
Lesser Black-backed Gull		4,500	223		620	12	285	620
Herring Gull		13,000	4				1	4
Great Black-backed Gull		4,900	150		2		51	150
Kingfisher			1				0	1

* 2005/06 data not included in the calculation of the mean as based on one count only, in September 2006.

The counts presented in the table refer to the peak counts of species in each I-WeBS season. Site peak and mean are calculated as the peak and mean of peak counts respectively over the seasons specified. Blank cells within columns which contain positive values for one or more species constitute zero for those species.



Cork Harbour 2004/05-2008/09

Species	1% National	1% International	2004/05	2005/06	2006/07	2007/08	2008/09	Mean	Peak
Mute Swan	110		71	54	73	68	30	61	73
Whooper Swan	130	210	7			3	1	2	7
Black Swan					2			0	2
Oystercatcher	50	870	1	3	1	6		2	6
Canada Goose			23	11	13	22	5	16	23
Light-bellied Brent Goose		280	18	28	11	17	6	16	28
Feral/hybrid Goose			2			6		1	6
Shelduck	160	3,000	1,301	1,360	918	823	849	1,066	1,301
Wigeon	820	15,000	2,043	2,332	1,492	1,259	665	1,558	2,332
Gadwall	20	600	13	13	7		6	8	13
Teal	450	5,000	1,169	1,302	667	644	680	834	1,302
Mallard	300	20,000	626	408	423	484	305	449	626
Pintail	20	600	20	14	2		22	12	22
Shoveler	26	400	24	45	62	51	19	40	62
Pochard	380	3,500	7	7	2	3	2	4	7
Tufted Duck	370	12,000	14	14	19	16	22	17	22
Scaup	45	3,100	2				1	1	2
Eider	30	12,830		15	1			3	15
Common Scoter	230	16,000	3	7		1	1	2	7
Velvet Scoter						3		1	3
Goldeneye	66	11,500	7	10	5	14	17	11	17
Red-breasted Merganser	36	1,700	85	80	68	72	51	71	85
Red-throated Diver	20	3,000		1	1			0	1
Black-throated Diver		3,750					1	0	1
Great Northern Diver					4	3	2	2	4
Little Grebe	25	4,000	80	68	58	65	43	63	80
Great Crested Grebe	55	3,600	105	137	83	108	78	86	137
Slavonian Grebe		55	1	2				1	2
Common Coot	140	1,200	370	308	163	285	144	254	370
Shag			2		2	8	3	3	8
Little Egret		1,300	100	120	143	151	69	131	100
Cattle Egret							3	1	3
Grey Heron	30	2,700	135	76	64	72	75	66	135
Spoonbill						1		0	1
Water Rail			2	2	2	2	1	2	2
Moorhen	20		24	33	55	25	25	32	55
Coot	330	17,500	23	16	19	7	2	13	23
Oystercatcher	680	10,200	1,857	2,076	1,061	1,590	896	1,496	2,076
Ringed Plover	150	730	25	67	17	27	38	35	67
Golden Plover	1,700	9,300	6,200	3,002	3,266	5,232		3,540	6,200
Grey Plover	66	2,600	4	24	12	30	8	17	30
Lapwing	2,100	20,000	4,133	4,066	3,321	3,321	1,166	3,205	4,133
Knot	190	4,500	85	117	124	111	32	94	124
Sanderling	66	1,200		33				7	33
Cutsw Sandpiper			3	4	1			2	4
Dunlin	680	13,300	4,325	3,674	4,456	3,579	5,091	4,265	5,091
Ruff		12,500		1		3		1	3
Snipe		20,000	14	40	32	75	7	36	75
Black-tailed Godwit	140	470	2,637	3,337	1,433	2,623	2,060	2,618	3,337
Bar-tailed Godwit	160	1,200	268	218	363	267	19	235	363
Whimbrel		2,000	1	4	1	1	1	2	4
Cutsw	550	8,500	2,317	1,809	1,363	1,607	694	1,558	2,317
Common Sandpiper			2	2	1	4	3	2	4
Green Sandpiper			1	1				0	1
Spotted Redshank		900	2	1	1	1		1	2
Greenshank	20	2,300	83	68	72	71	44	68	83

The counts presented in the table refer to the peak counts of species in each I-WeBS season. Site peak and mean are calculated as the peak and mean of peak counts respectively over the seasons specified. Blank cells within columns which contain positive values for one or more species constitute zero for those species.



Redshank	310	3,900	2,295	1,543	1,450	1,725	1,027	1,610	2,295
Turnstone	120	1,500	101	130	129	214	67	141	214
Mediterranean Oul			13	15	24	48	65	33	65
Bonaparte's Gull					1			0	1
Black-headed Gull		20,000	2,170	2,627	2,010	2,103	613	1,685	2,627
Ring-billed Gull			1					0	1
Common Gull		16,000	290	188	214	207	71	194	290
Lesser Black-backed Gull		4,500	490	31	630	72	57	257	630
Herring Gull		13,000	30	40	123	51	41	56	123
Iceland Gull							1	0	1
Glaucous Gull						1		0	1
Great Black-backed Gull		4,800	385	157	137	99	43	184	385
Sandwich Tern			2	225	2	17	1	40	225
Common Tern				1	1	1		1	1
Arctic Tern						1		0	1
Kingfisher			3	3	1	2	1	2	3

Cork Harbour coverage 2004/05-2008/09

Subsite	Site Grid	2004/05	2005/06	2006/07	2007/08	2008/09
Rostellan Lake	W8765	7	7	6	6	6
Rathcoursey & Ahanes	W8770	6	5	7	7	6
Lough Beg	W790630	5	5		1	
Owenboy Estuary	W750620	6	3		6	1
Ringaskiddy - Luc Strand	W750640	4	1		1	
Weir Island	W8171	7	7	7	7	
Harpers Island	W7872					3
Ballintubrid	W840702	7	7	7	7	
Ballynacora	W875715	6	5	6	7	6
Cuskenny	W817674	6	4	5	5	6
Dunkettle	W727723	5	1	4	6	
Brick Island	W8270	7	7	7	7	
Douglas Estuary	W720698	6	6	5	7	
Glounthans Estuary/ Slarty Water	W790727	6	5	6	5	3
Aghada	W8566	7	7	6	6	6
Whitegate Bay	W8363	7	7	6	6	6
North Channel - Ballintubrid	W810702	6	4	5	5	5
Bally - Marino Point	W790708	6	4	5	1	6
Monkstown Creek	W780760	5	5		1	
Saleen	W8767	7	7	6	6	6
East Lough Mahon	W7670				6	
Carrigrenan Pools	W7771				4	
Belvelly Tower	W794707				6	
Belvelly Bridge - Railway	W793705				6	
Carrigrenan - Great Island & Railway	W775705				6	

The counts presented in the table refer to the peak counts of species in each I-WeBS season. Site peak and mean are calculated as the peak and mean of peak counts respectively over the seasons specified. Blank cells within columns which contain positive values for one or more species constitute zero for those species.

B. Complete Breeding Bird Survey Data (2011)

Common Name	Scientific name	Breeding Evidence at Dunkettle (BTO)	No. of Pairs at Dunkettle	Red-list Status	EU Status	Nest Locations at Dunkettle
Blackbird	<i>Sylvia atricapilla</i>	Confirmed	Many	-	-	Scrub/woodland throughout
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	Non-breeder	0	Red	-	Non-breeding juvenile feeding in Pfizer mudflat
Blackcap	<i>Turdus merula</i>	Probable	3	-	-	Dunkettle Estate and Pfizer woodland
Blue Tit	<i>Parus caerulea</i>	Probable	Several	-	-	Woodland/ stone walls throughout
Chaffinch	<i>Fringilla coelebs</i>	Probable	Several	-	-	Scrub/woodland throughout
Chiffchaff	<i>Phylloscopus collybita</i>	Probable	Many	-	-	Scrub/woodland throughout
Coal Tit	<i>Parus ater</i>	Probable	Several	-	-	Scrub/woodland throughout
Curlew	<i>Numenius arquata</i>	Non-breeder	0	Red	-	Non-breeder - Flock of 14 feeding at Jack Lynch Tunnel intertidal polder. Single at Pfizer intertidal mudflats.
Duncock	<i>Prunella modularis</i>	Confirmed	Many	-	-	Scrub/woodland throughout
Goldcrest	<i>Regulus regulus</i>	Confirmed	Many	-	-	Woodland throughout
Goldfinch	<i>Carduelis carduelis</i>	Confirmed	Many	-	-	Scrub/woodland throughout
Great Tit	<i>Parus major</i>	Probable	Several	-	-	Woodland throughout
Greenfinch	<i>Carduelis chloris</i>	Confirmed	Several	-	-	Scrub/woodland throughout
Grey Heron	<i>Ardea cinerea</i>	Confirmed	7	Amber	-	Breeding Colony at Pfizer. Forages throughout on intertidal mudflats
Hooded Crow	<i>Corvus corone</i>	Confirmed	2	-	-	Tree east of Pfizer grasslands, and Iarnród Éireann Hedge.
Jackdaw	<i>Corvus monedula</i>	Confirmed	Several	-	-	Light masts above existing interchange
Little Egret	<i>Egretta garzetta</i>	Confirmed	X	-	EU	Breeding Colony at Pfizer. Forages throughout on intertidal mudflats
Long-tailed Tit	<i>Aegithalos caudatus</i>	Confirmed	Several	-	-	Scrub/woodland throughout
Magpie	<i>Pica pica</i>	Confirmed	Many	-	-	Hedges/woodland throughout
Mallard	<i>Anas platyrhynchos</i>	Confirmed	1	-	-	Iarnród Éireann Intertidal mudflat
Moorhen	<i>Gallinula chloropus</i>	Possible	1	-	-	Iarnród Éireann Intertidal mudflat
Meadow Pipit	<i>Anthus pratensis</i>	Probable	1	-	-	Iarnród Éireann storage yard

Mistle Thrush	<i>Turdus viscivorus</i>	Probable	2			
Pheasant	<i>Phasianus colchicus</i>	Confirmed	3	-	-	Dunkettle Estate, Pfizer woodland, and Iarnród Éireann scrub
Pied Wagtail	<i>Motacilla alba</i>	Probable	3	-	-	Iarnród Éireann storage yard and BASF hardstanding
Reed Bunting	<i>Emberiza schoeniclus</i>	Probable	2	-	-	Pfizer grasslands
Ringed Plover	<i>Charadrius hiaticula</i>	Probable	0-1	Amber	-	Single bird holding territory in gravel at Pfizer southwest of wood. No second bird seen
Robin	<i>Erithacus rubecula</i>	Confirmed	Many	-	-	Scrub/woodland throughout
Rook	<i>Corvus frugilegus</i>	Confirmed	Many	-	-	Rookerie in Dunkettle Estate Parkland (Scot's Pine)
Shelduck	<i>Tadorna tadorna</i>	Possible	0-2	Amber	-	1-2 pairs feeding in Pfizer, Iarnród Éireann, and North Esk intertidal mudflats. No juveniles observed.
Sniipe	<i>Gallinago gallinago</i>	Non-breeder	0	Amber	-	Wintering birds roosting in early spring in Iarnród Éireann and Pfizer (Peak 6)
Song Thrush	<i>Corvus monedula</i>	Confirmed	X	-	-	-
Starling	<i>Sturnus vulgaris</i>	Confirmed	1	Amber	-	Shed at Dunkettle Estate outside Zol
Stock Dove	<i>Columba oenas</i>	Probable	0-1	Amber		Single pair in Dunkettle Estate treeline outside Zol
Stonechat	<i>Saxicola torquata</i>	Probable	0-1	-	-	Pfizer grasslands
Swallow	<i>Hirundo rustica</i>	Confirmed	01-Feb	Amber	-	Aerial feeding throughout. Nest XX in Dunkettle XX
Whitethroat	<i>Sylvia communis</i>	Possible	2	-	-	Pfizer grasslands and Jack Lynch Tunnel grassland
Willow Warbler	<i>Phylloscopus trochilus</i>	Probable	Many	-	-	Woodland throughout
Wood Pigeon	<i>Columba palumbus</i>	Confirmed	Many	-	-	Woodland throughout
Wren	<i>Troglodytes troglodytes</i>	Probable	Many	-	-	Scrub/woodland throughout

Table 1 Breeding Bird Data within Zol (2011)



APPENDIX 4
Accidental Spillage Risk Assessment

Dunkettle Interchange Proposed Development HA Assessment of Pollution Impacts from Spillage													
Network	Outfall	Chainage		Link Description	Receiving Watercourse	RL length (km)	SS	Response time < 1 hour	Design Year 2031				
		from	to						AADT	% HGVs	Probability of accident (P _{spl}) - Note 1	Probability / year (P _{inc/year}) Note 2	1 in years
Link A	2	50	650	N40 N/B (JLT) to N25 E/B	Lough Mahon	0.60	0.36	0.45	19998	5	0.00008	0.00004	26594
Link A	3	650	1123	N40 N/B (JLT) to N25 E/B	Lough Mahon	0.47	0.36	0.45	19998	5	0.00007	0.00003	33734
Link B	2	40	299	N40 N/B (JLT) to N8 W/B merge slip road	Lough Mahon	0.26	0.36	0.45	6957	7	0.00002	0.00001	144397
Link C	1	1425	1482	N25 W/B to M8 N/B	Lough Mahon	0.06	0.36	0.45	2658	8	0.00000	0.00000	1395315
Link C	2	950	1425	N25 W/B to M8 N/B	Lough Mahon	0.48	0.36	0.45	2658	8	0.00001	0.00001	167438
Link C	3	0	950	N25 W/B to M8 N/B	Lough Mahon	0.95	0.36	0.45	2658	8	0.00003	0.00001	83719
Link D	1	0	295	M8 S/B to N40 S/B (JLT)	North Esk	0.30	0.36	0.45	12365	10	0.00005	0.00002	44580
Link D	1	0	295	N40 N/B (JLT) to M8 N/B	North Esk	0.30	0.36	0.45	12365	10	0.00005	0.00002	44580
Link E	1	195	470	M8 S/B to Link A	Lough Mahon	0.28	0.36	0.45	3017	5	0.00001	0.00000	377477
Link E	2	195	470	M8 S/B to Link A	Lough Mahon	0.28	0.36	0.45	3017	5	0.00001	0.00000	377477
Link F	2	0	710	N8 E/B to N40 S/B (JLT)	Lough Mahon	0.71	0.36	0.45	5513	5	0.00003	0.00001	86412
Link G	3	0	338	Link A to North Dumbbell Roundabout	Lough Mahon	0.34	0.36	0.45	5885	4	0.00001	0.00000	242919
Link H	3	130	239	R623 to North Dumbbell Roundabout	Lough Mahon	0.11	0.36	0.45	11717	5	0.00001	0.00000	249847
Link I	3	0	558	North Dumbbell Roundabout to N25 E/B merge slip road	Lough Mahon	0.56	0.36	0.45	858	2	0.00000	0.00000	1471836
Link J	3	0	576	N25 W/B Diverge Slip Road to South Dumbbell Roundabout	Lough Mahon	0.58	0.36	0.45	861	5	0.00000	0.00000	695938
Link K	2	665	825	N25 W/B Diverge Slip Road to N40 S/B (JLT)	Lough Mahon	0.16	0.36	0.45	17023	5	0.00002	0.00001	124184
Link K	3	0	665	N25 W/B Diverge Slip Road to N40 S/B (JLT)	Lough Mahon	0.67	0.36	0.45	17023	5	0.00007	0.00003	29879
Link L	3	0	532	South Dumbbell Roundabout to Link K (N40 S/B JLT)	Lough Mahon	0.53	0.36	0.45	5134	3	0.00001	0.00001	199739
Link M	3	0	630	South Dumbbell Roundabout to N8 W/B Merge	Lough Mahon	0.63	0.36	0.45	4053	10	0.00003	0.00002	64934
Link Q	4	0	503	R623	Pfizer	0.50	0.36	0.45	11519	6	0.00004	0.00002	49472
Link R	3	65	129	Dumb-bell Link Road	Pfizer	0.06	0.36	0.45	12283	4	0.00000	0.00000	537833
Link R	4	0	65	Dumb-bell Link Road	Lough Mahon	0.07	0.36	0.45	12283	4	0.00000	0.00000	529559
Link T	1	0	875	N8 E/B to Roundabout with Dunkettle Road	North Esk	0.88	0.36	0.45	2861	7	0.00002	0.00001	92543
Link U	1	0	584	Link T (N8 E/B) to M8 N/B	North Esk	0.58	0.36	0.45	3842	7	0.00002	0.00001	104686
Total Mainline					Lough Mahon	10.32	0.36	0.45			0.00060	0.00027	3690

Spillage Rate (SS)	0.36 Urban Trunk Road
P _{pol}	0.45 Urban (Response time to site < 20 mins)
Note 1	$P_{SPL} = RL \times SS \times (AADT \times 365 \times 10^{-9}) \times (\%HGV/100)$
Note 2	$P_{INC} = P_{SPL} \times P_{POL}$

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