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Natura Impact Statement

Proposed Maintenance Dredging
Aughinish, Co. Limerick

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1 SUMMARY OF FINDINGS

1.1 NATURA IMPACT STATEMENT

Project Title	Proposed Maintenance Dredging, Aughinish, Co. Limerick
Project Proponent	Aughinish Alumina Ltd
Project Location	Shannon Estuary, Aughinish, Co. Limerick
Natura Impact Statement	In cases where an Appropriate Assessment is required a Natura Impact Statement (NIS) is prepared. This is a report based on a scientific examination of evidence and data, carried out by competent persons with the aim of identifying and classifying any implications of a proposal, either individually, or in combination with other plans or projects, on Natura 2000 sites in view of the conservation objectives of the sites
Conclusion	In conclusion, provided the recommended mitigation measures are implemented in full, it is not expected that the proposal to carry out maintenance dredging at Aughinish, Co. Limerick will result in an adverse residual impact on the Natura 2000 sites considered in this NIS, namely: • Lower River Shannon SAC (002165) • River Shannon and River Fergus Estuaries SPA (004077)

2 INTRODUCTION

The Natura 2000 network, which stems from the Habitats Directive, comprises the collective of Special Areas of Conservation (SACs), designated under the EU Habitats Directive[1], and Special Protection Areas (SPAs) designated under the EU Birds Directive[2]. Natura 2000 sites are selected to ensure the long-term survival of Europe's most valuable and threatened species and habitats.

2.1 REQUIREMENT FOR APPROPRIATE ASSESSMENT

Article 6(3) of Directive 92/43/EEC stipulates that certain projects and plans must be subjected to an "appropriate assessment" of their effects on the integrity of Natura 2000 site(s). Article 6(3) provides in full:

> *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."*

The assessment carried out under Article 6(3) must be completed before a decision is made. This means consent can only be given after the competent authority, either the relevant Local Authority or An Bord Pleanála, has determined that the proposal for which consent is sought will not adversely affect the integrity of a Natura 2000 site, in view of the site's conservation objectives. Case law of the Court of Justice of the European Union has established that the assessment carried out under Article 6(3) cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of a project on a European site[3].

Appropriate Assessment is the consideration and assessment of the potential impacts of proposed projects or plans, either alone or in combination with other projects or plans, on the integrity of Natura 2000 site(s), with respect to the structure and function and the conservation objectives of Natura 2000 sites.

2.2 STAGES OF APPROPRIATE ASSESSMENT

The Appropriate Assessment process is a four-stage process with issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. The stages are set out in Appendix 1. The screening for Appropriate Assessment, or stage 1, associated with this proposal (See Appendix 2) determined that this proposal should proceed as far as Stage 2.

[1] Council Directive 92/43/EEC

[2] Council Directive 79/409/EEC

[3] Sweetman v. An Bord Pleanála, Case C-258/11, CJEU judgment 11 April 2013

In cases where an Appropriate Assessment is required a Natura Impact Statement shall be prepared which shall include a scientific examination and assessment of evidence and data, carried out by competent persons, that identifies and classifies any implications for Natura 2000 sites in view of the conservation objectives of the site(s) and in light of potential impacts that could ensue from the proposal under consideration. Mitigation measures designed to ameliorate any impacts identified are described in detail in the NIS and these can be considered, subsequently, by the competent authority during the Appropriate Assessment determination.

2.3 PURPOSE OF ASSESSMENT

This Natura Impact Statement (NIS) has been undertaken to determine the potential for adverse impacts of a proposal to undertake maintenance dredging of the seabed in the Shannon Estuary, at Aughinish, Co. Limerick, on two Natura 2000 sites, identified during the screening for Appropriate Assessment carried out in relation to the proposal considered in this NIS (See Appendix 2).

This NIS has been undertaken by staff ecologists from Malachy Walsh and Partners, Engineering and Environmental Consultants.

2.4 ASSESSMENT METHODOLOGY

2.5 APPROPRIATE ASSESSMENT GUIDANCE

This Natura Impact Statement has been undertaken in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2001) and the European Commission Guidance 'Managing Natura 2000 sites' (EC, 2000) and guidance prepared by the NPWS (DoEHLG, 2009). Further information is available at:

http://ec.europa.eu/environment/nature/legislation/habitatsdirective/

http://www.npws.ie/planning/appropriateassessment/

The current assessment was conducted within this legislative framework and also the Department of the Environment, Heritage and Local Government (2009) guidelines.

As outlined in these, it is the responsibility of the proponent of the project, in this case Aughinish Alumina Ltd, to provide a comprehensive and objective Natura Impact Statement which can then be used by the competent authority, in this case the Environmental Protection Agency and the Department of the Environment, Community and Local Government or, on appeal, An Bord Pleanála, in order to conduct the Appropriate Assessment (DoEHLG, 2009).

The aim of the assessment is to provide a sufficient level of information to the competent authority on which to base their appropriate assessment of the plan or project. The proposed dredging campaign will be fully described in section 2.88 below, the Natura 2000 sites will be identified in section 010 below and the potential impacts that could ensue will be identified in section 2.111 below.

2.6 DESK STUDY

In order to complete the Natura Impact Statement certain information on the existing environment is required. A desk study was carried out to collate available information on the subject site's natural environment. This comprised a review of the following publications, data and datasets:

- OSI Aerial photography and 1:50000 mapping
- National Parks and Wildlife Service (NPWS)
- National Biodiversity Data Centre (NBDC) (on-line map-viewer)
- BirdWatch Ireland
- Teagasc soil area maps (NBDC website)
- Geological Survey Ireland (GSI) area maps
- Environmental Protection Agency (EPA) water quality data
- Shannon International River Basin District (ShIRBD) datasets (Water Framework Directive)
- Other information sources and reports footnoted in the course of the report

2.7 FIELD SURVEYS

A number of surveys were carried out on-site to determine existing site conditions and help inform the assessment of potential impacts to the receiving environment. These included:

- Bathymetric analysis
- Current and tidal monitoring
- Baseline characterisation including benthic faunal sampling, sediment analysis and characterisation
- Sediment transport modelling (STM)
- Marine mammal risk assessment (MMRA)

Further details on the field surveys carried out, including methodologies and findings, are included in the Screening for Appropriate Assessment, which precedes this Natura Impact Statement, and which can be found in Appendix 2.

2.8 DESCRIPTION OF PLAN/PROJECT

2.8.1 Brief Project Description

It is proposed to undertake maintenance dredging by means of a bed leveller/plough dredger on the sea bed adjacent to the existing deep water jetty at Aughinish Alumina, Co Limerick. Aughinish Alumina is an existing industrial facility operated by RUSAL, and is involved in the import and processing of raw bauxite into alumina for export. The dredge campaign will involve the removal of a maximum of 8,000m^3 of material or 16,000 tonnes of material each year. The application for a Dumping at Sea (DaS) licence is being sought for a period of 8 years. The dredging will be undertaken in a number of events over a calendar year as the need arises. The purpose of the maintenance dredging is to make localised adjustments to the bed level where material has accumulated in mounds or high points on the sea bed. The main focus of maintenance dredging each year will be in the three areas shown on the drawings enclosed with the DAS permit application. There are three main areas, Area A on the outer or Northern Berth, Area B adjacent to the shoreline/facility and Area C which is the inner berth. Bed levelling may also take place in areas adjacent to the jetty and within the manoeuvring area for ships approaching and leaving the jetty.

The proposed dredging will take place within an area of estuary which is contained within the original granted Foreshore Licence/Lease. This NIS has been completed to accompany an application a Dumping at Sea permit and a Foreshore Licence application.

The application for the DaS permit is being lodged with the Environmental Protection Agency (EPA) and the Foreshore Licence Application is being lodged with the Department of Environment Community and Local Government.

This Natura Impact Statement, and preceding Screening for Appropriate Assessment, will accompany both applications to allow for a full assessment of the implications of the proposal on Natura 2000 sites. The DaS licence will be subject to conditions imposed by the EPA who will be responsible for management and enforcement of such conditions.

2.8.2 Purpose of the Project

The purpose of maintenance dredging is as follows:

- to maintain design and navigational depths for shipping
- to allow for the full use of the length of the jetty structure and manoeuvring area
- to allow for the berthing of larger ships in conjunction with a new unloader being provided on the jetty structure

2.8.3 Subject Site Location

The proposed dredging sites are located within the Shannon Estuary at Aughinsh, Co. Limerick, within the immediate vicinity of the existing deep-water jetty. Aughinish is situated approximately 3.5km north-east of Foynes, 12.5km south-west of Shannon and 27km due west of Limerick city.

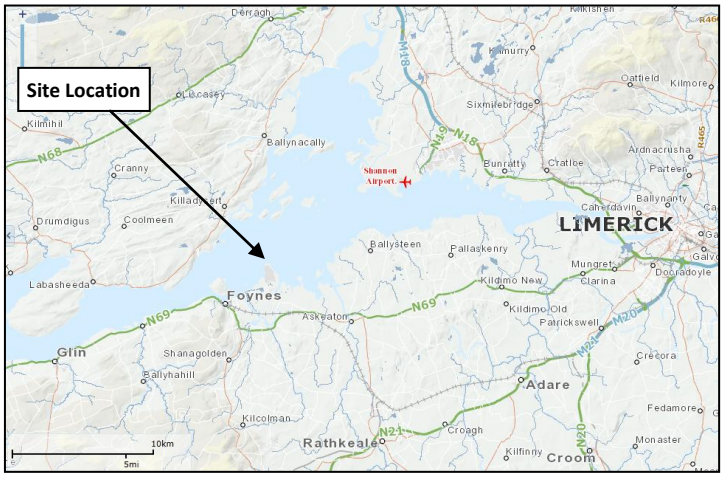

Figure 1. Location of jetty and proposed dredging works (Adapted from the NBDC online map-viewer)[4]

[4] http://maps.biodiversityireland.ie/#/Map [Accessed 29/01/2016]

2.8.4 Description of the Site

2.8.4.1 General site description

Aughinish is located in Co. Limerick within the Shannon Estuary. The Shannon Estuary is the largest estuary in Ireland and one of the most important deep-water channels in the country[5]. Plough dredging is routinely used in the Shannon Estuary as part of maintenance operations. Aughinish Alumina, an industrial facility which imports bauxite for processing into alumina, is situated directly on the southern banks of the Shannon Estuary, on what is known as 'Aughinish Island'. Aughinish is one of RUSALs largest alumina refineries operating within the estuary which is under the control of Shannon Foynes Port Company (SFPC).

The facility has a deep-water jetty which provides cargo vessel access for both the import and export of materials. The jetty is accessed from land via a causeway which extends northwards for c.940m, from the plant into the main estuary channel. The land-based area immediately adjacent to the jetty and within the footprint of the Aughinish Alumina facility is classified as an 'Industrial and commercial' with 'Inter-tidal flats' extending along the shoreline to the east and west of the facility. Pre-dominant land-use in the greater area is given over to agriculture, classified as 'Pastures'[6].

The majority of the estuarine area surrounding the jetty at Aughinish is sub-tidal in nature, providing access to marine vessels off-loading cargo. As is typical of transitional water-bodies significant volumes of organic and inorganic sediments are carried off-land into the estuary where build-up over time results in insufficient water depths to allow large cargo vessels access to berthing facilities. In addition natural sediments occur in the estuary and these deposit on the sea bed overtime. These accumulations or deposition of sediments can lead to raised areas or mounds occurring on the seabed. In order to maintain design depths and provide safe navigation at all times, maintenance dredging is required to make adjustments to the bed levels.

2.8.4.2 Bathymetry

Aughinish Alumina and Shannon Foynes Port Company regularly undertake bathymetry surveys adjacent to the jetty and within the approach channel to the jetty. There are historical records of bathymetry dating back in time. The original capital dredge completed at the time of the construction of the alumina facility established the required bed levels to facilitate operation of the jetty.

Drawing numbers 17076 – 1004A, 1005A and 1006A show the existing bed levels adjacent to the jetty and shore line where maintenance dredging will take place. The original as built drawings compiled in 1983 outlined the original design depths. The outer berth has a design depth of -14.3, the inner berth -12.2 CD

2.8.4.3 Tidal current metering

Tidal current metering was completed by Hydrographic Surveys Ltd in January and February 2016 and included both neaps and spring tides. This tidal current metering was supplemented by existing tidal current metering data from the Jetty supplied by SFPC along with a historical tidal current velocity survey completed by Ercon in 1980. The tidal current metering assisted in the assessment of

[5] https://shannonestuarysifp.files.wordpress.com/2015/08/executive_summary_22112013.pdf [Accessed 26/01/2016]

[6] http://gis.epa.ie/Envision/ [Accessed 01/02/2016]

sediment transport and in categorising the nature of currents in the vicinity and their interaction with the currents of the Shannon estuary channel.

2.8.4.4 Sediment transport modelling

Hydro Environmental Ltd. prepared a sediment transport model for the proposed dredge areas adjacent to the jetty. The model was based on an existing Telemac – 2D hydrodynamic module software. The existing hydrodynamic model for the estuary covers an area from Loop Head to Corbally weir and covers an area of 561km^2 of estuary.

Hydro Environmental Ltd. completed a number of simulations based on a four day continuous dredging event for both the spring and neap tides. The simulations show the plume over a number of tidal excursions is transported up in to the lower Fergus Estuary where extensive mud flats already exist. The typical suspended sediment concentration in the dredge plume varies from 20 to 100 mg/l with an average concentration of approximately 40 to 60mg/l. Higher concentrations of 100 to 200mg/l are also present within in the plume path from the disposal site.

The Aquafact turbidity survey (December 2015) show that the ambient concentration of suspended sediment as turbidity is high in the vicinity of the jetty berths with NTU values of 40 to 280. Often a factor of 3 is used to convert NTU's to suspended solid concentrations in mg/l, which suggests potential ambient suspended solid concentrations of 100 to 800mg/l. These levels reflect the normal naturally high turbidity that exists in this estuary particularly in the middle and upper estuary reaches where mud flats are present and large river inflows and high turbulent tidal velocities.

2.8.4.5 Benthic ecology

A benthic assessment of sub-tidal fauna carried out at the proposed dredge locations and surrounding area found that benthic samples across all sampling stations were generally species-poor. All species observed were considered typical of silt/clay habitat that contains high levels of organic enrichment. Some of the main dominants of the assemblage included the following major groups: Anthozoa (1), Nematoda (1), Nemertea (1), Annelida: Polychaeta (19), Annelida: Oligochaeta (3), Crustacea (2), and Mollusca (3). Taxa which were recorded were found to occur at low abundance (Aquafact, 2015). Further details on the benthic ecology of the area can be found in Appendix 2.

2.8.4.6 Marine Sediment

Following sediment analysis, the overall sediment classification was determined to be silt and fine/very fine sand with sands and silt-clays accounting for the majority of sample compositions. The sediment type within the vicinity of the pier was uniform with all but Station 8 recording silt. The sediment type at station 8 which was located to the east of the pier near the shore was fine sand. All sediments were classified as fine sand or silt. Gravel and coarse sand fractions were extremely low throughout.

Two metals, arsenic and nickel exceeded the lower Irish action limits at station 3 and Zinc exceeded the upper Irish action limit at station 1. HCB may exceed lower action limits at all stations however, this cannot be determined as the Limits of detection are above the lower action limit. PAH (∑16) exceeded the upper Irish action limit at station 2 (Aquafact, 2015).

Parameter	Units (dry wt) Note 2	Sampling points		
		ST 1	ST 2	ST 3
Arsenic	mg kg^{-1}	7.40	8.60	10.40
Cadmium	mg kg^{-1}	0.5	0.4	0.5
Chromium	mg kg^{-1}	31.80	46.70	57.30
Copper	mg kg^{-1}	6.10	10.70	10.60
Lead	mg kg^{-1}	36.60	25.90	30.90
Mercury	mg kg^{-1}	<0.08	<0.08	<0.08
Nickel	mg kg^{-1}	12.60	18.80	24.00
Zinc	mg kg^{-1}	472.00	105.00	80.40
Σ TBT & DBT Note 3	mg kg^{-1}	<0.007	<0.007	<0.009
γ-HCH (Lindane) Note 4	µg kg^{-1}	<2.0	<2.0	<2.0
HCB Note 5	µg kg^{-1}	<1.0	<1.0	<1.0
PCB (individual congeners of ICES 7) Note 6 PCB 028	µg kg^{-1}	<1.0	<1.0	<1.0
PCB 052	µg kg^{-1}	<1.0	<1.0	<1.0
PCB 101	µg kg^{-1}	<1.0	<1.0	<1.0
PCB 138	µg kg^{-1}	<1.0	<1.0	<1.0
PCB 153	µg kg^{-1}	<1.0	<1.0	<1.0
PCB 180	µg kg^{-1}	<1.0	<1.0	<1.0
PCB 118	µg kg^{-1}	<1.0	<1.0	<1.0
PCB (Σ ICES 7) Note 6	µg kg^{-1}	<7.0	<7.0	<7.0
PAH (Σ 16) Note 7	µg kg^{-1}	181.79	21161.09	219.58
Total Extractable Hydrocarbons	g kg^{-1}	0.0274	0.0754	0.0481

	Exceed Lower Irish Action Limit
	Exceeds Upper Irish Action Limit

Note 1: Applicants should highlight in Table B.1 any results which exceed either the upper or lower Irish action levels. Action levels are published in: *Cronin et al. 2006. Guidelines for the Assessment of Dredge Material for Disposal in Irish Waters. Marine Environment & Health Series, No. 24. Marine Institute.*

Note 2: Total sediment <2 mm

Note 3: Sum of tributyl tin and dibutyl tin

Note 4: 1α,2α,3β,4α,5α,6β-hexachlorocyclohexane

Note 5: Hexachlorobenzene

Note 6: ICES 7 polychlorinated biphenyls: PCB 28, 52, 101, 118, 138, 153, 180.

Note 7: Polyaromatic hydrocarbons (measured as individual compounds): Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(ah)anthracene, Benzo(ghi)perylene, Indeno(123-cd)pyrene.

2.8.4.7 Marine Mammal Risk Assessment (MMRA)

A Marine Mammal Risk Assessment was carried out by the Irish Whale and Dolphin Group (IWDG). This comprised a review of a number of marine mammal databases including the NBDC on-line database of species, published literature relating to bottle-nose dolphins in the Shannon Estuary and Static acoustic Monitoring Data obtained from within the estuary.

In summary, the review of data found that the main areas used within the estuary by this cetacean are the outer and mid estuary and these areas are considered core areas for the species (NPWS, 2012). Records of bottle-nose dolphins in the inner estuary are infrequent. A review of Static Acoustic Monitoring (SAM) data, which was carried out at Aughinish from 2011-2014 found bottle-nose dolphins to be present for 29% of days monitored. Similar monitoring, carried out at Foynes from 2009-2010 found dolphins to be present on 41% of days monitored.

No records of otters were found to exist on the NBDC database in the vicinity of the proposed works. Two records were found at adjacent areas but these are from well outside the area of the proposed works. Other marine mammals assessed as part of the MMRA but falling outside the remit of this document included harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*). Further details on the MMRA findings can be found in Appendix 2.

2.8.5 Characteristics of the Project

Maintenance dredging will be undertaken adjacent to the existing jetty at Aughinish. There are three target areas for plough dredging and these are set out on the drawings and documentation enclosed. In addition the permit application covers the area of the original granted Foreshore Lease in which the original capital dredge was completed. The original capital dredging established the design and operational depths for the jetty, berths and approach channel.

Maintenance Dredging will be undertaken by means of a bed leveller or plough dredger. The plough dredger makes adjustments to the sea bed level by moving material along the sea bed and by mobilising sediment in the water column which is then distributed by the natural currents of the area. The purpose of maintenance dredging is as follows:

- to maintain design and navigational depths for shipping
- to allow for the full use of the length of the jetty structure and manoeuvring area
- to allow for the berthing of larger ships in conjunction with a new unloader being provided on the jetty structure

Typically maintenance dredging can take place at different times of year depending on the need and the navigational areas being free of shipping. The prime opportunities occur in April and September due to quieter shipping periods at the jetty. The DAS permit application is based on a maximum annual dredging quantity of 8000m^3/16,000 tonnes.

Maintenance dredging could be undertaken three or four time per year depending on the accumulation of material on the sea bed, its location and its impact on navigation. Dredging events would typically be over a 4 to 5 day period and the volumes could vary between 1000m^3 and 6000m^3.

The application relates to an annual maximum dredge volume of 8,000m^3 or 16,000 tonnes and is being requested for a period of 8 years.

The three main dredge areas proposed are sections of bed underlying both the inner and outer jetty berths as well as a minor area adjacent to the shore, at an additional vessel berth located to the right of the causeway. Sediment accumulation, as a result of both natural hydrological processes and vessel propeller activity, is impacting cargo vessel movements, necessitating the need for dredging. Additional local high points on the bed within the immediate vicinity of the jetty may also be dredged where an insufficient water depth exists. All proposed dredge sites fall within the immediate vicinity of the existing jetty.

Bathymetric analysis found that current water depth at the proposed dredge sites ranges from -8.0m CD to -13.0m CD. This heterogeneity in water depth is as a result of the presence of localised high points on the bed where sediment has accumulated, reducing water depths relative to adjacent areas. The target water depth to be achieved in the jetty area is -14.50m CD, which will allow sufficient clearance for cargo vessels to safely access berthing facilities.

The proposal is described below and has been confirmed with the project engineer.

Size, scale, area, land-take	The areas of the various dredge sites are as follows: Dredge Area A (5,740m^2) Dredge Area B (800m^2) Dredge Area C (2,000m^2) Limit of original capital dredge area (257,105m^2) Limit of original capital dredge area plus Dredge Area B (257,905m^2) The annual maximum dredge yield will be 8,000m^3 / 16,000 tonnes. Dredge volumes per dredge event could vary between 1000m^3 and 6000m^3 The dredging locations are all situated within both the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA
Details of physical changes that will take place during the various stages of implementing the proposal	Maintenance dredging will involve the use of a plough dredger to complete bed levelling and move surplus material on the sea bed adjacent to the Jetty at Aughinish. The proposed dredging relates to increasing water depths for safe navigation of ships
Description of resource requirements for the construction/operation and decommissioning of the proposal (water resources, construction material, human presence etc)	The main resource will be the use a plough dredge vessel used to complete the dredging. There may also be general work boats and a rib involved for safety and jetty ship movements/management
Description of timescale for the various activities that will take place as a result of implementation (including likely start and finish date)	There may be 3 or 4 dredge event per year. Each event could last up to 5 days. Ideal target dates would be April and September, but the dredging can be carried out at any time of year providing the jetty and adjacent berthing areas are free of marine traffic and the weather and tides are optimal
Description of wastes arising and other residues (including quantities) and their disposal	No wastes arising
Identification of wastes arising and other residues (including quantities) that may be of particular concern in the context of the Natura 2000 network	No wastes arising
Description of any additional services required to implement the project or plan, their location and means of construction	No services required

2.9 IDENTIFICATION OF OTHER PROJECTS OR PLANS OR ACTIVITIES

A review of the Natura 2000 Standard Data form for the *Lower River Shannon cSAC* indicates that the estuarine habitats and associated species are vulnerable to land reclamation, industrial development, water pollution (from industrial, agricultural and domestic sources) and spread of *Spartina*. Dolphins are vulnerable to underwater aquatic disturbance, entanglement in fishing gear and collision with fast moving craft. Sublittoral sediments and submerged sand banks could be threatened by future developments.

A review of the Natura 2000 Standard Data form for the *River Shannon and River Fergus SPA* indicates that site receives pollution from several sources, including industry and agriculture, but it is not known if this has any significant impacts on the wintering birds. Reclamation of land is a threat near to the urbanised and industrial areas. Aquaculture occurs and may increase in the future. *Spartina* is well established and may threaten the estuarine habitats. Some disturbance occurs from boating activities.

The screening for Appropriate Assessment associated with this proposal (see Appendix 2) determined that that any projects or activities that are in close proximity, or that are hydrologically connected to the River Shannon, the Lower River Shannon SAC (002165) or the River Shannon and River Fergus Estuaries SPA (004077), are the activities with which the proposal could interact synergistically to create significant cumulative or in-combination effects.

2.9.1 Development

These activities include development and other similar projects listed in Limerick City and County Council's on line planning system, a summary list of which is included in Table 1 below.

Table 1:Planning Applications

Planning Number	Applicant	Description
12343	Aughinish Alumina Ltd.	The installation of a 150 tonne per hour gas-fired steam boiler with a maximum length of 31.32m, maximum width of 24.15m and maximum height above ground of 18.00m, and a 32m high exhaust stack with an external diameter of 3.0m and all other site development works above or below ground (this application relates to development which comprises or is for the purpose of an activity requiring an Integrated Pollution Prevention and Control Licence)
13161	Aughinish Alumina Ltd.	The demolition of all structures within a disused farm complex including a disused dwelling house, 7 no. outbuildings/sheds, a corrugated iron clad barn and the concrete walls surrounding the yard areas. The development will also consist of the breaking up of concrete hardstandings and yard areas and restoration of the site to a greenfield state
13164	Aughinish Alumina Ltd.	Amendment of planning reference no. 12/343 for provision of 2 no. 150 tonne per hour gas-fired steam boilers, all within a maximum width of 30.00m and maximum height above ground of 18.00m; including 2 no. 32m high exhaust stacks with an external diameter of 3.0m each; and all other associated site development works above and below ground
141083	Aughinish Alumina Ltd.	The installation of a second gantry crane ship unloader on the northern side of the Marine Terminal within the Shannon Estuary. An existing unutilised alumina loader (c. 30.2 metres high) is currently located on the same crane rails, but will be removed as part of the proposed development. The proposed development includes all other ancillary site development works.

2.9.2 Estuary Operations

The Shannon Estuary is one of the most important navigation channels in the country as the deep waters provide access by some of the largest marine vessels entering Irish waters to ports such as Shannon and Foynes as well as numerous industries located along the estuary's shores[7]. Due to the level of industry in the region significant numbers of vessels utilise the channel, including cargo vessels which berth at the existing deep-water jetty at Aughinish, and as such activity associated with these vessels could potentially result in cumulative/in-combination impacts as a result of the proposal.

2.9.3 Diffuse and Point Sources of Pollution

There are four aquaculture sites in the vicinity of Aughinish. These comprise both intensive and extensive mussel and oyster sites, the closest of which is located approx. 560m to the east. The closest designated shellfish waters are *ca.* 27.2km west of the Aughinish at the Ballylongford. A study of the marine atlas showed that the closest fishing ground is Pot fishing for shrimp *ca.*19.6 Km west of Aughinish. The marine atlas does not show any spawning grounds inside of the Shannon estuary (Aquafact , 2016). Additionally, agriculture is a feature of the greater landscape with improved grassland given over to livestock grazing abundant within the surrounding area. Given the proximity of these activities and the nature of the proposed works the potential for significant cumulative/in-combination effects must be assessed.

2.10 IDENTIFICATION OF NATURA 2000 SITES

The screening for AA associated with this proposal (see Appendix 2) concluded that significant effects, potentially ensuing from the proposed activity, on the conservation objectives of two Natura 2000 sites, cannot be ruled out. Therefore, further assessment is required to determine whether the proposed activity is likely to adversely affect the integrity of the following Natura 2000 sites:

- Lower River Shannon SAC (002165)
- River Shannon and River Fergus Estuaries SPA (004077)

2.10.1 Characteristics of Natura 2000 Sites

Table 2, below, lists the qualifying features of special conservation interest for the Natura 2000 sites selected for inclusion in the NIS. Information pertaining to the Natura 2000 sites is from site synopses, conservation objectives and other information available on www.npws.ie.

Table 2: Natura 2000 sites with qualifying features of special conservation interest

Natura 2000 site	Qualifying features of special conservation interest
Lower River Shannon SAC (002165)	• Sandbanks which are slightly covered by sea water all the time [1110] • Estuaries [1130] • Mudflats and sand flats not covered by seawater at low tide [1140] • Coastal lagoons [1150] • Large shallow inlets and bays [1160] • Reefs [1170] • Perennial vegetation of stony banks [1220]

[7] https://shannonestuarysifp.wordpress.com/sifp-documents/ [Accessed 01/02/2016]

	• Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] • *Salicornia* and other annuals colonising mud and sand [1310] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] • Mediterranean salt meadows (*Juncetalia maritimi*) [1410] • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] • *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae, Salicion albae*) [91E0] • Freshwater Pearl Mussel *(Margaritifera margaritifera)* [1029] • Sea Lamprey *(Petromyzon marinus*) [1095] • Brook Lamprey *(Lampetra planeri*) [1096] • River Lamprey *(Lampetra fluviatilis)* [1099] • Salmon *(Salmo salar*) [1106] • Common Bottlenose Dolphin *(Tursiops truncates)* [1349] • Otter *(Lutra lutra*) [1355]
River Shannon and River Fergus Estuaries SPA 004077	• Cormorant (*Phalacrocorax carbo*) [A017] • Whooper Swan (*Cygnus cygnus*) [A038] • Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Shelduck (*Tadorna tadorna*) [A048] • Wigeon (*Anas penelope*) [A050] • Teal (*Anas crecca*) [A052] • Pintail (*Anas acuta*) [A054] • Shoveler (*Anas clypeata*) [A056] • Scaup (*Aythya marila*) [A062] • Ringed Plover (*Charadrius hiaticula*) [A137] • Golden Plover (*Pluvialis apricaria*) [A140] • Grey Plover (*Pluvialis squatarola*) [A141] • Lapwing (*Vanellus vanellus*) [A142] • Knot (*Calidris canutus*) [A143] • Dunlin (*Calidris alpina*) [A149] • Black-tailed Godwit (*Limosa l*imosa) [A156] • Bar-tailed Godwit (*Limosa lapponica*) [A157] • Curlew (*Numenius arquata*) [A160] • Redshank (*Tringa totanus*) [A162] • Greenshank (*Tringa nebularia*) [A164] • Black-headed Gull (*Chroicocephalus ridibundus*) [A179] • Wetland and Waterbirds [A999]

2.10.2 Conservation Objectives

According to the Habitats Directive, the *Conservation Status of a natural habitat* will be taken as 'favourable' within its biogeographic range when:

- its natural range and areas it covers within that range are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the Conservation Status of its typical species is favourable as defined below.

According to the Habitats Directive, the Conservation Status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The Conservation Status will be taken as 'favourable' within its biogeographic range when:

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

The specific conservation objectives for each site are available on www.npws.ie. These have been accessed for the sites listed above on January 29th, 2016. Site specific and detailed Conservation Objectives Series documents are available for both the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077). Management plans are not available for either site.

All conservation objectives together with other designated site information are available on http://www.npws.ie/protectedsites/.

2.11 IDENTIFICATION OF POTENTIAL IMPACTS

Potential ecological impacts that could arise from the project if implemented without mitigation measures are identified in this section.

Description of elements of the project likely to give rise to potential ecological impacts sites.	• Plough-dredging (levelling) of the estuary bed resulting in re-suspension of sediment into the water column and dispersal onto adjacent areas of bed • Increase in vessel movements during dredging operations • Increase in noise emissions to air and water during dredging operations, both from the dredge vessel itself and the physical dredge activity • Use of oils/fuels/lubricants
Describe any likely direct, indirect or secondary ecological impacts of the project (either alone or in combination with other plans or projects) by virtue of: • *Size and scale;* • *Land-take;* • *Distance from Natura 2000 site or key features of the site;* • *Resource requirements;* • *Emissions;* • *Excavation requirements;* • *Transportation requirements;* • *Duration of construction, operation etc.; and* • *Other.*	• The total sediment volume produced over the eight-year dredge campaign will be c.64,000m^3. This equates to an average of 6,000m^3 of sediment produced per annum, with a maximum of 8,000m^3 per annum • The proposed dredging works will take place entirely within the boundary of two Natura 2000 sites; Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077) • Alteration of estuary bed at the dredge sites and adjacent bed areas • Water quality impacts from increased suspended sediment and turbidity in the water column potentially causing habitat alteration and/or species displacement • Pollutants/harmful substances could disperse into the aquatic environment once sediments are disturbed impacting on water quality and potentially causing indirect species displacement • Deposition of dredged material could cause habitat alteration and/or species displacement through smothering impacts on in-faunal communities, potentially affecting the food resource of SCI bird species • Increased vessel movements could result in both aquatic and avian species disturbance/displacement • Noise emissions to air/water during dredging operations could lead to temporary disturbance/displacement of bird/mammal species • Accidental spills of fuels/lubricants could lead to habitat alteration and/or species displacement through adverse impacts to water quality

2.12 SELECTION OF QUALIFYING FEATURES FOR IMPACT ASSESSMENT

It is considered, on the basis of the annexed species and the description of each of the Annex I habitats listed, including the list of their typical species, as outlined in the Interpretation Manual of European Habitats (DGE, 2013) and on the basis of the information included in the site synopses, in the Natura 2000 Standard Data Forms and Conservation Objectives backing documents[8], that certain habitats and species are not exposed to significant risk of adverse impacts from the proposal considered in this document. As such it is concluded that no direct or indirect significant impacts on the conservation objectives of these habitats and species are reasonably foreseeable as a result of the proposal. The qualifying features for the Lower River Shannon SAC (002165) are listed in Table 3 below and those for the River Shannon and River Fergus Estuaries SPA (004077) are listed in Table 5 below with a rationale for the selection or otherwise of qualifying features for impact assessment. Section 2.13 below will then focus on assessing potential impacts on the habitats and species selected for impact assessment. Mitigation measures to ameliorate impacts identified are outlined in section 2.14 below and consideration of residual impacts is included in section 2.15.

2.12.1 Lower River Shannon SAC (002165)

This very large site stretches along the Shannon valley from Killaloe in Co. Clare to Loop Head/ Kerry Head, a distance of some 120 km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitats lagoon and alluvial woodland, the only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species. A good number of Red Data Book species are also present. A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding. Indeed, the Shannon and Fergus Estuaries form the largest estuarine complex in Ireland and support more wintering wildfowl and waders than any other site in the country. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter[9].

2.12.1.1 Selection of qualifying features as receptors potentially exposed to significant impacts

Bearing in mind the potential impacts identified in section 2.111 above, the characteristics of the proposal as outlined in section 2.8.5 above, and its location, described in section 0 above, relative to the distribution of species and habitats for which the Lower River Shannon SAC is designated and the varying degree of connectedness that exists between the subject site and the potential receptors, it is considered that not all of the qualifying features are exposed to the potential impacts identified. An evaluation based on these factors has been conducted to determine which qualifying species and habitats are considered to be plausible ecological receptors for potential impacts of the unmitigated proposal. This determined that only certain habitats and species, listed in Table 3 below, should be selected for further assessment.

Table 3, below, lists the qualifying features of the Lower River Shannon SAC and evaluates, through a scientific examination of evidence and data, whether or not these features should or should not be

[8] Available at http://www.npws.ie/protectedsites [accessed 19/01/2016]

[9] Excerpt taken from the NPWS site synopsis. Available at http://www.npws.ie/sites/default/files/protected-sites/synopsis/SY002165.pdf [Accessed 02/02/2016]

selected for impact assessment. The qualifying features that are selected for further assessment are described further in section 2.12.1.2 below and an assessment of potentially significant effects arising from the impacts identified in section 2.111 above, is then carried out in section 2.133 below.

Table 3: Selection of qualifying features of Lower River Shannon SAC 002165, potentially exposed to adverse impacts

Qualifying Feature	Potential for Significant Impacts	Rationale
Invertebrates		
Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]	No	– Freshwater species not found in saline/brackish conditions – The mapped habitat distribution of the species within the site, which includes areas suitable for adult and juvenile mussels and suitable spawning and nursery habitat for host fish, is restricted to the Cloon River catchment in Co. Clare, which drains into the Shannon Estuary in excess of 29km downstream of the subject site (NPWS, 2012) – No plausible ecological pathway due to hydrological and topographical characteristics
Fish		
Sea lamprey (*Petromyzon marinus*) [1095]	Yes	– Marine/freshwater species whose range includes the habitats within the vicinity of the proposal – Potential impacts identified could have an adverse effect on the species during migratory periods – Precautionary principle
Brook lamprey (*Lampetra planeri*) [1096]	No	– Habitat requirements – Exclusively freshwater species (Kurz & Costello, 1999) – Proposed works taking place in estuarine waters – Non-migratory species
River lamprey (*Lampetra fluviatilis*) [1099]	Yes	– Marine/freshwater species whose range includes the habitats within the vicinity of the proposal – Potential impacts identified could have an adverse effect on the species during migratory periods – Precautionary principle
Atlantic Salmon (*Salmo salar*) [1106]	Yes	– Anadramous species whose range includes the habitat within the vicinity of the proposal – Potential impacts identified could have an adverse effect on the species during migratory periods

Qualifying Feature	Potential for Significant Impacts	Rationale
		– Precautionary principle
Mammals		
Otter (*Lutra lutra*) [1355]	Yes	– Terrestrial/semi-aquatic species whose range includes the habitats within the vicinity of the proposal – Potential impacts identified could have an adverse effect on the species – Precautionary principle
Bottle-nosed Dolphin (*Tursiops truncates*) [1349]	Yes	– Marine species whose range includes the habitat within the vicinity of the proposal – Potential impacts identified, in particular fugitive noise emissions to water, could have an adverse effect on the species – Precautionary principle
COASTAL AND HALOPHYTIC HABITATS (Open sea and tidal area)		
Sandbanks which are slightly covered by sea-water all the time [1110]	No	– Habitat not within the zone of influence of the project from examination of the habitat map of Annex I habitats within the conservation objectives report (NPWS, 2012)
Estuaries [1130]	Yes	– From examination of the habitat map for the SAC this habitat is within the potential zone of influence from the proposal (NPWS, 2012)
Mudflats and sandflats not covered by seawater at low tide [1140]	Yes	– From examination of the habitat map for the SAC this habitat is within the potential zone of influence from the proposal (NPWS, 2012)
Coastal lagoons [1150]*	No	– Habitat not within the zone of influence of the project from examination of the habitat map of Annex I habitats within the conservation objectives report (NPWS, 2012)
Large shallow inlets and bays [1160]	No	– Habitat not within the zone of influence of the project from examination of the habitat map of Annex I habitats within the conservation objectives report (NPWS, 2012)
Reefs [1170]	Yes	– From examination of the habitat map for the SAC this habitat is within the potential zone of influence from the proposal (NPWS, 2012)
COASTAL AND HALOPHYTIC HABITATS (Sea cliffs and shingle or stony beaches)		
Perennial vegetation of stony banks [1220]	No	– Habitat not within the zone of influence of the project from examination of the habitat map of Annex I habitats within the conservation objectives report

Qualifying Feature	Potential for Significant Impacts	Rationale
		(NPWS, 2012)
Vegetated sea cliffs of Atlantic and Baltic coasts [1230]	No	– Habitat not within the zone of influence of the project from examination of the habitat map of Annex I habitats within the conservation objectives report (NPWS, 2012)
COASTAL AND HALOPHYTIC HABITATS (Atlantic and continental salt marshes and salt meadows)		
Salicornia and other annuals colonising mud and sand [1310]	No	– The impact from the dredging operation will be limited to the marine sub-tidal environment; therefore significant intertidal impacts to this habitat type are not expected to occur
Atlantic salt meadows (*Glauco-Puccinellietalia-maritimae*) [1330]	No	– This habitat occurs in excess of 3.6km to the south-west of the proposal site. Potential habitat occurs in excess of 1.6km to the south-east of the proposal site, as mapped in the Conservation Objectives document for this site (NPWS, 2012) – The impact from the dredging operation will be limited to the marine sub-tidal environment; therefore significant intertidal impacts to this habitat type are not expected to occur
COASTAL AND HALOPHYTIC HABITATS (Mediterranean and thermo-Atlantic saltmarshes and salt meadows)		
Mediterranean salt meadows (*Juncetalia maritimi*)[1410]	No	– This habitat occurs in excess of 3.7km to the south-west of the proposal site – The impact from the dredging operation will be limited to the marine sub-tidal environment; therefore significant intertidal impacts to this habitat type are not expected to occur
FRESHWATER HABITATS Running Water		
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	No	– Habitat not within the zone of influence of the project from examination of the habitat map of Annex I habitats within the conservation objectives report (NPWS, 2012)
NATURAL AND SEMI-NATURAL GRASSLAND FORMATIONS Semi-natural tall-herb humid meadows		
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinia caeruleae)* [6410]	No	– Terrestrial habitat not within the zone of influence of the project – Identified impacts are transmitted via aquatic pathway
FORESTS (Forests of temperate Europe)		
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae, Salicion albae*) [91E0]	No	– Terrestrial habitat not within the zone of influence of the project – Identified impacts are transmitted via aquatic pathway

2.12.1.2 Characteristics of the ecological features selected for impact assessment

The habitats and species of conservation significance to the Natura 2000 site selected for impact assessment are discussed further below. Any impacts on these habitats or species are evaluated in section 2.133, below.

- Sea Lamprey (P. *marinus)*[1095]
- River Lamprey *(L. fluviatilis)*[1099]
- Atlantic Salmon (*S. salar*) [1106]
- Otter (*L. lutra*) [1355]
- Bottle-nosed Dolphin (*T. truncates*)[1349]
- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Reefs [1170]

The Conservation Status of each of these is assessed in NPWS (2103a and 2013b) as being either 'favourable', 'unfavourable-inadequate' and/or 'unfavourable-bad', based on four parameters as defined in Article 1 of the Directive. The parameters for habitats are range, area, structure and functions and future prospects; for species they are range, population, habitat and future prospects. Where there is great uncertainty it is also possible to report the Conservation Status as 'unknown'. The assessments of the four parameters are combined following an agreed method to give an overall assessment of Conservation Status[10].

2.12.1.2.1 Sea Lamprey (*P. marinus), River Lamprey (L. fluviatilis)*

All three lamprey species recorded in Ireland are listed on Annex II of the EU Habitats Directive. Sea lampreys (*P. marinus*) spend their adult life in marine and estuarine waters, living as external parasites on other fish species. They migrate up river to spawn in areas of clean gravels between April – July, after which they die. After hatching, the young larvae burrow into fine river sediments in areas of still water. Lamprey larval burrows are characteristically found at eddies or backwaters, on the inside of bends or behind obstructions, where current velocity is below that of the main stream and where organic material tends to accumulate (Kelly & King, 2001). They favour partially shaded areas, and the presence of aquatic plants. Larvae live as filter feeders and may remain in fine sediments for several years before transforming into adults. The seaward migration of young adults occurs in the autumn/winter months. Sea lampreys, which can grow up to 1m in length, are widely distributed around the coast. However, they tend to occur in low densities. The river lamprey (*L. Fluviatilis)* grows to 30cm and has a similar life history to the sea lamprey except that both the upstream adult spawning migration and seaward migration of young adults takes place in autumn/winter. The overall assessment of Conservation Status is for sea lamprey is 'Unfavourable Bad' (NPWS, 2013b). With regard to river lamprey the overall assessment of Conservation Status is 'Favourable'; (NPWS, 2013b).

NPWS distribution maps for sea lamprey indicate that the 10km grid square in which the proposal site is located (R25) is included in neither the current range nor current distribution for this species but is included in the favourable reference range. However, the adjacent 10km grid square (R35) is

[10] http://bd.eionet.europa.eu/activities/Reporting/Article_17

included in the current range and those further upriver are also included in the current distribution (NPWS, 2013b). A review of the NBDC on-line distribution mapping for this species determined that the nearest record of sea lamprey to the proposal site is from grid square, R37, which encompasses the River Fergus and its tributaries, which drain into the Shannon Estuary at Ennis, in excess of 16km north of the proposal site.

NPWS distribution maps for river lamprey indicate that the 10km grid square, R25, and adjacent grid squares (R15 and R35) are included in both the favourable range and current range for this species, but not the current distribution (NPWS, 2013b). A review of the NBDC on-line mapping database determined that there are no confirmed records for river lamprey anywhere near the proposal site.

2.12.1.2.2 Atlantic Salmon (*S. salar*)

The Atlantic salmon is an anadromous species, living in freshwater for at least the first two or three years of life before migrating to sea. Relatively large cool rivers with extensive gravelly bottom headwaters are essential during their early phases of the life cycle. Young salmon, or smolts, migrate to sea, mainly between April and June, where they may live for one or two years before returning to fresh water. The majority of adults make the upstream spawning migration in the summer months although some, which have spent longer periods at sea, may commence their upstream migration in spring. A decline in salmon stocks is well recognised in Ireland and throughout its range and is attributed to several factors including disease, poor marine survival and overfishing. It is during the relatively sedentary freshwater phase of its lifecycle that this species is most vulnerable to point or diffuse source impacts. Once in the marine environment this highly mobile species migrates long distances in deep ocean environments. The species is listed on Annex II of the Habitats Directive and is afforded full legal protection during the freshwater phases of its life cycle. The overall assessment of Conservation Status is 'Unfavourable Inadequate' (NPWS, 2013b).

NPWS distribution mapping for salmon determined that the 10km grid square encompassing the proposal site (R25), and adjacent grid squares are all included in both the favourable and current range for the species but not the current distribution (NPWS, 2013b). The nearest mapped records for salmon to the proposal site are from Dromore in County Clare, located in excess of thirty linear kilometres to the north [11].

2.12.1.2.3 Otter (*L. lutra*)

Otter are widespread in Ireland throughout freshwater and coastal habitats with their preferred habitat including good vegetation cover. Otters are largely solitary animals, occurring at low population densities. They are highly territorial towards members of the same sex, so although this means ranges of males and females can overlap; it has implications for the number of otters which will potentially occupy a given stretch of waterway. Home ranges can comprise 20km of watercourse for females and in excess of 32km for males. A key requirement of potential territory is a sufficient source of prey. Otters feed primarily on fish and the amount of time spent in different parts of their home-range is related to the abundance of prey. Otters are mainly nocturnal creatures and so require safe refuges, known as holts, in which to rest during the day. These holts are the main den sites and area often situated underground along a river bank or under tree roots. An otters territory will typically contain several holts as well as resting sites, known as couches. These are above-ground lying-up areas concealed within vegetation and often linked to a nearby watercourse by a regularly-used track. Therefore, the presence of freshwater, a sufficient prey-base and suitable sites for

[11] http://maps.biodiversityireland.ie/#/Map [Accessed 10/02/2016]

holts/couches are key factors in determining otter distribution. In Ireland otters are protected by the Wildlife Act (1976), Wildlife (Amendment) Act (2000), the EU Habitats Directive (EC/92/43) and the Bern Convention**.** The overall assessment of Conservation Status for this species is 'Favourable' (NPWS, 2013b).

NPWS mapping of otter distribution indicates that the 10km grid square relevant to the proposal site (R25), and the adjacent grid squares are all considered to fall within the current range of the species. Additionally, grid squares R25 and the adjacent square, R35 are also both within the current distribution for otter (NPWS, 2013b). A review of the NBDC on-line map database found that the nearest record of otter to the proposal site is from Poulaweala Creek (R283517), over 2.5km to the south, when four otter spraints were found on rocks near the bridge during surveying in 2005. An additional 2005 record of otter exists from Ballysimon (R324552), located to the north-east of the site. There is also a historical record of otter spraints found near the N69 National Road to the south of Aughinish (R269497)[12].

However, given that evidence of otters has been recorded within the greater area and the coastal/estuarine setting it is considered likely that otter utilise this stretch of coastline. Indeed the entire length of the southern banks of the Shannon Estuary, encompassing a 250m wide strip of coastline, is mapped as a 'commuting buffer' for otter, as indicated in Figure 2 below.

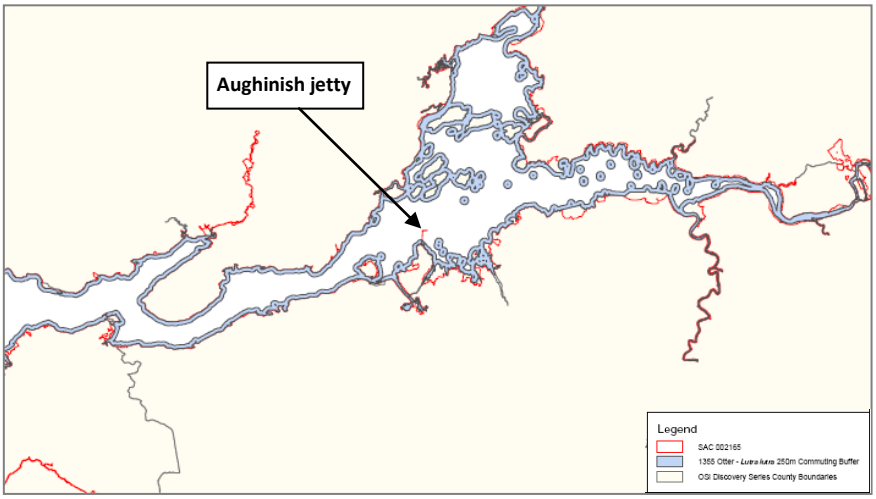

Figure 2. Extent of shoreline within the Lower River Shannon SAC (002165) currently mapped as a 'commuting buffer' for otter. Source: (NPWS, 2012)

2.12.1.2.4 Bottle-nosed Dolphin (*T. truncates*)

Bottle-nosed dolphins are medium-sized cetaceans which commonly occur in Irish waters. They are widespread along the coastal waters of western Ireland with the largest resident population of dolphins in Irish waters found in the Shannon Estuary, a critical habitat for this species. The species has been assessed as having a Conservation Status of 'Favourable' (NPWS, 2013b). Bottlenose dolphin is listed as an Annex II species under the EU Habitats Directive and the Shannon Estuary is one of only two Special Areas of Conservation designated for this species in Irish waters. The dolphins show long term site fidelity in the Shannon (Englund *et al.*, 2007). Research since 1993 has shown that the dolphins are resident within the area occurring throughout the year. The same individuals are recorded repeatedly over many years (NPWS, 2012b). The site is also an important

[12] http://maps.biodiversityireland.ie/#/Map [Accessed 10/02/2015]

calving area (Berrow *et al*. 1996; *Ingram, 2000* cited in Berrow *et al*. 2010) with calves mainly being born in the summer months (May-Sept) (NPWS, 2012b). Historical references suggest that dolphins have been in the estuary since at least 1835 (Knott, 1997 cited in Berrow *et al*. 2010) and probably much longer. Indeed, the Shannon Estuary population is considered to be genetically distinct from other populations (NPWS, 2012b).

Extensive surveys have been carried out on the bottle-nose dolphins which inhabit the Shannon Estuary. Population assessments, carried out in 2010, recorded the highest concentrations of individuals in the outer estuary with large groups also seen in the middle estuary (Berrow, et al., 2010). These are areas within the estuary in which dolphins are frequently recorded and are classified as 'Critical habitat' for the species, although the vast majority of the estuary is considered to be suitable habitat and within the species range (NPWS, 2012).

NPWS distribution mapping for bottle-nose dolphin indicates that the proposal site lies within both the current range and current distribution for this species (NPWS, 2013b). A review of the NBDC on-line mapping database found that the nearest mapped record for this species to the proposal site is located approximately 20km to the west, in the middle estuary, at Aylevarroo Bay, near Kilrush[13].

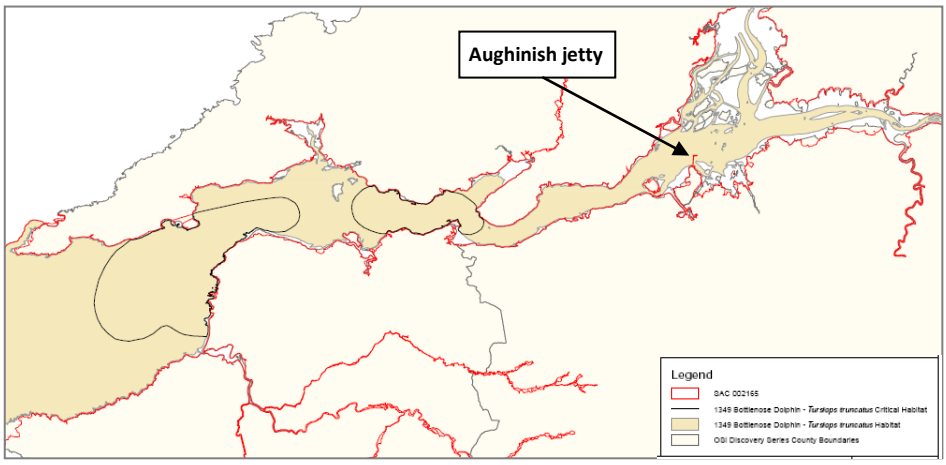

Figure 3. Bottlenose dolphin habitat within the Lower River Shannon SAC including two 'critical habitat' areas located within the outer and middle estuary (NPWS, 2012)

2.12.1.2.5 Estuaries

Estuaries are defined as the downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. River estuaries are coastal inlets where, unlike 'large shallow inlets and bays' there is generally a significant freshwater influence. Estuaries, from the high water mark to the sub-tidal, are frequently observed to be composed of a range of distinct substrates. The high water points of estuaries are often formed from boulders/shingle and frequently from man-made margins in urban areas. The intertidal flanks exposed to the forces that form the estuarine habitat can be composed of deposited material such as sand and mud/silt. The estuarine bed or channel is eroded to the greatest extent by the movement of the river channel and is consequently generally coarse material or bedrock (NPWS, 2013a). The overall Conservation Status for estuaries has been

[13] http://maps.biodiversityireland.ie/#/Map [Accessed 10/02/2016]

assessed as 'Unfavourable Inadequate' (NPWS, 2013a). The Shannon and Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon Estuary (NPWS, 2013).

2.12.1.2.6 Mudflats and sandflats not covered by seawater at low tide

This habitat is found exclusively between the low water and mean high water marks. It is often a subset of the Annex I habitats 'large shallow inlets and bays' and 'estuaries' but is not dependent on those habitats for occurrence. The finer silt and clay sediments are dominant in mud flats and the larger sand fractions are associated with areas exposed to significant wave energy. The fine sediment of intertidal mudflats is most often associated with rivers. The limit of tidal ingress often coincides with the beginning of flanking mudflat habitats. The competing forces of seaward-flowing freshwater meeting the flooding tide reduces net flow velocity and consequently the carrying capacity for sediment leading to deposition. Mudflats and sandflats form a significant resource for various bird and mammal species for feeding, breeding and resting (NPWS, 2013a). The overall Conservation Status for intertidal mudflats has been assessed as 'Unfavourable Inadequate' (NPWS, 2013a). Both the Fergus and inner Shannon Estuaries feature vast expanses of intertidal mudflats (NPWS, 2013).

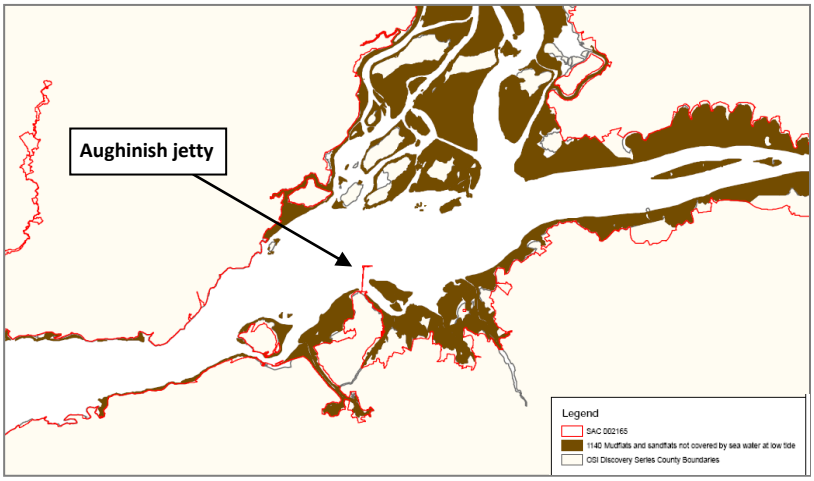

Figure 4. Likely distribution of the Annex 1 habitat 'mudflats and sandflats not covered by seawater at low tide' within the Lower River Shannon SAC (002165) (NPWS, 2012)

2.12.1.2.7 Reefs

Reefs may have a rocky substrate (non-biogenic reefs) or be constructed by animals (biogenic reefs). They are hard compact substrata on solid and soft bottoms, which arise from the sea floor in the sub-littoral and littoral zone. Reefs may support a zonation of benthic communities of algae and animal species as well as concretions and corallogenic concretions. The overall Conservation Status for reefs has been assessed as 'Unfavourable Bad' (NPWS, 2013a). The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore. The communities found are tolerant to sand scour and tidal streams (NPWS, 2013). Habitat mapping for the Lower River Shannon SAC (002165) has determined that this habitat-type occurs in isolated

pockets within the vicinity of the proposal site (NPWS, 2012). Based on this mapping the closest area of mapped reef is located approximately 550m to the west of the proposal site[14].

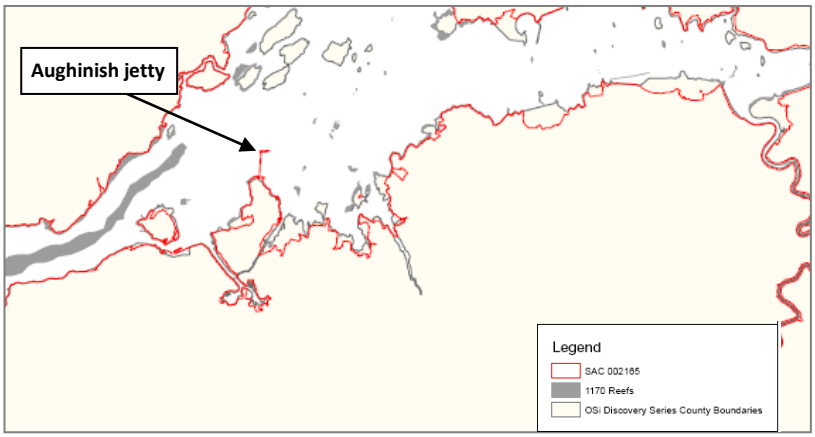

Figure 5. Known distribution of the Annex I habitat-type 'reefs' within the Lower River Shannon SAC (002165)

2.12.2 River Shannon and River Fergus Estuaries SPA (004077)

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises the entire estuarine habitat west from Limerick City and south from Ennis, extending west as far as Killadysert and Foynes on the north and south shores respectively of the River Shannon (a distance of some 25 km from east to west). Also included are several areas in the outer Shannon estuary, notably Clonderalaw Bay and Poulnasherry Bay, as well as the intertidal areas on the south shore of the Shannon between Tarbert and Beal Point. The site has vast expanses of intertidal flats, which provide a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds.

This Natura 2000 site is of great ornithological interest, being designated for the protection of twenty one bird species and for the additional conservation interest of wetlands and their associated waterbird species. It is of international importance on account of the numbers of wintering birds it supports including internationally important numbers of three species, i.e. Dunlin, Black-tailed Godwit and Redshank. In addition, there are 16 species that have populations of national importance. For several of the bird species, it is the top site in the country. Also of note is that three of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover and Bar-tailed Godwit (NPWS, 2005).

The Natura 2000 Standard Data Form for the River Shannon and River Fergus Estuaries SPA (004077) indicates that qualifying bird species for which the site is designated comprise non-breeding, migrant and overwintering populations only. Therefore designated species populations are present for part of the year only and are therefore subject to potential impacts for that duration only. The long term trends for the populations of all the species are stable or increasing and no significant decrease in their natural ranges are expected. None of the populations in question are considered to be isolated within their extended ranges and for all but one of the species, namely ringed plover (*C. hiaticula*), it is considered that the ecological resources within the SPA site, on which the different species rely,

[14] http://maps.biodiversityireland.ie/#/Map [Accessed 02/02/2016]

have an 'Excellent' degree of conservation. With regard to ringed plover, it is considered that the ecological resources of the site on which this species relies have a 'Good' degree of conservation. Therefore the ecological resources required to ensure that the conservation objectives of the SPA site are achieved are sufficient for the needs of the populations in question.

The qualifying species and the seasonal population usage of the site are outlined in Table 4 below (NPWS, 2012a).

Table 4. Qualifying features of the River Shannon and River Fergus Estuaries SPA, including species population usage and maximum populations thought to occur

Qualifying Feature	Population usage of the site[15]	Max. population within the site[16]
Cormorant (*Phalacrocorax carbo*)	Breeding + wintering	237
Whooper Swan (*Cygnus Cygnus*)	Wintering	269
Light-bellied Brent Goose (*Branta bernicla hrota*)	Wintering	176
Shelduck (*Tadorna tadorna*)	Wintering	291
Wigeon (*Anas penelope*)	Wintering	1,821
Teal (*Anas crecca*)	Wintering	812
Pintail (*Anac acuta*)	Wintering	30
Shoveler (*Anas clypeata*)	Wintering	45
Scaup (*Aythya marila*)	Wintering	24
Ringed Plover (*Charadrius hiaticula*)	Wintering	92
Golden Plover (*Pluvialis apricaria*)	Wintering	1,929
Grey Plover (*Pluvialis squatarola*)	Wintering	69
Lapwing (*Vanellus vanellus*)	Wintering	2,012
Knot (*Calidris canutus*)	Wintering	100
Dunlin (*Calidris alpina*)	Wintering	3,374
Black-tailed Godwit (*Limosa limosa*)	Wintering	740
Bar-tailed Godwit (*Limosa lapponica*)	Wintering	72
Curlew (*Numenius arquata*)	Wintering	767
Redshank (*Tringa totanus*)	Wintering	292
Greenshank (*Tringa nebularia*)	Wintering	30
Black-headed Gull (*Chroicocephalus ridibundus*)	Wintering	1,303
Wetlands	n/a	n/a

2.12.2.1 Selection of qualifying features as receptors potentially exposed to significant impacts

Bearing in mind the potential impacts identified in section 2.111, above, the characteristics of the proposal as outlined in section 2.8.5, above, and its location, described in section 0, above, relative to the distribution of species and habitats for which the River Shannon and River Fergus Estuaries SPA is designated and the varying degree of connectedness that exists between the subject site and the potential receptors, it is considered that not all of the qualifying features are exposed to the potential impacts identified. An evaluation based on these factors has been conducted to determine

[15] Taken from the Conservation Objectives document for the River Shannon and River Fergus Estuaries SPA (004077)

[16] Population data (2006/07 – 2010/11 period) taken from the Conservation Objectives Supporting Document for the River Shannon and River Fergus SPA. Available at www.npws.ie

which qualifying features are considered to be plausible ecological receptors for potential impacts of the unmitigated proposal.

Table 35 below, lists the qualifying features of the River Shannon and River Fergus Estuaries SPA and evaluates, through a scientific examination of evidence and data, whether or not these features should or should not be selected for impact assessment. The qualifying features that are selected for further assessment are described further in section 2.12.1.2 below and an assessment of potentially significant effects arising from the impacts identified in section 2.111 above is then carried out in section 2.133 below.

Table 5: Selection of Qualifying Features of River Shannon and River Fergus SPA (004077), potentially exposed to adverse impacts

Qualifying Feature of Interest	Potential for Adverse Impact	Rationale
21 bird species of conservation interest	Yes	– Potentially utilise habitats within the zone of influence – Impacts identified could affect species intensity of use of areas within the site – Precautionary principle
Wetlands	No	– There will be no reduction in the permanent area of wetland within the site – Therefore there will be no adverse impact on the favourable conservation condition of 'Wetlands' and so it is not considered further in this assessment

2.12.2.2 Characteristics of the ecological features selected for impact assessment

This Natura 2000 site is designated for the protection of 21 species of bird. Any impacts on these species are evaluated section 2.13 below.

2.12.2.2.1 Cormorant (*P. carbo*)

In Ireland cormorants are typically resident all-year round, although a proportion of wintering individual may also occur. They breed mainly on off-shore islands and rocky coast-lines although there are some inland breeding populations. Cormorants feed on fish, foraging mainly in shallow waters (<30m depth) and may roost in inter-tidal or supra-tidal areas. The species is amber-listed in Ireland due to a localised breeding population[17]. Cormorant is the only qualifying species with a breeding population within the River Shannon and River Fergus Estuaries SPA (NPWS, 2012a).

2.12.2.2.2 Whooper Swan (*C. cygnus*)

Whooper swan is a migratory species which over-winters within the site. Birds typically arrive in Ireland in late autumn and leave by mid-April although a few may remain throughout the summer months. They forage diurnally grazing primarily on agricultural grasses and grains although aquatic plants in inter-tidal areas are also utilised. The majority of foraging records for this species are from outside the SPA boundary in nearby agricultural areas, highlighting the importance of these areas for the over-wintering population (NPWS, 2012a). Whooper swan is amber-listed in Ireland as Ireland hosts more than 20% of the European wintering population.

[17] www.birdwatchireland.ie [Accessed 03/02/2016]

2.12.2.2.3 Light-bellied Brent Goose (*B. bernicla hrota*)

Light-bellied brent geese are a migratory species which over-winter within the site, although they exhibit a relatively-restricted distribution (NPWS, 2012a). Birds typically start arriving to Ireland in late-August. They winter on coastal estuaries during the autumn and early winter typically moving to grasslands from mid-winter on before departing to breeding grounds in Canada in late April. They graze mainly in inter-tidal areas in coastal and estuarine areas, preferring to forage on eelgrass (*Zostera* spp.) although a variety of plant species may be taken. Foraging also occurs in coastal grassland. They are amber-listed in Ireland as the majority winter at less than ten sites and the Irish population is internationally significant (Colhoun & Cummins, 2013).

2.12.2.2.4 Shelduck (*T. tadorna*)

This migratory species departs Ireland on its moult migration during the autumn, following which it moves to its wintering sites, typically arriving to the Shannon Estuary around November. There have a more varied foraging ecology relative to many of the other over-wintering species in the site, being capable of utilising both inter-tidal and sub-tidal habitats (NPWS, 2012a). Shelduck are amber-listed in Ireland as the majority of the wintering population occurs at less than ten sites.

2.12.2.2.5 Wigeon (*A. penelope*)

Wigeon is a highly-migratory species which arrive to Ireland in late summer/early autumn (August/September) to winter in coastal areas, estuaries and further inland in wetlands and grasslands which are close to water. They are mainly herbivorous feeding on algae's and other plants in inter-tidal and shallow water areas, although they may forage in nearby grasslands and agricultural areas (NPWS, 2012a). Wigeon is red-listed in Ireland due to declines in the non-breeding (wintering) population.

2.12.2.2.6 Teal (*A. crecca*)

Teal are a migratory species which over-winters within the site along the estuary, marshes and other wetland habitats. Past surveys have determined that the species are relatively widespread throughout the SPA (NPWS, 2012a). Teal are omnivorous, feeding on plant matter, seeds and invertebrates. They prefer to forage in areas of shallow water and have shown a preference for inter-tidal rather than sub-tidal areas within the site (NPWS, 2012a). Teal is amber-listed in Ireland due to a decline in the breeding population.

2.12.2.2.7 Pintail (*A. acuta*)

Pintail is a rare breeding species in Ireland, occurring mainly as an over-wintering species in estuaries, large lakes and coastal lagoons. They have a restricted distribution within the SPA being associated with inter-tidal habitats including small creeks and channels (NPWS, 2012a). They are omnivorous feeding on a variety of aquatic plants, seeds and invertebrates both in shallow water areas and on-land. Pintail is red-listed due to significant declines in the non-breeding (wintering) population.

2.12.2.2.8 Shoveler (*A. clypeata*)

Although a small proportion is resident and breeds in Ireland the majority of the population comprises wintering birds which have come from main breeding sites. Wintering birds typically arrive to Ireland between October to March to estuaries, coastal lagoons and inland lakes. They are a 'dabbling' duck feeding mainly on zooplankton, insects, molluscs and plant matter mainly via surface-feeding in shallow water. Shoveler is red-listed in Ireland due to long-term declines in the non-breeding population (Colhoun & Cummins, 2013).

2.12.2.2.9 Scaup (*A. marila*)

Scaup are a winter visitor to Ireland, arriving from breeding sites to the north between November and April to coastal areas, estuaries, brackish lagoons and freshwater lakes close to the coast. They forage in sub-tidal areas, diving to hunt for molluscs and crustaceans as well as feeding on marine plants in areas typically with a depth of less than 10m. Scaup is amber-listed due to its small breeding population and its localised wintering range[18].

2.12.2.2.10 Ringed Plover (*C. hiaticula*)

The site is designated for wintering ringed plover which have come south from breeding areas to the north. The population peaks in late summer/early autumn with numbers decreasing slightly into the winter months. They are widespread around the coast in winter mainly along sandy stretches of coastline and in estuarine areas. They forage along areas of exposed sediment in inter-tidal areas for insects, crustaceans and molluscs (NPWS, 2012). The species is amber-listed in Ireland as the wintering population is of international importance (Colhoun & Cummins, 2013).

2.12.2.2.11 Golden Plover (*P. apricaria*)

Golden plover both breed and over-winter in Ireland with a non-breeding population occurring within the SPA. The main bulk of the Irish population occurs between October and February[19]. They have a widespread distribution in Ireland being found in both coastal and inland areas. During winter months they tend to forage mainly on agricultural land, feeding on soil and surface-dwelling invertebrates and plant matter, although they may also utilise inter-tidal areas for feeding as well as roosting (NPWS, 2012a). Golden plover is red-listed due to declines in both the breeding and non-breeding populations (Colhoun & Cummins, 2013).

2.12.2.2.12 Grey Plover (*P. squatarola*)

Grey plover are both a winter and passage migrant to Ireland with the majority occurring between September and April. During the winter they are widespread around coastal and estuarine areas. They forage in inter-tidal areas taking a wide variety of prey including molluscs, crustaceans and burrowing worms. Grey plover is amber-listed in Ireland due to the highly-localised wintering population with the majority winter at less than ten sites around the country, mainly along eastern and southern coasts.

2.12.2.2.13 Lapwing (*V. vanellus*)

Lapwing is resident in Ireland with numbers boosted by both summer and winter visitors. Peak population numbers occur between September and April. While the breeding population prefers agricultural areas lapwing can be found in a variety of habits during the winter months including wetlands, mudflats, pasture and marginal ground with estuaries often utilised for roosting (NPWS, 2012a). They feed on soil and surface invertebrates and are also opportunistic feeders, taking advantage of recently disturbed habitats such as those associated with agricultural activity and flooding. Lapwing is red-listed in Ireland due to declines in both the breeding and non-breeding populations.

2.12.2.2.14 Knot (*C. canutus*)

Knot breeds in Ireland in low numbers with the bulk of the population comprising wintering birds, occurring mainly between October and February. During the winter they are coastal in their

[18] www.birdwatchireland.ie [Accessed 03/02/2016]

[19] www.birdwatchireland.ie [Accessed 03/02/2016]

distribution with preferred sites mainly comprising estuaries with extensive mudflats. They are specialist foragers of molluscs and crustaceans in inter-tidal areas, being particularly adapted to hunt prey buried in the substrate. Although knot were red-listed in Ireland due to declines in the global population the wintering population has increased in recent times and as such knot has now been re-assigned as amber-listed (Colhoun & Cummins, 2013).

2.12.2.2.15 Dunlin (*C. alpina*)

Dunlin are a common wader along Irish coasts. As well as a small breeding population, dunlin occurs in Ireland as summer and winter visitors as well as passage migrants. Wintering populations favour coastal areas such as estuaries and mudflats with the population peaking in mid-winter. They tend in feed in groups on mudflats, often at the water's edge taking a variety of prey including molluscs, crustaceans and worms. Dunlin is widespread within the site favouring inter-tidal foraging areas (NPWS, 2012a). Dunlin is red-listed in Ireland sue to declines in the wintering population (Colhoun & Cummins, 2013).

2.12.2.2.16 Black-tailed Godwit (*L. limosa*)

Black-tailed godwit is mainly a winter visitor to Ireland although breeding has been recorded in some lowland sites. Winter numbers tend to peak in September. During winter months they can be found in inland areas including grassland and along lowland rivers as well as coastal estuaries. They feed on a variety of invertebrates including crustaceans, molluscs and worms particularly in muddy estuaries, areas of brackish water and sometimes in rough, agricultural pasture[20]. They are amber-listed in Ireland due to a highly localised wintering population with the majority occurring at less than ten sites around the country (Colhoun & Cummins, 2013).

2.12.2.2.17 Bar-tailed Godwit (*L. lapponica*)

Bar-tailed godwit is a winter visitor only, arriving from northern areas from October to April. They are exclusively coastal favouring sandy estuaries. They feed mainly along inter-tidal areas or in very shallow water, preying on a range of sediment-dwelling invertebrates, in particular polychaete worms. They have a restricted foraging distribution within the SPA (NPWS, 2012a). The species is amber-listed in Ireland due to a localised winter distribution (Colhoun & Cummins, 2013).

2.12.2.2.18 Curlew (*N. arquata*)

Curlews breed in Ireland in small numbers in peat-lands and floodplains. In winter the population is boosted significantly by individuals arriving from other locations within the species range. During the winter they can be found at wetlands both in coastal and inland locations. They feed on a range of invertebrates with the group often dispersed over a large area, particularly when feeding in estuaries. They tend to roost communally, typically in nearby salt-marsh. Curlews have been found to be widely distributed within the SPA, utilising both inter-tidal and supra-tidal habitats (NPWS, 2012a). Curlew is red-listed due to a long-term decline in its breeding and wintering population and its breeding range (Colhoun & Cummins, 2013).

2.12.2.2.19 Redshank (*T. totanus*)

Although a small breeding population is present in Ireland this species predominantly occurs as winter visitors with some passage migrants[21]. During winter redshank are widely-distributed around the coast favouring estuaries and mudflats but can also be found at wetlands inland. They forage in

[20] www.birdwatchireland.ie [Accessed 03/02/2016]

[21] www.birdwatchireland.ie [Accessed 03/02/2016]

muddy estuarine areas including along channels/creeks, feeding mainly on worms, molluscs and other in-fauna. They have a wide foraging distribution within the site (NPWS, 2012a). Redshank is red-listed in Ireland due to a long-term decline in its breeding population (Colhoun & Cummins, 2013).

2.12.2.2.20 Greenshank (*T. nebularia*)

Greenshank is mainly a wintering species in Ireland although there are rare records of breeding. Over-wintering birds are typically present between September and April, with the vast majority occurring in estuaries[22]. They feed in both inter-tidal and sub-tidal zones foraging in channels, brackish water and on mudflats. Greenshank utilise an array of foraging techniques feeding on a wide variety of prey including invertebrate in-fauna, such as molluscs and worms, as well as taking small fish. Greenshank has been found to have a wide distribution within the SPA most probably as a result of territoriality over feeding grounds, which causes birds to disperse throughout the site (NPWS, 2012a).

2.12.2.2.21 Black-headed Gull (*C. ridibundus*)

Black-headed gull is resident in Ireland throughout the year with winter numbers boosted by wintering individuals arriving from mainland Europe. The species over-winters and breeds in both coastal and inland locations, nesting in colonies in sand dunes, coastal islands, moorland polls, bogs and on freshwater lake islands. They take a wide variety of food items including fish, worms, molluscs, insects and plant material and are opportunistic feeders, taking advantage of any available food-source including domestic/fishing waste. They are widely-distributed within the SPA favouring inter-tidal foraging areas (NPWS, 2012a). Black-headed gull is red-listed due to a long term decline in its breeding population and distribution (Colhoun & Cummins, 2013).

2.13 ASSESSMENT OF POTENTIALLY SIGNIFICANT IMPACTS

Identification of the risk of impact does not mean that there is a latent possibility of ecological or environmental damage occurring. The level and significance of the impact depends upon the nature of the risk, the extent of the exposure to the risk and the characteristics of the receptor. The test criteria that pertains to an appropriate assessment carried out under Article 6(3) assessment is to assess whether the impacts identified at section 2.11, above, will have 'an adverse effect on the integrity' of the Natura 2000 sites selected for inclusion in this Natura Impact Statement. The focus is to determine whether the potential impacts identified as plausibly ensuing from the proposal will have adverse impacts on the Conservation Objectives of those sites selected for assessment in the NIS. Where potentially significant adverse effects are identified proven mitigation measures will be recommended.

When Natura 2000 sites are selected for Stage 2 assessment all the qualifying features of conservation interest must be considered. However, when assessing impact, qualifying features are only considered relevant where a credible or tangible source-pathway-receptor link exists between the proposed development and a protected species or habitat type. In order for an impact to occur there must be a risk initiated by having a 'source' (e.g. disturbance of benthic sediment), a 'receptor' (e.g. a protected species associated with aquatic/coastal habitats) and an impact pathway between the source and the receptor (e.g. a watercourse which connects the proposal site to the site designated for the protection of the aforementioned species). Identifying a risk that could, in theory,

[22] www.birdwatchireland.ie [Accessed 03/02/2016]

cause an impact does not automatically mean that the risk event will occur, or that it will cause an adverse impact.

Table 2 above, lists the qualifying features of conservation interest for which the Natura 2000 sites evaluated in this document are designated. An evaluation of each qualifying feature has been carried out to identify which are considered likely ecological receptors of the potential impacts identified, as a result of the proposed dredging works. This evaluation and the rationale underpinning it are outlined in Table 3 and Table 5 above.

There follows an evaluation of significance of potential impacts by the proposed project on the qualifying features that have been selected for impact assessment. This section considers the habitats and species identified in the preceding section together with the potential impacts identified in section 2.11, above, and determines whether the proposed dredging campaign is likely to have significant effects on any of the Natura 2000 sites designated for the protection of the qualifying features selected.

The likelihood of adverse effects to a Natura 2000 site from the project was determined based on a number of indicators including:

- Habitat loss and/or alteration
- Water quality and resource
- Disturbance and/or displacement of species
- Habitat or species fragmentation

The likelihood of significant cumulative/in-combination effects is assessed in section 2.13.5 below.

The habitats and species selected for impact assessment are listed in Table 6 below.

Table 6. Habitats Directive habitats and species selected for impact assessment

Site Code	Qualifying Feature
Species	
Fish	
002165	Sea lamprey (*Petromyzon marinus*) [1095]
002165	River lamprey (*Lampetra fluviatilis*) [1099]
002165	Salmon (*Salmo salar*) [1106]
Mammals	
002165	Otter (*Lutra lutra*) [1355]
002165	Bottle-nosed Dolphin (*Tursiops truncates*) [1349]
Birds	
004077	21 bird species of conservation interest
Habitats	
Coastal and Halophytic	
002165	Estuaries [1130]
002165	Mudflats and sandflats not covered by seawater at low tide [1140]
002165	Reefs [1170]

2.13.1 Water Quality

2.13.1.1 Increase in suspended solid concentration

As the proposed activity will involve disturbance of the estuary bed some increase in levels of suspended sediment will occur in the surrounding water column. However, lower increases in suspended sediment concentrations are expected to occur, relative to other dredge methods, as the plough will simply push any localised accumulations of sediment to adjacent areas of a lower bed depth. As such it is expected that dredge activity will cause only minor increases in the level of re-suspended sediment. Furthermore it is expected that any material which becomes re-suspended as a result of bed disturbance will remain relatively low in the water column, close to the estuary bed. Given that significant disturbance of the estuary bed is not expected as a result of the dredge method to be employed any increase in suspended sediment concentration in the water column will likely occur locally over the relevant dredge area. Much of this material will naturally fall out of suspension over time, re-settling onto the estuary bed. It is expected that the courser fraction of re-suspended material will quickly fall out of the water column towards the estuary bed. Some of the minor fraction, which migrates into areas with lower currents, will also be taken out of suspension. A minor proportion may remain in suspension and will be subject to ambient water currents. The typical suspended sediment concentration in the dredge plume varies from 20 to 100 mg/l with an average concentration of approximately 40 to 60mg/l. For the most part additional suspended sediment concentrations would be less than 50mg/l.

Turbidity surveys carried out on-site in December 2015 indicated potential ambient suspended solid concentrations of 100 to 800mg/l. Therefore, given the natural characteristics of estuarine habitat any temporary increases in suspended sediment concentrations are expected to be minor relative to the naturally high suspended sediment levels associated with transitional water-bodies. Therefore, the potential suspended sediment concentrations as a result of the proposed dredging works are not expected to pose any significant adverse risk to water quality, particularly as any relatively higher suspended sediment concentrations will cover small areas that move with the tide.

2.13.1.2 Benthic contaminants

Marine sediment analysis determined that the sediments within the proposal site do not comprise a radiological hazard. Results indicate that disturbance of these sediments as a result of the proposed dredge campaign will not result in any radiological hazard to the receiving environment (Aquafact , 2016).

Chemical analysis found that all parameters except zinc were below the relevant upper Irish action limits. Zinc was found to have exceeded the upper Irish action limit at station 1 but was found to be below the lower Irish action limits at stations 2 and 3 (Aquafact , 2016). Consultation between Aquafact International Services Ltd. and Margot Cronin of the Marine Institute determined that in this instance, zinc concentrations are not expected to pose any significant risk to the receiving environment. In summary, bed material at the dredge sites is considered to be clean and therefore suitable for the proposed activity.

2.13.1.3 Fuel/oil spill

There is a risk without appropriate mitigation measures in place that point source pollution within the *Lower River Shannon SAC (002165)* and the *River Shannon and River Fergus Estuaries SPA (004077)* could ensue through accidental spillage of fuel/oil into the surrounding aquatic

environment resulting in adverse water quality impacts. Such impacts, were they to arise, could then exert indirect impacts on the habitats and species, as listed in Table 6 above. Given that the potential source of any fugitive emissions of such substances i.e. the dredge vessel itself, will be sited within the Shannon estuary, there is a direct and immediate link between the potential source and ecological receptors within these designated sites.

Section 2.14, below, outlines a programme of mitigation measures designed to control and eliminate the point and diffuse pollution sources identified and to ameliorate the potential adverse water quality impacts that might ensue. Residual impacts are assessed in section 2.152.15 below.

In summary, based on the results of the physiochemical analysis the proposed dredge works are not considered to pose any significant risk to water quality within the *Lower River Shannon SAC (002165)* or the *River Shannon and River Fergus Estuaries SPA (004077).* Given that mitigation measures are in place regarding fuel management associated with the dredge vessel and other vessels which may be present i.e. safety rib, no significant impact to water quality is likely to occur.

2.13.2 Habitat Loss and Alteration

2.13.2.1 Lower River Shannon SAC (002165)

The dredge method to be employed (plough-dredging) will result in localised accumulations of sediment on the estuary bed being dragged to adjacent areas of a lower depth, such that the estuary bed is levelled and as such there will be no direct removal of sediment or associated sub-littoral communities. Therefore there will be no direct habitat loss within the *Lower River Shannon SAC (002165)*. The potential for habitat alteration, including impacts to marine communities which may be present, is discussed as follows:

2.13.2.2 Estuaries

As areas of the estuary bed will be plough-dredged there will be discrete areas of direct habitat alteration within the Shannon Estuary. Localised high points on the estuary bed will be levelled such that these areas and adjacent areas to which sediment will be moved will be subject to direct habitat alteration impacts. Accumulations of sediment and the sub-littoral communities present within them will be dragged to adjacent areas by the action of the plough-dredge. Therefore adjacent bed areas will be overlain with newly-dredged material.

The marine communities present within the *Lower River Shannon SAC (002165)* have been mapped and from this it has been determined that the community-type present within the dredge proposal area is classified as *'Subtidal sand to mixed sediment with Nephtys spp. Community complex'* (NPWS, 2012). This community complex occurs extensively east of Battle Island to Foynes; elsewhere it is recorded from Labasheeda Bay, Clonderalaw Bay, Ballymacrinan Bay, Ballylongford Bay and Carrigaholt Bay. It also occurs from Kilconly Point along the Loop Head Peninsula to the western boundary of the site. It occurs in depths between 2m and 44m. The sediment of the complex is that of sand to mixed sediment with a great deal of variation within the sediment fractions. In the upper to mid estuary the sediment is predominately mixed sediment with pockets of muddy sand. The community is distinguished by the polychaete genera *Nephtys* spp. (NPWS, 2012b).

Faunal sampling and analysis carried out at several sampling stations on-site found that in general sediment samples were species-poor with the number of taxa ranging from 1 (STN 7) to 16 (STN4).

Additionally, taxa were recorded in relatively low abundance (from 2 individuals in STN5 and 7 to 49 specimens in STN4). Diversity and evenness indices were generally low across all stations. No samples were collected at station 1 (STN1) and analysis of the sediment from station 3 (STN3) yielded no macrofauna (Aquafact , 2016).

The faunal assemblage at Stations 2 and 4 (Group d) was dominated by cirratulids (21.24%), *Scoloplos armiger* (also a polychaete, 15.02%), nematodes and nemerteans (21.34% contribution), nephtyid polychaetes (21.34% contribution), capitellids (*Capitella* sp. complex, 10.62%) and tubificid oligochaetes (*T. pseudogaster* agg., 10.62%). The polychaete *S. armiger*, nematodes and nemerteans can be found under most environmental conditions but are more common in situation of excess organic matter loads. Nephtyid polychaetes (such as *N. longosetosa*, found in these samples) are species not generally affected by organic enrichment and include suspension feeders and scavengers (Aquafact , 2016).

The communities at Stations 3 and 5 (Group a) had very few (STN5) or no taxa (STN3). The two taxa found in the sediment samples collected at Station 5 were the polychaete *Protodorvillea kefersteini* (1 specimen) and the oligochaete *Tubificoides amplivastus* (1 specimen) (Aquafact , 2016). Only one taxon was present in the samples from station 7 (Group b), the amphipod *Corophium volutator* (just two individuals). Group c (Stations 6 and 8) contained 6 taxa led by the polychaete *Prionospio* sp., unidentified mytilids (probably *Mytilus edulis* spat) and the bivalves *Macoma balthica*.

Overall, *Nephtys* spp. were not recorded within the sub-littoral communities at Stations 3 and 5 (which were located at the outer berth and along the jetty's eastern approach). While *Nephtys* spp. (*N. Longosetosa*, unidentified *Nephtys* sp.) were found to occur at Stations 2 and 4 they were found to account for approximately 21% of the overall faunal assemblage and so do not represent a dominant component of the community at these locations. Neither the amphipod *Bathyporeia elegans* nor the polychaete *Magelona johnstoni*, both also distinguishing species of this community type, were recorded at any of the sampling stations.

Conclusion

The conservation objectives for the habitat-type Estuaries [1130] relate to maintaining the habitat area and its community distributions within the *Lower River Shannon SAC (002165).* While there may be some limited alteration of the estuary bed within the proposal area, there will be no reduction in the overall habitat area. While there may be some localised and temporary disturbance of the faunal assemblage present, including a limited area which may potentially comprise *Nephtys* spp. as outline above, at most a minor proportion of these taxa may be lost or may be disturbed to adjacent bed areas where they are expected to re-colonise over a relatively short space of time. Furthermore, given the existing level of vessel activity which occurs within the jetty area as a result of import and export activities associated with the facility it can be expected that marine faunal communities present are already exposed to at least some degree of regular disturbance as a result of vessel movements and propeller activity. There are naturally high suspended solid concentrations in the Shannon Estuary as a result of relatively high current speeds and high volumes of river runoff. This suspended solid load moves with the tides and currents and can ultimately settle to the seafloor. This creates an environment and communities adapted to and tolerant of a level of sediment deposition on the seafloor.

For these reasons and bearing in mind that there will be reduction in either habitat area or marine community distribution, no significant adverse impacts on Estuaries [1130] are expected to ensue as a result of the proposed dredging works.

2.13.2.3 Mudflats and sandflats not covered by seawater at low tide

The habitat-type Mudflats and sandflats not covered by seawater at low tide [1140] is considered to provide important feeding habitat for a wide variety of waders and wildfowl as they are typically rich in invertebrate and algal species (DGE, 2013). This habitat-type lies within the immediate vicinity of the proposal area i.e. between the jetty and the shoreline. There will be no dredging within areas of estuary bed designated as 'Mudflats and sandflats not covered by seawater at low tide' therefore there will be no direct loss of this habitat-type. There is, however, some limited potential for indirect habitat alteration through deposition of re-suspended sediment as a result of the proposed dredge activity. Such impacts could in turn result in smothering of faunal/algal communities present within this intertidal area.

However, the courser fraction of any re-suspended material is expected to fall out of suspension quickly and so is most likely to re-settle over the immediate dredge area. Analysis indicated that all the plough material from fine sand to silt is easily suspended and transported away with the tidal velocities on both spring and neap tides. Sediment simulations show that once mobilised there will be very little opportunity for very fine material to settle out due to the high ambient velocities in the estuary near the dredge site (Hydro Environmental Ltd., 2016). Any sediment in suspended form will move into the main estuary flow channel where it is expected to be transported back and forth with the ebbing and flooding tide and as such will be further dispersed with the tide over time (Hydro Environmental Ltd., 2016). The simulations show the plume over a number of tidal excursions is transported up into the lower Fergus Estuary where extensive mud flats already exist. Given the degree of sediment dispersal which can be expected due to tidal influence and the relatively higher suspended sediment concentration occurring naturally within the estuary, particularly in the middle and upper estuary reaches where mud flats and large river inflows occur, the amount of sediment which may potentially be transported towards areas of mudflat habitat is not considered to pose a significant smothering risk to faunal communities present over and above that which would be expected to occur naturally. Furthermore, due to the higher ebbing (outgoing) velocities the sediment plume is expected to travel further westward than eastward, where mudflats and sandflats are not as great a component of the overall estuary area.

Therefore, as there will be no reduction in the overall habitat area or community distribution associated with this habitat-type and no significant adverse impacts are expected to occur to the inter-tidal community present, through dispersal of disturbed sediment and potential smothering effects, and that the limited quantity of material which may potentially settle out is naturally-occurring within the estuary, no impacts to the structure and function and therefore the overall integrity of this habitat-type are expected to occur as a result of the proposed dredging activities.

2.13.2.4 Reefs

The habitat-type Reefs [1170] occurs largely as small, discrete areas of habitat within the vicinity of Aughinish jetty, as shown in Figure 5 above. Due to the nature of the proposed activity there could. In theory, be potential for indirect habitat alteration through smothering impacts as a result of the re-suspension and subsequent dispersal of material.

However, as outlined in section 2.12.2.4 above much of the courser fraction of material is expected to re-settle out of suspension very quickly and so will not pose a risk to areas of reef within the estuary. In terms of finer material which becomes re-suspended in the water column, such as fine sands and silts, this material is expected to be transported into the main estuary channel where it will be influenced heavily by tidal currents and will be transported accordingly on the ebbing and flooding tide. Furthermore, as outlined above, any increases in suspended sediment concentrations as a result of the proposed dredging works are not considered to be of concern in light of the ambient suspended sediment concentrations already occurring naturally within the estuary channel. Any material which does happen to settle onto areas of reef will not be considered to be in excess of that which would normally occur due to the natural deposition and dispersal of sediment within the estuary channel.

Therefore, bearing in mind that there will not be a reduction in either the distribution or area of reef habitat within the estuary and that no significant adverse impacts are expected to communities associated with reef habitat, no adverse impacts to the conservation objectives of reef habitat area expected to occur within the *Lower River Shannon SAC (002165).*

2.13.3 Disturbance and/or Displacement of Species

2.13.3.1 Lower River Shannon SAC

This Natura 2000 site is designated for the protection of one marine species, four freshwater species and one semi aquatic species. Table 7, below lists the species considered to be within the zone of influence of the proposal with their overall conservation status (NPWS 2013).

Table 7. Qualifying interest species for the Lower River Shannon SAC (002165) considered to be within the zone of potential influence

Qualifying interest	Overall conservation status
River lamprey (*Lampetra fluviatilis*)	Favourable
Sea lamprey (*Petromyzon marinus*)	Bad
Salmon (*S. salar*)	Inadequate
Bottlenose dolphin (*T. truncatus*)	Good
Otter (*L. Lutra*)	Favourable

2.13.3.1.1 Sea Lamprey (P. marinus), River Lamprey (L. fluviatilis)

A review of the NBDC on-line distribution mapping for this species determined that the nearest record of sea lamprey to the proposal site is from grid square, R37, which encompasses the River Fergus and its tributaries, which drain into the Shannon Estuary at Ennis, in excess of 16km north of the proposal site. A review of the same map database determined that there are no confirmed records for river lamprey anywhere near the proposal site.

As lamprey are not known to occupy any of the watercourses which drain into the estuary at Aughinish any potential impacts to lamprey as a result of the proposed dredging works are lessened. However, given that there are records for sea lamprey at two sites upriver, including in the River Fergus and the River Shannon and its tributaries, the general area of the proposed works could potentially act as a corridor with adults essentially passing through as they migrate upstream to spawning sites or young make their seaward migration. Based on the precautionary approach it

would be prudent to assume that river lamprey could also migrate through this area during the migratory phases of their life-cycle.

In the unlikely event of lamprey migrating through the area either during or immediately following dredging works any increased suspended sediment concentration within the water column are not expected to pose any significant risk to either species given the scale and intermittent nature of the works and the temporary and localised nature of the dredging. Given the limited increase in suspended material which may occur and the background levels of suspended sediment occurring naturally any increase associated with dredging activity is not expected to have adverse impacts on lamprey which may be passing through the area. Therefore significant impacts to either sea lamprey or river lamprey are not expected to occur as a result of the proposed activity.

2.13.3.1.2 Atlantic Salmon (S. Salar)

Populations of this species are not expected to be resident within the brackish waters of the estuary for significant periods. The estuary area acts as a corridor for returning adults and migrating smolts, linking a variety of freshwater watercourses located upstream to the Atlantic Ocean. There would be no potential for spawning beds or nurseries to exist within the estuary as smaller freshwater streams would be preferred. In the unlikely event of salmon migrating through the area either during or immediately following dredging works any increase in suspended sediment concentrations within the immediate vicinity of the dredge areas will be temporary and not significant, particularly in light of existing background levels. Therefore it is considered that the proposed dredging works are extremely unlikely to pose any significant risk to this species.

2.13.3.1.3 Otter (L. lutra)

The main threat to this species from the proposal is disturbance associated with fugitive noise from dredging and human presence during the works. Some potential also resides for impacts to otters should the proposal lead to a reduction in prey availability by means of adverse water quality impacts.

It is noted that, because otter are an aggressively territorial species, the number of individuals present within the general Aughinish area is expected to be low. With regard to disturbance due to fugitive noise from machinery or human activity it is considered that any otter(s) present are already habituated to the levels of disturbance that prevail at the existing jetty and it is noted that the sources of noise will be restricted to the temporary duration of the proposed programme of works. Therefore significant disturbance or displacement impacts, from fugitive noise associated with the proposal, are not expected to occur.

With regard to a potential reduction in prey availability, which could potentially result from adverse water quality impacts, attention is drawn to the assessment made in section 2.13.1. Given the temporary nature of the increased sedimentation associated with the proposed dredging works, particularly in light of greater existing background levels, a reduction in prey availability that could adversely impacts otter potentially in the area is not expected as a result of the proposal.

2.13.3.1.4 Bottle-nosed Dolphin (T. truncates)

A total of 446 days were monitored for dolphin activity at Aughinish via Static Acoustic Monitoring (SAM) over a 27 month period. Dolphin detections were logged at the site on 29% of days monitored, with ranges in detection positive minutes per day from 0 to 33, meaning dolphins were

present at the site on some occasions for a total of 33 minutes in a day over a 24 hour period (IWDG, 2015). The number of detections was greater during neap tides with significantly more detections recorded during night-time hours (IWDG, 2015). The level of detections at Aughinish relative to other areas within the estuary indicates that this area is not frequented by bottle-nosed dolphins and so is not considered to be within the species core habitat (IWDG, 2015).

The most likely impact to bottle-nosed dolphins within the Lower River Shannon SAC (002165) would be potential disturbance /displacement as a result of noise emissions from dredging activity. Dredge operations emit continuous low frequency sound into the marine environment, however, the sound signature associated with these types of works is generally considered of lesser concern for impacts on marine mammals (IWDG, 2015). The dredger itself is considered to be the greatest potential source of noise and as such the increase in noise will be greatest within the immediate vicinity of the dredger, decreasing with distance. Therefore, although the presence of an operational dredger at the site will lead to a small local increase in noise, given that the Shannon Estuary is Ireland's premier deep-water port, and caters for ships up to 200,000 deadweight tonnage, disturbance from these operations are likely to be minimal (IWDG, 2015).

The proposed dredging works will be temporary and intermittent in nature which will minimise any potential disturbance of dolphins which may be in the area. Dredging will only be carried out during the hours of daylight. Given the high level of vessel activity which occurs throughout the estuary on a daily basis any increase in noise emissions associated with dredge activity are not expected to result in any significant disturbance impacts as it is expected that the resident population would be reasonably habituated to fugitive noise emissions to water. Bearing current levels of vessel activity in mind the resident population of dolphins can also be expected to be used to vessel activity within the estuary and so the presence of the dredge vessel is not considered to pose any risk of collision to dolphins which may potentially be in eh area.

While dolphins may be temporarily displaced from the area whilst dredging is taking place, or as a result of any temporary and localised increased in suspended sediment concentrations, it is expected that dolphins will quickly return to the area once dredging activity has ceased and given that suspended material will be quickly dispersed by tidal currents. Any temporary displacement will be localised to the Aughinish area and as such displacement from key areas of habitat within the estuary is not likely to occur. Again, bearing in mind the existing levels of vessel activity throughout the estuary it is considered likely that any displacement would be short-lived and not result in any significant adverse impacts to the species.

Therefore, for the reasons outlined above, significant, adverse impacts to the conservation objective for bottle-nosed dolphins within the *Lower River Shannon SAC (002165)* are not envisaged as a result of the proposed dredging works.

2.13.3.2 River Shannon and River Fergus Estuaries SPA

It is proposed to carry out dredging works during two annual dredge windows; April and September. Of the 21 bird species which occur within the site and for which the this site is designated all comprise wintering populations only, except cormorant which also breeds within the site, as outlined in Table 4 above.

Due to the proposed dredge schedule almost all of the designated species, except perhaps shoveler, golden plover and knot can be expected to be present within the SPA during dredge periods. However, given difficulties in predicting actual arrival and departure times all species could potentially be present.

The proposed works could potentially result in some limited disturbance of birds in the area due to noise emissions from dredging activity. However, given that the works will be temporary and intermittent in nature any potential disturbance is expected to be short-term and not significant. Furthermore, given the high level of activity which normally takes place within the vicinity of Aughinish and throughout the greater estuarine area, it is expected that bird populations which over-winter within the SPA are already habituated to a relatively high level of noise associated with vessel movements and plant operations. Therefore, given that dredging will take place while the vessel berths are not in use, any noise emissions resulting from dredging activity are not expected to surpass those which would normally occur were the jetty fully operational.

Some of the wintering species, such as shelduck, scaup and greenshank, do occasionally utilise sub-tidal areas for foraging. However, given that there will be no significant direct alteration of the sub-tidal bed areas; significant displacement of these species from potential feeding areas is not considered likely to occur. Bed material will simply be levelled, rather than removed and as such no significant impacts to potential marine prey resources for these species is envisaged.

The dredging is not expected to result in any significant indirect alteration of feeding grounds for birds as it will be conducted exclusively within the sub-tidal zone. In light of the reasons outlined in section 2.13.1 and 2.13.2 above no significant impacts to inter-tidal habitats, such as the mudflats and sandflats occurring within the vicinity of the proposed operations, which are likely to be used as feeding grounds by over-wintering species, are envisaged. The proposed works will not have any significant impacts on other estuarine habitats utilised as feeding grounds, such as rocky shore, therefore displacement from these areas is not considered likely to occur.

Therefore, in light of the reasons outlined above, and bearing in mind the highly localised and temporary nature of the proposed dredge activity, no significant disturbance/displacement impacts to overwintering bird species, for which the *River Shannon and River Fergus estuaries SPA (004077)* is designated, are expected to occur

2.13.4 Habitat or Species Fragmentation

Habitat fragmentation has been defined as ‘reduction and isolation of patches of natural environment’ (Hall et al., 1997 cited in Franklin et al., 2002) which results in spatial separation of habitat areas which had previously been in a state of greater continuity. Adverse effects of habitat fragmentation on species or populations can include the increased isolation of populations which can detrimentally impact on the resilience or robustness of the populations thereby reducing overall species diversity and altering species abundance.

The preceding sections have concluded that significant habitat loss or alteration to any Natura 2000 site are not foreseen, no significant water quality impacts are predicted and significant disturbance or displacement to any species are not expected to ensue. Having regard to the nature and scale of the proposed dredge campaign and the conclusions of the preceding sections it is considered that

significant habitat or species fragmentation impacts are not reasonably foreseeable as a result of the proposal considered in this report.

It is objectively concluded that significant habitat or species fragmentation impacts on the Natura 2000 sites listed at Table 6, as a result of the proposed dredging activity, are not likely.

2.13.5 Cumulative/In-combination Impacts

All of the planning applications which were identified as relevant to the proposal have been completed, following grants of planning permission, except for the installation of a second gantry crane ship unloader which is currently being completed. The installation of this structure is entirely land-based with all standard precaution measures in place regarding storage and use of plant and machinery and the storage and containment of fuels, etc.

The proposed dredging works will take place annually during two optimum dredge windows (April and September) when the jetty is closed to cargo vessel activity. The dredge vessel will remain within the vicinity of the dredge sites during these dredge windows. Given the large numbers of vessels which utilise the greater estuary area movements and activities of the dredge vessel itself are no expected to result in any significant cumulative impacts with other vessels in the area.

The proposed dredge activity will be short-term and intermittent in nature. Analysis of sediment characteristics has determined that the material is clean and does not pose any risk to the surrounding environment. Any material which becomes re-suspended into the water column is what already occur naturally on the estuary bed and levels of re-suspended material are not expected to exceed normal ambient background levels. Therefore agriculture and aquaculture within the area, as potential sources of point and diffuse sources of pollution, are not expected to result in any significant adverse cumulative or in-combination impacts with the proposal.

Bearing in mind the nature and scale of the proposed activity, including the temporary and localised nature of the activity, no significant cumulative/in-combination effects are envisaged, as a result of the programme of works described in section 2.8.5 above.

2.14 MITIGATION

As with most maritime dredging/other large scale projects, environmental monitoring and mitigation will be required throughout the project. The following sections outline the mitigations that will be in place during the operational phase of the project.

2.14.1 Marine Mammals

To minimise the risk of permanent or temporary disturbance to marine mammals, especially bottlenose dolphins in the vicinity of the dredging operations, The NPWS Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters" waters – January 2014' (NPWS 2014) recommends that stated mitigation procedures for dredging are followed and monitored by a suitable qualified Marine Mammal Observer.

- A suitably qualified and experienced marine mammal observer (MMO) will be appointed to monitor for marine mammals, for the duration of the dredging works and will log all relevant events using standardised data forms
- A dedicated Marine Mammal Observer will conduct a 30 minute watch for marine mammals (specifically bottlenose dolphins at this site) within 500m of the dredging vessel prior to the start up. If a seal, otter or bottlenose dolphin is sighted within 500m of the vessel, start up will be delayed until the mammals observed move outside the mitigation zone, or 30 minutes has passed without the mammal being sighted within the mitigation zone
- An agreed, and clear on site communication signal will be used between the MMO, and the Superintendent/Site Engineer, as to whether the relevant activity may proceed, or not, or resume following any break in activities. It shall only commence on positive confirmation with the MMO
- Dredging activities will only commence in daylight hours where effective visual monitoring, as preformed and determined by the MMO, has been achieved. Where effective monitoring (determined by the MMO), has not been achieved/was not possible for some reason, the sound producing activities will be postponed until effective monitoring is possible
- This pre-start-up monitoring will be followed immediately by normal dredging/drilling/pile driving activities. The delay between the end of pre-start-up monitoring, and the full dredging/drilling/pile driving must minimised
- Once normal dredging operations commence, there is no requirement to halt or discontinue the activity at night-time, nor if weather or visibility conditions deteriorate, nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the monitored zone
- Operations will cease temporarily if marine mammals are observed within the monitored zone. Then pre-start monitoring will be carried out again, prior to recommencement of dredging activities
- If there is a break in sound output for greater than 30 minutes (equipment failure/location change/shutdown), then pre-start monitoring will be carried out again, prior to recommencement of dredging activities
- Any approach by marine mammals into the immediate works area should be reported to the National Parks and Wildlife Service

- During movement of vessels (dredger etc.) caution should be exercised to minimize risks to marine mammals that may avoid detection by the MMO. A speed limit of 10 knots will be considered

In addition, it is recommended that the following mitigation measures are implemented to reduce the magnitude of the impact of dredging activities associated with the works to marine mammals:

- Minimise the duration over which these activities are taking place,
- Incorporate "ramp-up" (i.e. "soft start") procedures whereby sound is introduced in a gradual manner to the marine environment

Summary

Based on the location of the Aughinish Jetty within the Lower River Shannon SAC site, and given that there is evidence for the year round detection of dolphins at the site, it is recommended that the NPWS guidelines are adopted, and followed for the duration of all works. Observations should be carried out from land, or from the dredge vessel, at the relevant mitigation outlines above implemented. All observations and a detailed report of mitigation should be used to inform on future works. The proposed works with the mitigation outlines above are considered unlikely to present a risk to bottlenose dolphins, or other marine mammals that could be encountered at the site (IWDG, 2015).

2.14.2 Water Quality Measures

The following water quality measures will be carried out:

- Consult with relevant stakeholders prior to dredging, to inform them
- Prepare contracts which meet the requirements of all licenses, consents and agreements applicable
- Fully brief the contractor beforehand on the sensitivities of the site, and any monitoring that will be taking place
- Ensure dredging is undertaken in a manner that reduces the volumes of sediment that escape into the water column and become suspended in the water column

2.14.2.1 Visual water quality monitoring

Visual monitoring will be carried out from the shore and from the dredging vessel by the Contractor and Resident Engineer. An alarm will be raised if turbidity levels/plume levels increase above a permissible level and dredging activities will cease.

2.14.2.2 Fuel and Oil

There will be no refuelling of the dredger at the site.

Potential leaks from vessels/boats will be mitigated by contractually requiring the contractors to only operate/supply vessels/boats that are in good working order, up to date in servicing etc., and free of leaks.

2.14.2.3 Emergency Plans and Procedures

The contractor will prepare an emergency response plan and set of procedures for events likely to cause pollution including the pollution of watercourses with fuels/oils, spillages, etc. There will be a contingency plan in place during construction and displayed at appropriate locations.

2.14.3 Dredging Activities

- The dredger will operate in an appropriate safe manner
- Short term dredge events will be undertaken at optimal times in the dredge cycle in order to minimise the volume and extent of plume and dispersal

2.14.4 Archaeology

- Archaeological monitoring or dive survey will be carried out if required

2.15 RESIDUAL IMPACTS

From a review of the Sediment Transport Model prepared by Hydro Environmental Ltd, the Marine Mammal Risk Assessment carried out by the Irish Whale and Dolphin Group and marine sediment characterisation analysis carried out by Aquafact International Ltd. and in view of the mitigation measures which have been outline above in section 2.14, no residual impacts to either the *Lower River Shannon SAC (002165)* or the *River Shannon and River Fergus Estuaries SPA (004077)* are expected to occur.

2.16 CONCLUSION

- The proposed project has the potential (without mitigation measures) to impact negatively on the *Lower River Shannon SAC (Site code: 002165)* and the *River Shannon and River Fergus Estuaries SPA (004077)*

- The main potential impacts on these protected sites are the risk of underwater noise and vibration to marine mammals, the impairment of water quality and alteration of aquatic and inter-tidal habitats

- The main features which could potentially be affected (without mitigation measures) are estuaries, mudflats and sandflats not covered by sea water at low tide, reefs, bottlenose dolphin, Atlantic salmon, sea lamprey, river lamprey and otter within the *Lower River Shannon SAC (002165)* and bird species of conservation interest within the *River Shannon and River Fergus SPA (004077)*

- Mitigation measures proposed include the employment of a marine mammal operator (MMO), the presence of a Resident Engineer on-site throughout dredge activity, implementation of best practice guidelines in relation to dredge activity as well as other measures outlined above in section 2.14

- Provided the proposed mitigation measures are fully and adequately implemented during the proposed dredge events, no significant direct, indirect or cumulative impacts to the qualifying features of the Natura 2000 sites listed in Table 6 are likely to occur

- In summary, provided all mitigation measures proposed are fully implemented, it is not expected that there will be an adverse impact on the integrity of the Natura 2000 sites considered in this assessment

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Appendix 1

Stages of Appropriate Assessment

Stage 1 - Screening

This is the first stage of the Appropriate Assessment process and that undertaken to determine the likelihood of significant impacts as a result of a proposed project or plan. It determines need for a full Appropriate Assessment.

If it can be concluded that no significant impacts to Natura 2000 sites are likely then the assessment can stop here. If not, it must proceed to Stage 2 for further more detailed assessment.

Stage 2 - Natura Impact Statement (NIS)

The second stage of the Appropriate Assessment process assesses the impact of the proposal (either alone or in combination with other projects or plans) on the integrity of the Natura 2000 site with respect to the conservation objectives of the site and its ecological structure and function. This is a much more detailed assessment that Stage 1. A Natura Impact Statement containing a professional scientific examination of the proposal is required and includes any mitigation measure to avoid, reduce or offset negative impacts.

If the outcome of Stage 2 is negative i.e. adverse impacts to the sites cannot be scientifically ruled out, despite mitigation, the plan or project should proceed to Stage 3 or be abandoned.

Stage 3 - Assessment of alternative solutions

A detailed assessment must be undertaken to determine whether alternative ways of achieving the objective of the project/plan exists.

Where no alternatives exist the project/plan must proceed to Stage 4.

Stage 4 - Assessment where no alternative solutions exist and where adverse impacts remain

The final stage is the main derogation process examining whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project to adversely affect a Natura 2000 site where no less damaging solution exists.

Appendix 2

Screening for Appropriate Assessment

Malachy Walsh and Partners
Engineering and Environmental Consultants

Screening for Appropriate Assessment

Proposed Maintenance Dredging, Aughinish, Co. Limerick

ISSUE FORM	
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1 SUMMARY OF FINDINGS

1.1 SCREENING FOR APPROPRIATE ASSESSMENT

Project Title	Proposed Maintenance Dredging, Aughinish, Co. Limerick
Project Proponent	Rusal Aughinish
Project Location	Shannon Estuary, Aughinish, Co. Limerick
Conclusion	It has been objectively concluded during the screening process that significant impacts on the following Natura 2000 sites, as a result of the proposed dredging campaign, are not considered likely: • Barrigone SAC (000432) • Askeaton Fen Complex SAC (002279) • Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161) • Curraghchase Woods SAC (000174) It cannot be objectively concluded, at this stage, that significant adverse impacts to the following sites, will not occur: • Lower River Shannon SAC (002165) • River Shannon and River Fergus Estuaries SPA (004077) Therefore, it is necessary to proceed to Appropriate Assessment and as such a Natura Impact Statement is required for these sites

2 INTRODUCTION

2.1 PURPOSE OF ASSESSMENT

This screening for Appropriate Assessment has been undertaken to determine the potential for significant impacts of a proposal to undertake maintenance dredging of the seabed in the Shannon Estuary, at Aughinish, Co. Limerick, on nearby sites with European conservation designations (i.e. Natura 2000 Sites).

This screening for Appropriate Assessment has been undertaken by staff ecologists with Malachy Walsh and Partners, Engineering and Environmental Consultants while additional specialist surveys were undertaken by Aqua-Fact International Services, Hydrographic Surveys Ltd., Hydro Environmental, the Irish Whale and Dolphin Group (IWDG) and Lar Dunne Archaeology.

2.2 LEGISLATIVE CONTEXT

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and wild fauna and flora by the designation of Special Areas of Conservation (SACs) and the Birds Directive (79/409/EEC) seeks to protect birds of special conservation interest (SCI) by the designation of Special Protected Areas (SPAs). It is the responsibility of each member state to designate SPAs and cSACs, both of which will form part of Natura 2000, a network of protected sites throughout the European Community. Further information is available at:

http://ec.europa.eu/environment/nature/legislation/habitatsdirective/

http://www.npws.ie/planning/appropriateassessment/

The current assessment was conducted within this legislative framework and also the DoEHLG (2009) guidelines. As outlined in these, it is the responsibility of the proponent of the project, in this case Rusal Aughinish, to provide a comprehensive and objective screening for Appropriate Assessment which can then be used by the competent authority, in this case the Environmental Protection Agency and the Department of Environment, Community and Local Government, in order to conduct the Appropriate Assessment (DoEHLG, 2009).

2.3 STAGES OF APPROPRIATE ASSESSMENT

The Appropriate Assessment process is a four-stage process with issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. The stages are set out in Appendix 1. This proposal has proceeded as far as Stage 2.

3 ASSESSMENT METHODOLOGY

3.1 APPROPRIATE ASSESSMENT GUIDANCE

This screening for Appropriate Assessment, or Stage 1, has been undertaken in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2001) and the European Commission Guidance 'Managing Natura 2000 sites' (EC, 2000) and guidance prepared by the NPWS (DoEHLG, 2009).

3.2 DESK STUDY

In order to complete the screening for Appropriate Assessment certain information on the existing environment is required. A desk study was carried out to collate available information on the site's natural environment. This comprised a review of the following publications, data and datasets:

- OSI Aerial photography and 1:50000 mapping
- National Parks and Wildlife Service (NPWS)
- National Biodiversity Data Centre (NBDC) (on-line map-viewer)
- BirdWatch Ireland
- Teagasc soil area maps (NBDC website)
- Geological Survey Ireland (GSI) area maps
- Marine Institute (MI) (confirmed marine sediment quality parameters)0
- Environmental Protection Agency (EPA) water quality data
- Shannon International River Basin District (ShIRBD) datasets (Water Framework Directive)
- Other information sources and reports footnoted in the course of the report

3.3 FIELD SURVEYS

A number of marine surveys were completed in support of the Dumping At Sea (DAS) and Foreshore Licence Applications. The following is a list of the studies and reports undertaken which were used to inform the Screening for Appropriate Assessment:

- Bathymetric surveys and analysis
- Tidal current measurements
- Baseline characterisation including benthic faunal sampling, sediment analysis and characterisation
- Sediment transport modelling (STM)
- Marine mammal risk assessment (MMRA)
- Archaeological Impact Assessment

The following sections summarise the methodologies employed for each of the elements listed above.

3.3.1 Bathymetry

Bathymetric survey information was supplied by Rusal Aughinish to Malachy Walsh & Partners. This was supplemented by data from Shannon Foynes Port Company. The bathymetry shows the current bed level adjacent to the jetty within the area of the original granted foreshore lease area.

3.3.2 Current and Tidal Metering

Tidal current metering was undertaken by Hydrographic Surveys Ltd by means of deployment of a number of current meters on the full range of tidal cycles. This tidal current metering was undertaken in January and February 2016. This data was compiled and used in conjunction with an existing historical report completed by Ercon Ltd in 1980. That report characterised the main current regime in the vicinity of the jetty and the main Shannon channel.

Shannon Foynes Port Company also provided current metering information from records they had on currents adjacent to the jetty structure.

The tidal current information was used to examine the likely dispersion of any plume or residue in the water column during and following the dredging/bed levelling process. The tidal current data and bathymetry were then used to calibrate an existing hydrodynamic model of the estuary.

3.3.3 Baseline Characterisation Area

A baseline characterisation assessment of the proposal area was carried out by Aquafact International Services Ltd. to evaluate the potential impacts of the proposed dredging campaign on designated habitats and species within the receiving environment. This involved sediment characterisation at the proposed dredge site as well as sub-tidal faunal assessment at this and additional sample locations within the estuary. All benthic sampling was undertaken on the 25th November 2015.

3.3.3.1 Benthic Faunal Sampling

To carry out the sub-tidal benthic faunal assessment of the proposed dumpsite, eight sites were sampled within and around the dumpsite. Samples were retrieved using a 0.025m^2 van Veen grab. At the laboratory all samples were sorted and identified to species level. Statistical evaluation of the faunal data was undertaken.

3.3.3.2 Granulometry and Organic Carbon Sampling

An additional sample was collected at all eight stations for grain size analysis and organic carbon content. Organic carbon by Loss on Ignition for the faunal samples was carried out by ALS Labs in Loughrea. AquaFact carried out the particle size analysis and moisture and density content analysis.

3.3.3.3 Sediment Characterisation

To carry out the sediment characterisation survey, one grab sample was collected at three stations within the dredge areas. Two of these stations which were selected by the Marine Institute had to be relocated as the sites of the original samples were occupied by vessels. Once back in the lab, all sediment samples for the analysis of organics and contaminants were sent to the Environmental Scientifics Group Limited in Staffordshire. A composite of the Stations 1, 2 and 3 was sent to the Radiological Protection Institute of Ireland (RPII) for radiological analysis.

The sub-tidal and intertidal habitats in and around the Aughinish area have been previously mapped and documented as part of the NPWS mapping programme in the Lower River Shannon cSAC (002165) (NPWS, 2012).

3.3.4 Sediment Transport Model (STM)

An existing model for the estuary was developed by Tony Cawley of Hydro Environmental Services of Galway some years ago. This model was modified, using the new, current data to run a series of scenarios in order to identify where any dredged material may migrate to and the extent of same.

3.3.5 Marine Mammal Risk Assessment (MMRA)

NPWS guidance recommends that certain marine activities, including dredging, are subject to a risk assessment for sound-related impacts on protected marine mammal species, such that an informed assessment can be made by the consenting authority (NPWS, 2014). A Marine Mammal Risk Assessment was carried out in support of the application for a dredge permit and Dumping at Sea

licence for the proposal. The IWDG was commissioned by Malachy Walsh and Partners to carry out this MMRA based on a review of marine mammal activity within the vicinity of the Aughinish Jetty, Co. Limerick.

The following sources of marine mammal records were consulted by IWDG to assess marine mammal occurrence within the vicinity of the proposed dredge campaign:

- The National Biodiversity Data Centre (NBDC) online database of species (accessed at www.biodiversityireland.ie on 14th January, 2016)
- A review of published literature on the distribution and abundance of bottlenose dolphins in the Shannon Estuary SAC.
- A review of Static Acoustic Monitoring (SAM) data from Foynes carried out under the PReCAST programme
- The Shannon Dolphin and Wildlife Foundation (SDWF) an ancillary group of the IWDG who manage and maintain Static Acoustic Monitoring (SAM) data from all around the Shannon Estuary since 2004. The SDWF have an archived dataset of SAM from Auginish between 2011 and 2014 (Accessed 10th January, 2016)

3.4 SCREENING FOR APPROPRIATE ASSESSMENT

As set out in the NPWS (DoEHLG, 2009) guidance, the task of establishing whether a plan or project is likely to have an effect on a Natura 2000 site is based on a preliminary impact assessment using available information and data, including that outlined above, and other available environmental information, supplemented as necessary by local site information and ecological surveys. This is followed by a determination of whether there is a risk that the effects identified could be significant. The precautionary principle approach is required.

Once the potential impacts that may arise from the proposal are identified the significance of these is assessed through the use of key indicators:

- Habitat loss
- Habitat alteration
- Habitat or species fragmentation
- Disturbance and/or displacement of species
- Water quality and resource

4 SCREENING FOR APPROPRIATE ASSESSMENT

Screening for Appropriate Assessment (Stage 1) determines the need for a full Appropriate Assessment (Stage 2) and consists of a number of steps, each of which is addressed in the following sections of this report:

- Establish whether the proposed project is necessary for the management of a Natura 2000 site
- Description of the proposed project
- Identification of Natura 2000 sites potentially affected
- Identification and description of individual and cumulative impacts of the project
- Assessment of the significance of the impacts on the integrity of Natura 2000 sites
- Conclusion of screening stage

4.1 MANAGEMENT OF NATURA 2000 SITES

The proposal is not connected with or necessary to the conservation management of a Natura 2000 site.

4.2 DESCRIPTION OF PLAN/PROJECT

4.2.1 Brief Project Description

It is proposed to undertake maintenance dredging by means of a bed leveller/plough dredger on the sea bed adjacent to the existing deep-water jetty at Aughinish Alumina, Co. Limerick. Aughinish Alumina is an existing industrial facility operated by RUSAL, and is involved in the import and processing of raw bauxite into alumina for export. The dredge campaign will involve the removal of a maximum of 8,000m^3 of material or 16,000 tonnes of material each year. The application for a Dumping at Sea (DaS) licence is being sought for a period of 8 years. The dredging will be undertaken in a number of events over a calendar year as the need arises. The purpose of the maintenance dredging is to make localised adjustments to the bed level where material has accumulated in

mounds or high points on the sea bed. The main focus of maintenance dredging each year will be in the three areas shown on the drawings enclosed with the DAS permit application. There are three main areas, Area A on the outer or Northern Berth, Area B adjacent to the shoreline/facility and Area C which is the inner berth. Bed levelling may also take place in areas adjacent to the jetty and within the manoeuvring area for ships approaching and leaving the jetty.

The proposed dredging will take place within an area of estuary which is contained within the original granted Foreshore Licence/Lease. A map showing proposed dredge sites in relation to the original granted Foreshore Licence is included in the Planning drawings (Drawing No. 17076-1004-A). The application for the DaS permit is being lodged with the Environmental Protection Agency (EPA) and the Foreshore Licence Application is being lodged with the Department of Environment Community and Local Government.

This Screening for Appropriate Assessment will accompany both applications to allow for a full assessment of the implications of the proposal on Natura 2000 sites. The DaS licence will be subject to conditions imposed by the EPA who will be responsible for management and enforcement of such conditions. Copies of additional survey reports are included as attachments to the permit application form.

4.2.2 Purpose of the Project

The purpose of the proposed dredging works is to routinely level the estuary bed alongside an existing jetty in order to maintain design navigational levels and depths of water. Adequate bed levels are essential to facilitate the berthing, turning and navigation of large scale cargo vessels at the jetty.

4.2.3 Site Location

The proposed dredging sites are located within the Shannon Estuary at Aughinish, Co. Limerick, within the immediate vicinity of the existing deep-water jetty. Aughinish is situated approximately 3.5km north-east of Foynes, 12.5km south-west of Shannon and 27km due west of Limerick city.

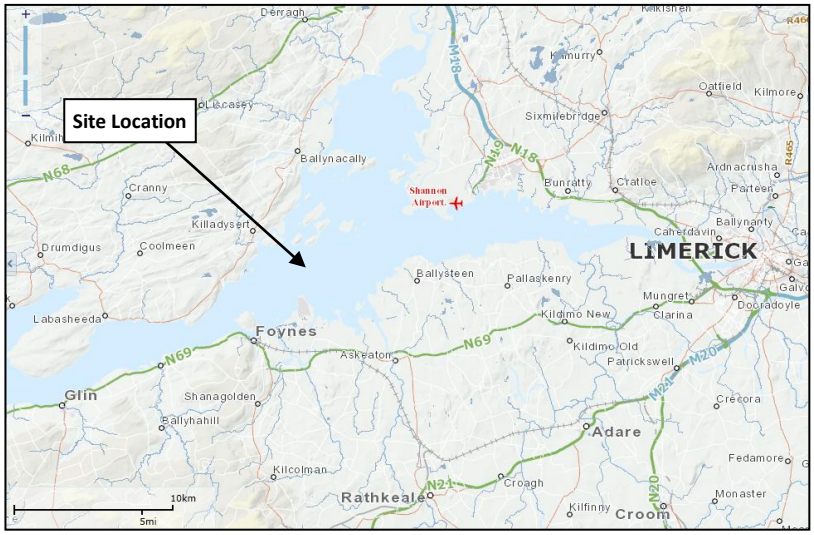

Figure 1. Location of jetty and proposed dredging works (Adapted from the NBDC map-viewer[1])

[1] http://maps.biodiversityireland.ie/#/Map [Accessed 22/01/2016]

4.2.4 Description of the General Location

Aughinish is located in Co. Limerick within the Shannon Estuary. The Shannon Estuary is the largest estuary in Ireland and one of the most important deep-water channels in the country[2]. Plough dredging is routinely used in the Shannon Estuary as part of maintenance operations. Aughinish Alumina, an industrial facility which imports bauxite for processing into alumina, is situated directly on the southern banks of the Shannon Estuary, on what is known as 'Aughinish Island'. Aughinish is one of RUSALs largest alumina refineries operating within the port under the Shannon Foynes Port Company (SFPC).

The facility has a deep-water jetty which provides cargo vessel access for both the import and export of materials. The jetty is accessed from land via a causeway which extends northwards for c.940m, from the plant into the main estuary channel. The land-based area immediately surrounding the proposal site is classified as 'Industrial and commercial units' with 'Inter-tidal flats' extending along the shoreline to the east and west of the facility. Pre-dominant land-use in the greater area is given over to agriculture, classified as 'Pastures'[3].

The majority of the estuarine area surrounding the jetty at Aughinish is sub-tidal in nature, providing access to marine vessels off-loading cargo. As is typical of transitional water-bodies significant volumes of organic and inorganic sediments are carried off-land into the estuary where build-up over time results in insufficient water depths to allow large cargo vessels access to berthing facilities. Therefore, to prevent this, on-going maintenance of navigation channels, in the form of dredging, is required.

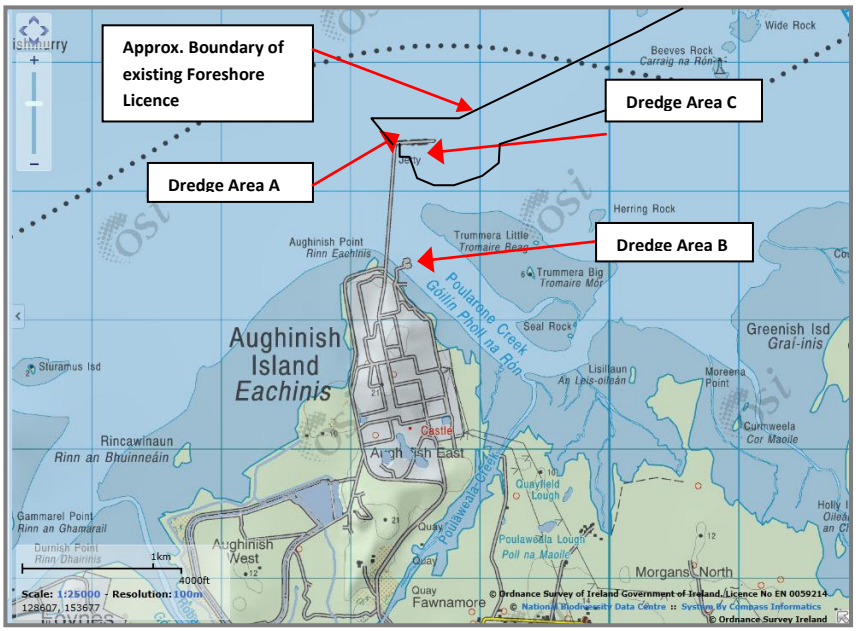

Figure 2. Locations of proposed dredge sites at Aughinish Alumina jetty including approximate boundary of existing Foreshore Licence (Source: NBDC map-viewer)

[2] https://shannonestuarysifp.files.wordpress.com/2015/08/executive_summary_22112013.pdf [Accesssed 26/01/2016]

[3] http://gis.epa.ie/Envision/ [Accessed 01/02/2016]

4.2.5 Description of the Dredge/Dump Site

The dredge method to be employed is plough-dredging. This means that the dredge site will also act as the dumpsite by virtue of the fact that local accumulations of sediment will simply be pushed to adjacent areas of a lower depth, rather than excavated and dumped elsewhere. Existing conditions of the dredge/dump-site are described under the following sub-sections:

4.2.5.1 Bathymetry

Aughinish Alumina and Shannon Foynes Port Company regularly undertake bathymetry surveys adjacent to the jetty and within the approach channel to the jetty. There are historical records of bathymetry dating back in time. The original capital dredge completed at the time of the construction of the alumina facility established the required bed levels to facilitate operation of the jetty.

Drawing numbers 17076 – 1004A, 1005A and 1006A show the existing bed levels adjacent to the jetty and shore line where maintenance dredging will take place. The original as built drawings compiled in 1983 outlined the original design depths. The outer berth has a design depth of -14.3, the inner berth -12.2 CD.

4.2.5.2 Tidal Current Metering

Tidal current metering was completed by Hydrographic Surveys Ltd in January and February 2016 and included both neaps and spring tides. This tidal current metering was supplemented by existing tidal current metering data from the Jetty supplied by SFPC along with a historical tidal current velocity survey completed by Ercon in 1980.

The tidal current metering assisted in the assessment of sediment transport and in categorising the nature of currents in the vicinity and their interaction with the currents of the Shannon estuary channel.

4.2.5.3 Sediment Transport Modelling

Hydro Environmental Ltd. prepared a sediment transport model for the proposed dredge areas adjacent to the jetty. The model was based on an existing Telemac – 2D hydrodynamic module software. The existing hydrodynamic model for the estuary covers an area from Loop Head to Corbally weir and covers an area of 561km^2 of estuary.

Hydro Environmental Ltd. completed a number of simulations based on a four day continuous dredging event for both the spring and neap tides. The simulations show the plume over a number of tidal excursions is transported up in to the lower Fergus Estuary where extensive mud flats already exist.

4.2.5.4 Benthic Ecology

A benthic assessment of sub-tidal fauna carried out at the proposed dredge locations and surrounding area found that benthic samples across all sampling stations were generally species-poor. All species observed were considered typical of silt/clay habitat that contains high levels of organic enrichment. Some of the main dominants of the assemblage included the following major groups: Anthozoa (1), Nematoda (1), Nemertea (1), Annelida: Polychaeta (19), Annelida: Oligochaeta (3), Crustacea (2), and Mollusca (3). Taxa which were recorded were found to occur at low abundance (Aquafact, 2015).

4.2.5.5 Marine Sediments

Following sediment analysis, the overall sediment classification was determined to be silt and fine/very fine sand with sands and silt-clays accounting for the majority of sample compositions. The sediment type within the vicinity of the pier was uniform with all but Station 8 recording silt. The sediment type at station 8 which was located to the east of the pier near the shore was fine sand. All sediments were classified as fine sand or silt. Gravel and coarse sand fractions were extremely low throughout (Aquafact , 2016).

Two metals, arsenic and nickel exceeded the lower Irish action limits at station 3 and Zinc exceeded the upper Irish action limit at station 1. HCB may exceed lower action limits at all stations however, this cannot be determined as the Limits of detection are above the lower action limit. PAH (∑16) exceeded the upper Irish action limit at station 2.

4.2.6 Marine Mammal Risk Assessment (MMRA)

The Shannon Estuary is home to Ireland's only known resident population of bottle-nosed dolphins. The main areas used within the estuary by this cetacean are the outer and mid estuary and these areas are considered core areas for the species (NPWS, 2012). Records of bottle-nose dolphins in the inner estuary are infrequent. A review of Static Acoustic Monitoring (SAM) data, which was carried out at Aughinish from 2011-2014, found bottle-nose dolphins to be present for 29% of days monitored. Similar monitoring, carried out at Foynes from 2009-2010 found dolphins to be present on 41% of days monitored.

No records of otters were found to exist on the NBDC database in the vicinity of the proposed works. Two records were found at adjacent areas but these are from well outside the area of the proposed works. Other marine mammals assessed as part of the MMRA but falling outside the remit of this document included harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*).

4.2.7 Characteristics of the Project

Multiple maintenance dredge-sites are proposed, all of which are located within the immediate vicinity of the existing deep-water jetty operated by Aughinish Alumina. The three main dredge areas proposed are sections of bed underlying both the inner and outer jetty berths as well as a minor area adjacent to the shore, at an additional vessel berth located to the right of the causeway. Sediment accumulation, as a result of both natural hydrological processes and vessel propeller activity, is impacting cargo vessel movements, resulting in the requirement for dredging. Additional local high points on the bed within the immediate vicinity of the jetty may also be dredged where an insufficient water depth exists. All proposed dredge sites fall within the immediate vicinity of the existing jetty. Current water depth at the proposed dredge sites ranges from -8.0m CD to -13.0m CD. The design water depth to be achieved in the area is -14.0m CD, which will allow sufficient clearance for cargo vessels.

The dredge method which will be employed at the location is known as 'plough-dredging 'or bed levelling. This is a method of increasing water depth through levelling of the estuary bed. A plough-dredge, composed of a steel leveller, is dragged over the dredge site which means that material is dragged along the bed to adjacent areas of a lower level. The end result of this dredge method is that local high points on the bed are levelled such that design water depths are restored. Dredged material is mainly dispersed onto the surrounding bed with some proportion dispersing into the water column. As the sites will be plough dredged the dredge sites will also act as the dump-sites.

The proposal relates to an annual dredge campaign with an annual maximum dredge volume of 8,000m^3 or 16,000 tonnes. Maintenance dredging could be undertaken three or four time per year depending on the accumulation of material on the sea bed, its location and its impact on navigation. Dredging events would typically be over a 4 to 5 day period and the volumes could vary between 1000m^3 and 6000m^3. Typically maintenance dredging can take place at different times of year depending on the need and the navigational areas being free of shipping. The prime opportunities occur in April and September due to quieter shipping periods at the jetty.

4.2.7.1 Summary of the Characteristics of the Project

The following table provides a summary of the characteristics of the project. The proposal has been confirmed with the project engineer.

Size, scale, area, land-take	The areas of the various dredge sites are as follows: Dredge Area A (5,740m^2) Dredge Area B (800m^2) Dredge Area C (2,000m^2) Limit of original capital dredge area (257,105m^2) Limit of original capital dredge area plus Dredge Area B (257,905m^2) The annual maximum dredge yield will be 8,000m^3 / 16,000 tonnes. Dredge volumes per dredge event could vary between 1000m^3 and 6000m^3 The dredging locations are all situated within both the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA
Details of physical changes that will take place during the various stages of implementing the proposal	Maintenance dredging will involve the use of a plough dredger to complete bed levelling and move surplus material on the sea bed adjacent to the Jetty at Aughinish. The proposed dredging relates to increasing water depths for safe navigation of ships
Description of resource requirements for the construction/operation and decommissioning of the proposal (water resources, construction material, human presence etc)	The main resource will be the use a plough dredge vessel used to complete the dredging. There may also be general work boats and a rib involved for safety and jetty ship movements/management
Description of timescale for the various activities that will take place as a result of implementation (including likely start and finish date)	There may be 3 or 4 dredge event per year. Each event could last up to 5 days. Ideal target dates would be April and September, but the dredging can be carried out at any time of year providing the jetty and adjacent berthing areas are free of marine traffic and the weather and tides are optimal
Description of wastes arising and other residues (including quantities) and their disposal	No wastes arising
Identification of wastes arising and other residues (including quantities) that may be of particular concern in the context of the Natura 2000 network	No wastes arising
Description of any additional services required to implement the project or plan, their location and means of construction	No services required

4.3 IDENTIFICATION OF OTHER PROJECTS OR PLANS OR ACTIVITIES

4.3.1 Development

A search of Limerick City and County Council's on-line planning enquiry system determined that there are numerous current and outstanding planning applications within the vicinity of the Aughinish jetty and also within the greater area. These are mainly land-based projects with several within the Aughinish alumina plant itself. These relate to the installation of two gas-fired steam boilers and exhaust stacks as well as the installation of a second gantry crane ship un-loader on the northern side of the existing marine terminal[4].

4.3.2 Estuary Operations

The Shannon Estuary is one of the most important navigation channels in the country as the deep waters provide access by some of the largest marine vessels entering Irish waters to ports such as Shannon and Foynes as well as numerous industries located along the estuary's shores[5]. Due to the level of industry in the region significant numbers of vessels utilise the channel, including cargo vessels which berth at the existing deep-water jetty at Aughinish, and as such activity associated with these vessels could potentially result in cumulative/in-combination impacts as a result of the proposal.

4.3.3 Diffuse and Point Sources of Pollution

There are four aquaculture sites in the vicinity of Aughinish. These comprise both intensive and extensive mussel and oyster sites, the closest of which is located approx. 560m to the east. The closest designated shellfish waters are *ca.* 27.2km west of the Aughinish at the Ballylongford. A study of the marine atlas showed that the closest fishing ground is Pot fishing for shrimp *ca.*19.6 Km west of Aughinish. The marine atlas does not show any spawning grounds inside of the Shannon estuary (Aquafact , 2016). Additionally, agriculture is a feature of the greater landscape with improved grassland given over to livestock grazing abundant within the surrounding area. Given the proximity of these activities and the nature of the proposed works the potential for significant cumulative/in-combination effects must be assessed.

4.4 IDENTIFICATION OF NATURA 2000 SITES

4.4.1 Likely Zone of Impact Influence

As described above, the test for the screening for Appropriate Assessment is to assess, in view of best scientific knowledge, if the development, individually or in combination with other plans or projects is likely to have a significant effect on a Nature 2000 site. If there are any significant, potentially significant, or uncertain effects, it will be necessary to proceed to Appropriate Assessment and submit an NIS. National guidance recommends that a list is compiled of all Natura 2000 sites within what is described as a 'likely zone of impact of [a] plan or project' (DoEHLG , 2009, p.32) and which may, or ultimately may not , be impacted upon by the proposal. In the case of plans it is recommended that this zone extends out for a distance of 15km (Scott Wilson *et al*., 2006, cited in DoEHLG, 2009). With regard to projects such as the proposal considered in this report, the guidance goes on to state, as follows:

[4] http://eplan.limerick.ie/searchresults [Accessed 01/02/2016]

[5] https://shannonestuarysifp.wordpress.com/sifp-documents/ [Accessed 01/02/2016]

> *For projects, the distance could be much less than 15km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects.* (DoEHLG, 2009)

The Natura 2000 sites within this 'likely zone of impact' and their qualifying features of Special Conservation Interest are identified in section 4.4.2, below, and the conservation objectives of the sites are described in accordance with the guidance. Following this, the potential impacts associated with the proposal will be identified before an assessment is made of the likely significance of these impacts. If, at the end of the screening process, it cannot be objectively concluded that no significant impacts are likely or, if screening concludes that there is uncertainty about the significance of the impacts, it will be necessary to proceed to Stage 2, Appropriate Assessment, for a more detailed assessment of the potentially significant effects on the Natura 2000 sites in view of their conservation objectives.

4.4.2 Identification of Natura 2000 Sites

Adopting the precautionary principle in identifying potentially affected European sites, it has been decided to include all cSACs and SPAs within 15km of the proposal site.

Table 1 below lists designated cSACs and SPAs within 15km or the zone of influence of the proposal site including their proximity. A map showing these designated sites in relation to the proposal is given in Appendix 3.

Table 1: Natura 2000 sites within 15km radius of proposal site

No.	Designated Site	Site Code	Proximity of site to nearest point of designated site
1	Lower River Shannon SAC	002165	Within this Natura 2000 site
2	River Shannon and River Fergus Estuaries SPA	004077	Within this Natura 2000 site
3	Barrigone SAC	000432	Natura 2000 site located 3.76km to the south-east
4	Askeaton Fen Complex SAC	002279	Natura 2000 site located 8.68km to east
5	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	004161	Natura 2000 site located 10.12km to south-west
6	Curraghchase Woods SAC	000174	Natura 2000 site located 12.37km to south-east

4.4.3 Characteristics of Natura 2000 Sites

The following table lists the qualifying features of conservation interest for the cSACs and SPA sites that lie within 15km of the proposal site. Information pertaining to designated sites is from site synopses, conservation objectives and other information available on www.npws.ie[6].

Table 2: Natura 2000 sites with qualifying features of conservation interest

Designated Site	Qualifying features of conservation interest
Lower River Shannon SAC (002165)	• Sandbanks which are slightly covered by sea water all the time [1110] • Estuaries [1130] • Mudflats and sand flats not covered by seawater at low tide [1140] • Coastal lagoons [1150] • Large shallow inlets and bays [1160] • Reefs [1170] • Perennial vegetation of stony banks [1220] • Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] • *Salicornia* and other annuals colonising mud and sand [1310] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] • Mediterranean salt meadows (*Juncetalia maritimi*) [1410] • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] • *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae, Salicion albae*) [91E0] • Freshwater Pearl Mussel *(Margaritifera margaritifera)* [1029] • Sea Lamprey *(Petromyzon marinus*) [1095] • Brook Lamprey *(Lampetra planeri*) [1096] • River Lamprey *(Lampetra fluviatilis)* [1099] • Salmon *(Salmo salar*) [1106] • Common Bottlenose Dolphin *(Tursiops truncates)* [1349] • Otter *(Lutra lutra*) [1355]

[6] As of 17/7/2015

Designated Site	Qualifying features of conservation interest
River Shannon and River Fergus Estuaries SPA 004077	• Cormorant (*Phalacrocorax carbo*) [A017] • Whooper Swan (*Cygnus cygnus*) [A038] • Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Shelduck (*Tadorna tadorna*) [A048] • Wigeon (*Anas penelope*) [A050] • Teal (*Anas crecca*) [A052] • Pintail (*Anas acuta*) [A054] • Shoveler (*Anas clypeata*) [A056] • Scaup (*Aythya marila*) [A062] • Ringed Plover (*Charadrius hiaticula*) [A137] • Golden Plover (*Pluvialis apricaria*) [A140] • Grey Plover (*Pluvialis squatarola*) [A141] • Lapwing (*Vanellus vanellus*) [A142] • Knot (*Calidris canutus*) [A143] • Dunlin (*Calidris alpina*) [A149] • Black-tailed Godwit (*Limosa li*mosa) [A156] • Bar-tailed Godwit (*Limosa lapponica*) [A157] • Curlew (*Numenius arquata*) [A160] • Redshank (*Tringa totanus*) [A162] • Greenshank (*Tringa nebularia*) [A164] • Black-headed Gull (*Chroicocephalus ridibundus*) [A179] • Wetland and Waterbirds [A999]
Barrigone SAC (000432)	• *Juniperus communis* formations on heaths or calcareous grasslands [5130] • Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] • Limestone pavements [8240] • Marsh Fritillary (*Euphydryas aurinia*) [1065]
Askeaton Fen Complex (002279)	• Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] • Alkaline fens [7230]
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)	• Hen Harrier (*Circus cyaneus*) [A082]
Curraghchase Woods SAC (000174)	• Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] • *Taxus baccata* woods of the British Isles [91J0] • Lesser Horseshoe Bat *(Rhinolophus hipposideros)* [1303]

4.4.4 Conservation Objectives

According to the Habitats Directive, the *conservation status of a natural habitat* will be taken as 'favourable' within its biogeographic range when:

- its natural range and areas it covers within that range are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable as defined below.

According to the Habitats Directive, the conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' within its biogeographic range when:

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

The specific conservation objectives for each site are available on www.npws.ie. These have been accessed for the sites listed in the tables above on the 27/01/2016. Generic conservation objectives were available for the following sites:

- Barrigone SAC (000432)
- Askeaton Fen Complex (002279)
- Stack's to Mullaghareirks, West Limerick Hills and Mount Eagle SPA (004161)
- Curraghchase Woods SAC (000174)

Site specific and more detailed conservation objectives were available for the following sites:

- Lower River Shannon SAC (002165)
- River Shannon and River Fergus Estuaries SPA(004077)

Management plans were not available for any sites.

All conservation objectives together with other designated site information are available on http://www.npws.ie/protectedsites/.

4.5 IDENTIFICATION OF POTENTIAL IMPACTS

Potential likely ecological impacts arising from the project are identified in this section.

Description of elements of the project likely to give rise to potential ecological impacts.	• Plough-dredging (levelling) of the estuary bed resulting in re-suspension of sediment into the water column and dispersal onto adjacent areas of bed • Increase in vessel movements during dredging operations • Increase in noise emissions to air and water during dredging operations, from both the dredge vessel itself and the physical dredge activity • Use of oils/fuels/lubricants
Describe any likely direct, indirect or secondary ecological impacts of the project (either alone or in combination with other plans or projects) by virtue of: ○ *Size and scale;* ○ *Land-take;* ○ *Distance from Natura 2000 Site or key features of the Site;* ○ *Resource requirements;* ○ *Emissions;* ○ *Excavation requirements;* ○ *Transportation requirements;* ○ *Duration of construction, operation etc.; and* ○ *Other.*	• The total sediment volume produced over the eight-year dredge campaign will be c.64,000m^3. This equates to a maximum of 8,000m^3 of sediment produced per annum • The proposed dredging works will take place entirely within the boundary of two Natura 2000 sites; Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077) • Dredging activity will result in alteration of estuary bed at the dredge sites • Water quality impacts from increased suspended sediment and turbidity in the water column potentially causing habitat alteration and/or species displacement • Pollutants/harmful substances could disperse into the aquatic environment once sediments are disturbed impacting on water quality and potentially causing indirect species displacement • Deposition of dredged material could cause habitat alteration and/or species displacement through smothering impacts on in-faunal communities, potentially affecting the food resource of SCI bird species • Increased vessel movements could result in both aquatic and avian species disturbance/displacement • Noise emissions to air during dredging operations could lead to temporary disturbance/displacement of qualifying bird/mammal species • Noise emissions to water during dredging operations could cause temporary disturbance/displacement impacts to marine mammals potentially in the area • Accidental spills of fuels/lubricants could lead to habitat alteration and/or species displacement through adverse impacts to water quality

4.6 ASSESSMENT OF SIGNIFICANCE OF POTENTIAL IMPACTS

This section considers the list of sites identified in section 4.4.2 above, together with the potential ecological impacts identified in the previous section and determines whether the project is likely to have significant effects on a Natura 2000 site.

When assessing impact, Natura 2000 sites are only considered relevant where a credible or tangible source-pathway-receptor link exists between the proposed development and a protected species or habitat type. In order for an impact to occur there must be a risk initiated by having a 'source' (e.g. marine dredging), a 'receptor' (e.g. a protected habitat/species and/or the habitats on which they depend), and an impact pathway between the source and the receptor (e.g. a watercourse which connects the proposal site to the protected species or habitats). An evaluation based on these factors to determine which species and habitats are the plausible ecological receptors for potential impacts of the proposed programme of dredging works will be conducted in sections 4.6.1 and 4.6.2 below. The evaluation takes cognisance of the scope, scale, nature and size of the project, its location relative to the Natura 2000 sites listed in Table 1, above, and the degree of connectedness that exists between the project and each Natura 2000 site's potential ecological receptors.

4.6.1 Natura 2000 sites outside the zone of potential impact influence

With regard to the proposed maintenance dredging, it is considered that the proposal does not include any element that has the potential to significantly alter the favourable conservation status of species and habitats for which certain Natura 2000 sites, listed in Table 1 above, are designated. It is considered that these Natura 2000 sites are outside the zone of potential impact influence of the proposed programme of dredging and that no direct/plausible hydrological connection exists between these Natura 2000 sites and the dredging location. It is also considered that conditions required to initiate a potential 'source-pathway-target' vector connecting the proposal site to these Natura 2000 sites will not be created and that no potential impact pathway connects these sites to the location of the proposed dredging.

Therefore, bearing in mind these aforementioned factors and considering the attenuating effect of the distance intervening between these sites and the location of the proposed programme of dredging works, it is objectively concluded that no significant impacts on these sites are reasonably foreseeable as a result of the programme of works described at section 4.2.7 above.

These sites are listed in Table 3 below and will not be considered further in this document.

Table 3. Natura 2000 sites identified as being outside the zone of potential impact influence

Natura 2000 site	Distance intervening and direction to Natura 2000 site	Rationale for exclusion from assessment
Barrigone SAC (000432)	3.76km to SE	• Not designated for any aquatic/riparian habitats or species • No hydrological connection between the area of works and the Natura 2000 site • Nature of proposed works with regard to the sites conservation interests (terrestrial habitats/species)

Askeaton Fen Complex SAC (002279)	8.68km to E	• No plausible hydrological connection through which dredged sediment could have adverse impacts • Intervening distance between area of works and Natura 2000 site
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)	10.12km to SW	• Not designated for any aquatic/riparian habitats or species • No plausible hydrological connection through which dredged sediment could have adverse impacts • Intervening distance between the area of works and the Natura 2000 site
Curraghchase Woods SAC (000174)	12.37km to SE	• No plausible hydrological connection through which dredged sediment could have adverse impacts • Intervening distance between the area of works and the Natura 2000 site

Therefore, the assessment of significance of potential impacts that follows focuses on the two remaining designated sites. These sites are listed in Table 4 below, with their proximity to the proposal site.

4.6.2 Natura 2000 sites within the zone of potential impact influence

Table 4 below lists the Natura 2000 sites considered to be within the zone of impact influence of the proposal.

Table 4. Natura 2000 sites identified as being within the zone of potential impact influence

Natura 2000 site	Distance intervening and direction to Natura 2000 site
Lower River Shannon SAC (002165)	The proposal site lies within the boundary of this Natura 2000 site
River Shannon and River Fergus Estuaries SPA (004077)	The proposal site lies within the boundary of this Natura 2000 site

The likelihood of significant effects to a Natura 2000 site from the project was determined based on a number of indicators including:

- Habitat loss
- Habitat alteration
- Habitat or species fragmentation
- Disturbance and/or displacement of species
- Water quality and resource

The likelihood of significant cumulative/in-combination effects is assessed in Section 4.6.7.

4.6.3 Habitat Loss and Alteration

The proposed dredging works will take place entirely within the boundary of both the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077). Due to the nature and scale of the proposed works there is potential for direct habitat alteration within these designated sites. Direct habitat alteration could occur through the physical alteration of the estuary bed as a result of plough-dredge activity which would serve to level the estuary bed at the dredge-sites.

Furthermore, there is potential for indirect habitat loss and/or alteration impacts through potential adverse water quality impacts, again due to the nature and scale of the proposed activity. Potential implications for water quality within these Natura 2000 sites are discussed below in section 4.6.4.

Therefore significant adverse impacts to habitats, either directly or indirectly, for which these sites are designated cannot be objectively ruled out at this stage and as such further assessment is required.

4.6.4 Water Quality

The proposed dredging activity could potentially result in adverse impacts to water quality within the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077) through the following mechanisms:

- Increase in suspended solids concentration due to disturbance of estuary bed
- Risk of release and dispersal of pollutants from disturbed sediment
- Risk of leakage of fuel/oil from the dredge vessel into the aquatic environment

Dredging of the estuary bed will cause an increase in suspended sediment concentrations in the water column, both within the vicinity of the dredging works and potentially elsewhere in the estuary, through disturbance of bed sediments. This could potentially lead to adverse water quality impacts and subsequent adverse impacts on SCI habitats and species for which these sites are designated. Dredging of estuarine sediments could result in pollutants/toxic substances, chemically bound to sediment particles, being released into the aquatic environment. The presence of the dredge vessel would increase the risk of oil/fuel spill into the surrounding waters potentially leading to pollution of the aquatic environment and adverse impacts to qualifying features.

Therefore, significant adverse impacts to qualifying interest habitats and species for which these sites are designated, through adverse water quality impacts, cannot be ruled out at this stage.

4.6.5 Disturbance and/or Displacement of Species

The proposed dredging activity could result in disturbance/displacement of those aquatic/estuarine species for which the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077) are designated. Such impacts could occur through potential adverse water quality impacts/habitat alteration impacts/prey population impacts as outlined above, in sections 4.6.3 and 4.6.4. Additionally, fugitive noise emissions to air and water from the dredge vessel itself and from the physical dredge activity, could result in disturbance/displacement of species. As such, further assessment is required as to the significance of such potential impacts, where identified.

4.6.6 Habitat or Species Fragmentation

Habitat fragmentation has been defined as 'reduction and isolation of patches of natural environment' (Hall *et al*., 1997 cited in Franklin *et al*., 2002) usually due to an external disturbance such that an alteration of the spatial composition of a habitat occurs that alters the habitat and 'create[s] isolated or tenuously connected patches of the original habitat' (Wiens, 1989 cited in Franklin *et al*., 2002). This results in spatial separation of habitat units which had previously been in a state of greater continuity.

Adverse effects of habitat fragmentation on species/populations can include increased isolation of species/populations which can detrimentally impact on the resilience or robustness of the species/populations, potentially altering species abundance and leading to a reduction in overall species diversity.

4.6.7 Cumulative/In-combination Impacts

Projects/activities that could act in-combination with the proposed dredge campaign include the normal day-to-day operations within the Shannon Estuary, including the movement of both commercial and non-commercial vessels, as well as other potential sources outlined in section 4.3 above. There is therefore potential for cumulative water quality and/or species disturbance/displacement impacts and as such further assessment is required.

4.7 CONCLUSION OF SCREENING STAGE

In conclusion, to determine the potential impacts, if any, of the proposed dredging campaign on nearby Natura 2000 sites, a screening process for Appropriate Assessment was undertaken. The proposed development is within 15km of six Natura 2000 Sites.

It has been objectively concluded during the screening process that there will be no significant impacts to the following sites as a result of the proposed development:

- **Barrigone SAC (000432)**
- **Askeaton Fen Complex SAC (002279)**
- **Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)**
- **Curraghchase Woods SAC (000174)**

It has been objectively concluded that the proposal to undertake maintenance dredging at Aughinish, Co. Limerick could have significant effects, or significant effects cannot be ruled out at this stage, on two of the Natura 2000 sites within 15km of the proposal, namely the *Lower River Shannon SAC (002165)* and the *River Shannon and River Fergus Estuaries SPA (004077)*. Further assessment is required to determine whether the project is likely to adversely affect the integrity of these Natura 2000 sites.

Hence, the recommendation of the screening process is to proceed to Stage 2; Statement for Appropriate Assessment for two Natura 2000 sites:

- **Lower River Shannon SAC (002165)**
- **River Shannon and River Fergus Estuaries SPA (004077)**

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Appendix 1

Stages of Appropriate Assessment

Stage 1 - Screening

This is the first stage of the Appropriate Assessment process and that undertaken to determine the likelihood of significant impacts as a result of a proposed project or plan. It determines need for a full Appropriate Assessment.

If it can be concluded that no significant impacts to Natura 2000 sites are likely then the assessment can stop here. If not, it must proceed to Stage 2 for further more detailed assessment.

Stage 2 - Natura Impact Statement (NIS)

The second stage of the Appropriate Assessment process assesses the impact of the proposal (either alone or in combination with other projects or plans) on the integrity of the Natura 2000 site with respect to the conservation objectives of the site and its ecological structure and function. This is a much more detailed assessment that Stage 1. A Natura Impact Statement containing a professional scientific examination of the proposal is required and includes any mitigation measure to avoid, reduce or offset negative impacts.

If the outcome of Stage 2 is negative i.e. adverse impacts to the sites cannot be scientifically ruled out, despite mitigation, the plan or project should proceed to Stage 3 or be abandoned.

Stage 3 - Assessment of alternative solutions

A detailed assessment must be undertaken to determine whether alternative ways of achieving the objective of the project/plan exists.

Where no alternatives exist the project/plan must proceed to Stage 4.

Stage 4 - Assessment where no alternative solutions exist and where adverse impacts remain

The final stage is the main derogation process examining whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project to adversely affect a Natura 2000 site where no less damaging solution exists.

Appendix 2

Site Synopses

SITE SYNOPSIS

Site Name: Barrigone SAC

Site Code: 000432

Barrigone is situated approximately 5 km west of Askeaton, Co. Limerick. The site comprises an area of dry, species-rich, calcareous grassland and patches of scrub on a gentle, north-east-facing slope. The underlying limestone outcrops occasionally, and the proximity of the site to the Shannon Estuary adds a maritime influence.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[5130] Juniper Scrub
[6210] Orchid-rich Calcareous Grassland*
[8240] Limestone Pavement*
[1065] Marsh Fritillary (*Euphydryas aurinia*)

The open calcareous grassland supports an impressive range of plant species. Cowslip (*Primula veris*), Mountain Everlasting (*Antennaria dioica*), Carline Thistle (*Carlina vulgaris*), Wild Thyme (*Thymus praecox*), Wood Sage (*Teucrium scorodonia*) and Violets (*Viola* spp.) are present, while Burnet Rose (*Rosa pimpinellifolia*) is abundant and scattered throughout the grassland. The maritime influence is evident through the presence in the sward of Sea Plantain (*Plantago maritima*). The orchid flora is particularly well-developed and diverse, with eight species recorded on recent visits. These include Fragrant Orchid (*Gymnadenia conopsea*), Frog Orchid (*Coeloglossum viride*), Butterfly Orchid (*Platanthera bifolia*), Pyramidal Orchid (*Anacamptis pyramidalis*) and the scarce Irish Orchid (*Neotinea maculata*).

A range of scrub types are present, including a dense stand of Hazel (*Corylus avellana*) towards the south, and a small area dominated by Juniper (*Juniperus communis*) in the north. Blackthorn (*Prunus spinosa*), Hawthorn (*Crataegus monogyna*) and Gorse (*Ulex europaeus*) also form scrub patches, and these tend to be less species-rich.

Hairy Violet (*Viola hirta*), a species protected under the Flora (Protection) Order, 1999, occurs at Barrigone. The site also holds a large population of the Marsh Fritillary butterfly (*Euphydryas aurinia*), a species listed under Annex II of the E.U. Habitats Directive.

The primary threat to this site is quarrying. Grazing is also an important factor; over-grazing would cause damage to the vegetation, while under-grazing would allow scrub encroachment at the expense of grassland species which require more open

conditions. A balance between scrub and grassland is also important for invertebrate species.

A number of factors, including substrate, bedrock, microclimate and maritime influence, contribute to the floristic richness at Barrigone and hence to the ecological interest of this site. The presence of rare species of plant and invertebrate highlight the site's conservation value.

SITE SYNOPSIS

Site Name: Curraghchase Woods SAC

Site Code: 000174

This site is situated approximately 7 km east of Askeaton in Co. Limerick. The area is characterised by glacial drift deposits over Carboniferous limestone. The site consists largely of mixed woodland and a series of wetlands.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[91E0] Alluvial Forests*
[91J0] Yew Woodlands*
[1303] Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

One of the main interests at the site is the presence of a hibernation site of the Lesser Horseshoe Bat. The bats hibernate in the cellars of the former mansion Curraghchase House. The entrance to the cellar is now grilled and all other access points blocked to prevent disturbance. In recent years bats have remained within the cellar throughout the year.

In winter 1995/96 more than 60 bats were recorded in the hibernation site, rating the site of international importance. It is considered that the number of bats will increase now that the site is protected from disturbance. This is the largest known site for this species in Co. Limerick.

The woodland consists of both deciduous species and stands of commercial conifers. Beech (*Fagus sylvatica*) is the most frequent deciduous species, but Pedunculate Oak (*Quercus robur*), Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*) and Hornbeam (*Carpinus betulus*) are also present. Spruce (*Picea* sp.) and Scots Pine (*Pinus sylvestris*) are the commonest conifers. Hazel (*Corylus avellana*) scrub and areas of wet woodland (*Salix* spp.) also occur.

The alluvial forest occurs in the southern part of the site and occupies low ground in a stream valley and some areas adjacent to a small lake. The dominant canopy species include Rusty Willow (*Salix cinerea* subsp. *oleifolia*), Alder (*Alnus glutinosa*), Downy Birch (*Betula pubescens*) and Ash. Exotics also occur, both conifer and broadleaved species, such as Beech and Horse-chestnut (*Aesculus hippocastanum*). A rich herb layer is found where the conifers are less dense, characterised by such species as Bugle (*Ajuga reptans*), Hemlock Water-dropwort (*Oenanthe crocata*), Yellow Iris (*Iris pseudacorus*), Meadowsweet (*Filipendula ulmaria*), Water-cress (*Nasturtium officinale*), Common Nettle (*Urtica dioica*) and Wood Sanicle (*Sanicula europaea*).

The Yew wood occurs as a stand on a limestone ridge above a stream valley. It is associated with an Oak-Ash wood, but also has a range of commercial planted species. Nevertheless, Yew is well represented and is readily regenerating. Other species present include Holly (*Ilex aquifolium*), Ash, Pedunculate Oak, Hazel and Hawthorn (*Crataegus monogyna*).

A series of small lakes and fens runs the length of the site. Some of these lakes are overgrown with vegetation. Black Bog-rush (*Schoenus nigricans*), Great Fen-sedge (*Cladium mariscus*), Greater Tussock-sedge (*Carex paniculata*), Carnation Sedge (*Carex panicea*) and Blunt-flowered Rush (*Juncus subnodulosus*) are some of the wetland species recorded. These wetlands, along with some wet grassland, add habitat diversity to the site.

The semi-natural habitats within the site provide ideal foraging habitat for the Lesser Horseshoe Bat. Further planting of conifer tree species at the expense of deciduous species should be avoided and attempts should be made to increase the area of deciduous woodland.

The combination of a secure hibernation site and suitable foraging habitat and the presence of over 60 individuals make Curraghchase Woods an internationally important site for the Lesser Horseshoe Bat. The presence of two woodland types that are listed with priority status on Annex I of the E.U. Habitats Directive, and especially Yew woodland, which is of very limited occurrence in Ireland, is of particular note.

SITE SYNOPSIS

Site Name: Lower River Shannon SAC

Site Code: 002165

This very large site stretches along the Shannon valley from Killaloe in Co. Clare to Loop Head/ Kerry Head, a distance of some 120 km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1110] Sandbanks
[1130] Estuaries
[1140] Tidal Mudflats and Sandflats
[1150] Coastal Lagoons*
[1160] Large Shallow Inlets and Bays
[1170] Reefs
[1220] Perennial Vegetation of Stony Banks
[1230] Vegetated Sea Cliffs
[1310] *Salicornia* Mud
[1330] Atlantic Salt Meadows
[1410] Mediterranean Salt Meadows
[3260] Floating River Vegetation
[6410] *Molinia* Meadows
[91E0] Alluvial Forests*
[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
[1095] Sea Lamprey (*Petromyzon marinus*)
[1096] Brook Lamprey (*Lampetra planeri*)
[1099] River Lamprey (*Lampetra fluviatilis*)
[1106] Atlantic Salmon (*Salmo salar*)
[1349] Bottle-nosed Dolphin (*Tursiops truncatus*)
[1355] Otter (*Lutra lutra*)

The Shannon and Fergus Rivers flow through Carboniferous limestone as far as Foynes, but west of Foynes Namurian shales and flagstones predominate (except at Kerry Head, which is formed from Old Red Sandstone). The eastern sections of the Feale catchment flow through Namurian rocks and the western stretches through Carboniferous limestone. The Mulkear flows through Lower Palaeozoic rocks in the upper reaches before passing through Namurian rocks, followed by Lower Carboniferous shales and Carboniferous limestone. The Mulkear River itself, immediately north of Pallas Green, passes through an area of Rhyolites, Tuffs and Agglomerates.

The Shannon and Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon Estuary (considered to be a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit there are several tributaries with their own 'sub-estuaries' e.g. the Deel River, Mulkear River, and Maigue River. To the west of Foynes, a number of small estuaries form indentations in the predominantly hard coastline, namely Poulnasherry Bay, Ballylongford Bay, Clonderalaw Bay and the Feale or Cashen River estuary.

Both the Fergus and inner Shannon Estuaries feature vast expanses of intertidal mudflats, often fringed with saltmarsh vegetation. The smaller estuaries also feature mudflats, but have their own unique characteristics, e.g. Poulnasherry Bay is stony and unusually rich in species and biotopes. Plant species are typically scarce on the mudflats, although there are some eelgrass (*Zostera* spp.) beds and patches of green algae (e.g. *Ulva* sp. and *Enteromorpha* sp.). The main macro-invertebrate community which has been noted from the inner Shannon and Fergus estuaries is a *Macoma-Scrobicularia-Nereis* community.

In the transition zone between mudflats and saltmarsh, specialised colonisers of mud predominate. For example, swards of Common Cord-grass (*Spartina anglica*) frequently occur in the upper parts of the estuaries. Less common are swards of Glasswort (*Salicornia europaea* agg.). In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Common Reed (*Phragmites australis*) and club-rushes (*Scirpus maritimus, S. tabernaemontani* and *S. triquetrus*). In addition to the nationally rare Triangular Club-rush (*Scirpus triqueter*), two scarce species are found in some of these creeks (e.g. Ballinacurra Creek): Lesser Bulrush (*Typha angustifolia*) and Summer Snowflake (*Leucojum aestivum*).

Saltmarsh vegetation frequently fringes the mudflats. Over twenty areas of estuarine saltmarsh have been identified within the site, the most important of which are around the Fergus estuary and at Ringmoylan Quay. The dominant type of saltmarsh present is Atlantic salt meadow occurring over mud. Characteristic species occurring include Common Saltmarsh-grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea-milkwort (*Glaux maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*), Creeping Bent (*Agrostis stolonifera*), Saltmarsh Rush (*Juncus gerardi*), Long-bracted Sedge (*Carex extensa*), Lesser Sea-spurrey

(*Spergularia marina*) and Sea Arrowgrass (*Triglochin maritima*). Areas of Mediterranean salt meadows, characterised by clumps of Sea Rush (*Juncus maritimus*) occur occasionally. Two scarce species are found on saltmarshes in the vicinity of the Fergus estuary: a type of robust saltmarsh-grass (*Puccinellia foucaudii*), sometimes placed within the species Common Saltmarsh-grass (*P. maritima*) and Hard-grass (*Parapholis strigosa*).

Saltmarsh vegetation also occurs around a number of lagoons within the site, two of which have been surveyed as part of a National Inventory of Lagoons. Cloonconeen Pool (4-5 ha) is a natural sedimentary lagoon impounded by a low cobble barrier. Seawater enters by percolation through the barrier and by overwash. This lagoon represents a type which may be unique to Ireland since the substrate is composed almost entirely of peat. The adjacent shore features one of the best examples of a drowned forest in Ireland. Aquatic vegetation in the lagoon includes typical species such as Beaked Tasselweed (*Ruppia maritima*) and green algae (*Cladophora* sp.). The fauna is not diverse, but is typical of a high salinity lagoon and includes six lagoon specialists (*Hydrobia ventrosa, Cerastoderma glaucum, Lekanesphaera hookeri, Palaemonetes varians, Sigara stagnalis* and *Enochrus bicolor*). In contrast, Shannon Airport Lagoon (2 ha) is an artificial saline lake with an artificial barrier and sluiced outlet. However, it supports two Red Data Book species of stonewort (*Chara canescens* and *Chara cf. connivens*).

Most of the site west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs. The cliffs in the outer part of the site are sparsely vegetated with lichens, Red Fescue, Sea Beet (*Beta vulgaris* subsp. *maritima*), Sea Campion (*Silene vulgaris* subsp. *maritima*), Thrift and plantains (*Plantago* spp.). A rare endemic type of sea-lavender, *Limonium recurvum* subsp. *pseudotranswallianum,* occurs on cliffs near Loop Head. Cliff-top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated, with swards of Red Fescue and species such as Kidney Vetch (*Anthyllis vulneraria*) and Common Bird's-foot-trefoil (*Lotus corniculatus*).

The site supports an excellent example of a large shallow inlet and bay. Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered. All shores in the site have a zone of sand hoppers at the top, and below this each of the shores has different characteristic species giving a range of different shore types.

The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore. Well developed lichen zones and littoral reef communities offering a high species richness in the sublittoral fringe and strong populations of the Purple Sea Urchin *Paracentrotus lividus* are found. The communities found are tolerant to sand scour and tidal streams. The infralittoral reefs range from sloping platforms with some vertical steps, to ridged bedrock with

gullies of sand between the ridges, to ridged bedrock with boulders or a mixture of cobbles, gravel and sand. Kelp is very common to about 18 m. Below this it becomes rare and the community is characterised by coralline crusts and red foliose algae.

Other coastal habitats that occur within the site include stony beaches and bedrock shores (these support a typical zonation of seaweeds such as *Fucus* spp., *Ascophyllum nodosum* and kelps), shingle beaches (with species such as Sea Beet, Sea Mayweed - *Matricaria maritima*, Sea Campion and Curled Dock - *Rumex crispus*), sandbanks which are slightly covered by sea water at all times (e.g. in the area from Kerry Head to Beal Head) and sand dunes (a small area occurs at Beal Point, where Marram – *Ammophila arenaria* is the dominant species).

Freshwater rivers have been included in the site, most notably the Feale and Mulkear catchments, the Shannon from Killaloe to Limerick (along with some of its tributaries, including a short stretch of the Kilmastulla River), the Fergus up as far as Ennis, and the Cloon River. These systems are very different in character: the Shannon is broad, generally slow flowing and naturally eutrophic; the Fergus is smaller and alkaline; while the narrow, fast flowing Cloon is acid in nature. The Feale and Mulkear catchments exhibit all the aspects of a river from source to mouth. Semi-natural habitats, such as wet grassland, wet woodland and marsh occur by the rivers, but improved grassland is the most common habitat type. One grassland type of particular conservation significance, *Molinia* meadows, occurs in several parts of the site and the examples at Worldsend on the River Shannon are especially noteworthy. Here are found areas of wet meadow dominated by rushes (*Juncus* spp.) and sedges (*Carex* spp.), and supporting a diverse and species-rich vegetation, including such uncommon species as Blue-eyed Grass (*Sisyrinchium bermudiana*) and Pale Sedge (*C. pallescens*).

Floating river vegetation characterised by species of water-crowfoot (*Ranunculus* spp.), pondweeds (*Potamogeton* spp.) and the moss *Fontinalius antipyretica* are present throughout the major river systems within the site. The rivers contain an interesting bryoflora with *Schistidium alpicola* var. *alpicola* recorded from in-stream boulders on the Bilboa, new to Co. Limerick.

Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick. The woodland is up to 50 m wide on the banks and somewhat wider on the largest island. The most prominent woodland type is gallery woodland where White Willow (*Salix alba*) dominates the tree layer with occasional Alder (*Alnus glutinosa*). The shrub layer consists of various willow species with Rusty Willow (*Salix cinerea* ssp. *oleifolia*) and what appear to be hybrids of *S. alba* x *S. viminalis.* The herbaceous layer consists of tall perennial herbs. A fringe of bulrush (*Typha* sp.) occurs on the river side of the woodland. On slightly higher ground above the wet woodland and on the raised embankment remnants of mixed oak-ash-alder woodland occur. These are poorly developed and contain numerous exotic species but locally there are signs that it is invading open grassland. Alder is the principal tree species, with occasional Pedunculate Oak (*Quercus robur*), elm (*Ulmus glabra* and *U. procera*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and

the shrubs Guelder-rose (*Viburnum opulus*) and willows. The ground flora is species-rich.

While woodland is infrequent within the site, however Cahiracon Wood contains a strip of old oak woodland. Sessile Oak (*Q. petraea*) forms the canopy, with an understorey of Hazel and Holly (*Ilex aquifolium*). Great Wood-rush (*Luzula sylvatica*) dominates the ground flora. Less common species present include Great Horsetail (*Equisetum telmeteia*) and Pendulous Sedge (*Carex pendula*).

In the low hills to the south of the Slievefelim Mountains, the Cahernahallia River cuts a valley through the Upper Silurian rocks. For approximately 2 km south of Cappagh Bridge at Knockanavar, the valley sides are wooded. The woodland consists of birch (*Betula* spp.), Hazel, oak, Rowan (*Sorbus aucuparia*), some Ash (*Fraxinus excelsior*) and willow (*Salix* spp.). Most of the valley is not grazed by stock, and as a result the trees are regenerating well. The ground flora features prominent Great wood-rush and Bilberry (*Vaccinium myrtillus*), along with a typical range of woodland herbs. Bracken (*Pteridium aquilinum*) is a feature in areas where there is more light available.

The valley sides of the Bilboa and Gortnageragh Rivers, on higher ground north-east of Cappamore, support patches of semi-natural broadleaf woodland dominated by Ash, Hazel, oak and birch. There is a good scrub layer with Hawthorn, willow, Holly and Blackthorn (*Prunus spinosa*) common. The herb layer in these woodlands is often open, with a typically rich mixture of woodland herbs and ferns. Moss species diversity is high. The woodlands are ungrazed. The Hazel is actively coppiced in places.

There is a small area of actively regenerating cut-away raised bog at Ballyrorheen. It is situated approximately 5 km north-west of Cappamore in Co. Limerick. The bog contains some wet areas with good cover of bog mosses (*Sphagnum* spp.). Species of particular interest include Cranberry (*Vaccinium oxycoccos*) and White Sedge (*Carex curta*), along with two regionally rare mosses, including the bog moss *S. fimbriatum*. The site is being invaded by Downy Birch (*Betula pubescens*) scrub woodland. Both commercial forestry and the spread of Rhododendron (*Rhododendron ponticum*) has greatly reduced the overall value of the site.

A number of plant species that are listed in the Irish Red Data Book occur within the site, and several of these are protected under the Flora (Protection) Order, 1999. These include Triangular Club-rush (*Scirpus triquetrus*), a species which is only found in Ireland only in the Shannon Estuary, where it borders creeks in the inner estuary. Opposite-leaved Pondweed (*Groenlandia densa*) is found in the Shannon where it passes through Limerick City, while Meadow Barley (*Hordeum secalinum*) is abundant in saltmarshes at Ringmoylan and Mantlehill. Hairy Violet (*Viola hirta*) occurs in the Askeaton/Foynes area. Golden Dock (*Rumex maritimus*) is noted as occurring in the River Fergus estuary. Finally, Bearded Stonewort (*Chara canescens*), a brackish water specialist, and Convergent Stonewort (*Chara connivens*) are both found in Shannon Airport Lagoon.

Overall, the Shannon and Fergus Estuaries support the largest numbers of wintering waterfowl in Ireland. The highest count in 1995-96 was 51,423 while in 1994-95 it was 62,701. Species listed on Annex I of the E.U. Birds Directive which contributed to these totals include: Great Northern Diver (3; 1994/95), Whooper Swan (201; 1995/96), Pale-bellied Brent Goose (246; 1995/96), Golden Plover (11,067; 1994/95) and Bar-tailed Godwit (476; 1995/96). In the past, three separate flocks of Greenland White-fronted Goose were regularly found, but none were seen in 1993/94.

Other wintering waders and wildfowl present include Greylag Goose (216; 1995/96), Shelduck (1,060; 1995/96), Wigeon (5,976; 1995/96), Teal (2,319; 1995-96), Mallard (528; 1995/96), Pintail (45; 1995/96), Shoveler (84; 1995/96), Tufted Duck (272; 1995/96), Scaup (121; 1995/96), Ringed Plover (240; 1995/96), Grey Plover (750; 1995/96), Lapwing (24,581; 1995/96), Knot (800; 1995/96), Dunlin (20,100; 1995/96), Snipe (719, 1995/96), Black-tailed Godwit (1,062; 1995/96), Curlew (1,504; 1995/96), Redshank (3,228; 1995/96), Greenshank (36; 1995/96) and Turnstone (107; 1995/96). A number of wintering gulls are also present, including Black-headed Gull (2,216; 1995/96), Common Gull (366; 1995/96) and Lesser Black-backed Gull (100; 1994/95). This is the most important coastal site in Ireland for a number of the waders including Lapwing, Dunlin, Snipe and Redshank. It also provides an important staging ground for species such as Black-tailed Godwit and Greenshank.

A number of species listed on Annex I of the E.U. Birds Directive breed within the site. These include Peregine Falcon (2-3 pairs), Sandwich Tern (34 pairs on Rat Island, 1995), Common Tern (15 pairs: 2 on Sturamus Island and 13 on Rat Island, 1995), Chough (14-41 pairs, 1992) and Kingfisher. Other breeding birds of note include Kittiwake (690 pairs at Loop Head, 1987) and Guillemot (4,010 individuals at Loop Head, 1987).

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary. This is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. The population is estimated (in 2006) to be 140 ± 12 individuals. Otter, a species also listed on Annex II of this Directive, is commonly found on the site.

Five species of fish listed on Annex II of the E.U. Habitats Directive are found within the site. These are Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Allosa fallax fallax*) and Salmon (*Salmo salar*). The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries. The Fergus is important in its lower reaches for spring salmon, while the Mulkear catchment excels as a grilse fishery, though spring fish are caught on the actual Mulkear River. The Feale is important for both types. Twaite Shad is not thought to spawn within the site. There are few other river systems in Ireland which contain all three species of lamprey.

Two additional fish species of note, listed in the Irish Red Data Book, also occur, namely Smelt (*Osmerus eperlanus*) and Pollan (*Coregonus autumnalis pollan*). Only the former has been observed spawning in the Shannon.

Freshwater Pearl Mussel (*Margaritifera margaritifera*), a species listed on Annex II of the E.U. Habitats Directive, occurs abundantly in parts of the Cloon River.

There is a wide range of land uses within the site. The most common use of the terrestrial parts is grazing by cattle, and some areas have been damaged through over-grazing and poaching. Much of the land adjacent to the rivers and estuaries has been improved or reclaimed and is protected by embankments (especially along the Fergus estuary). Further, reclamation continues to pose a threat, as do flood relief works (e.g. dredging of rivers). Gravel extraction poses a major threat on the Feale.

In the past, cord-grass (*Spartina* sp.) was planted to assist in land reclamation. This has spread widely, and may oust less vigorous colonisers of mud and may also reduce the area of mudflat available to feeding birds.

Domestic and industrial wastes are discharged into the Shannon, but water quality is generally satisfactory, except in the upper estuary where it reflects the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences of industrial discharges apparent. Further industrial development along the Shannon and water polluting operations are potential threats.

Fishing is a main tourist attraction on the Shannon and there are a large number of angler associations, some with a number of beats. Fishing stands and styles have been erected in places. The River Feale is a designated Salmonid Water under the E.U. Freshwater Fish Directive. Other uses of the site include commercial angling, oyster farming, boating (including dolphin-watching trips) and shooting. Some of these may pose threats to the birds and dolphins through disturbance. Specific threats to the dolphins include underwater acoustic disturbance, entanglement in fishing gear and collisions with fast moving craft.

This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitats lagoon and alluvial woodland, the only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species. A good number of Red Data Book species are also present, perhaps most notably the thriving populations of Triangular Club-rush. A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding. Indeed, the Shannon and Fergus Estuaries form the largest estuarine complex in Ireland and support more wintering wildfowl and waders than any other site in the country. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter.

SITE SYNOPSIS

Site Name: Askeaton Fen Complex SAC

Site Code: 002279

Askeaton Fen Complex consists of a number of small fen areas to the east and south-east of Askeaton in Co. Limerick. This area has a number of undulating hills, some of which are quite steep, and is underlain by Lower Carboniferous Limestone. At the base of the hills a series of fens/reedbeds/loughs can be found, often in association with marl or peat deposits. At the south-east of Askeaton, both Cappagh and Ballymorisheen fens are surrounded by large cliff-like rocky limestone outcrops.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7210] *Cladium* Fens*
[7230] Alkaline Fens

In Askeaton Fen Complex SAC a diversity of fen types are represented in a gradation from open water to drier seepage areas. One of the more important fen types, *Cladium* fen, which contains Great Fen-sedge (*Cladium mariscus*), occurs in various forms and is the most common fen type within the SAC. It is associated with wet conditions generally not >25 cm deep and can be found in mono-dominant stands growing on a marl base, such as at Feereagh and Mornane Loughs, and in the fen in the townland of Mornane. It can also be co-dominant with Common Reed (*Phragmites australis*) in slightly drier conditions, such as in Deegerty, Blind Lough and Dromlohan. It is also found in association with alkaline fen species such as Black Bog-rush (*Schoenus nigricans*) where it grows on a peaty substrate. *Cladium* fen is indicative of extremely base rich conditions. Typical species seen growing with the Great Fen-sedge include pondweeds (*Potamogeton* spp.), Marsh Horsetail (*Equisetum palustre*), Water Horsetail (*E. fluviatile*), Lesser Water-parsnip (*Berula erecta*), Lesser Marshwort (*Apium innundatum*), Bottle Sedge (*Carex rostrata*), particularly where marl is present, and Water Mint (*Mentha aquatica*). One such area of fen within the site is the only known location in Ireland for the water beetle *Hygrotus decoratus* and is also known to contain *Hydroporus scalesianus*, a rare water beetle indicative of undisturbed fens. At the edge of some of the Great Fen-sedge fens, particularly where improved grassland is not present, there is typically found a gradation to wet marsh, which in turn grades into wet grassland. These transition habitats add to the ecological diversity of the site.

Alkaline fen is characterised by the presence of Black Bog-rush in association with brown mosses and a small sedge community. The soil is permanently waterlogged but generally not flooded unless for a short period. Examples of this fen type are

found at the edge of almost all the sites, but its extent is much less than the Great Fen-sedge fen type within the SAC. The fen in the townlands of Moig West and Graigues is a good example of alkaline fen. Species seen growing with Black Bog-rush include Purple Moor-grass (*Molinia caerulea*), Long-stalked Yellow-sedge (*Carex lepidocarpa*), Carnation Sedge (*C. panicea*), rushes (*Juncus* spp.) and an abundance of brown mosses, including *Campylium stellatum, Ctenidium molluscum, Calliergon cuspidatum* and *Bryum pseudotriquetrum.* This fen type also grades into marsh and wet grassland.

Scrub and woodland is present on high ground in some areas, such as Ballymorisheen, Blind Lough, Ballyvogue, Dromlohan and Lough Feereagh. Species include Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Gorse (*Ulex europaeus*), Ash (*Fraxinus excelsior*), willow (*Salix* sp.), Downy Birch (*Betula pubescens*) and Hazel (*Corylus avellana*). This is a useful faunal habitat particularly as it is adjacent to reedbeds and fens.

A small area of limestone species-rich grassland is found to the north of Balinvirick fen. Species found which are typically associated with the habitat include the Early-purple Orchid (*Orchis mascula*), Carline Thistle (*Carlina vulgaris*) and Mountain Everlasting (*Antennaria dioica*).

Snipe use the tall marsh vegetation at the edge of the fens. Birds of prey such as Sparrowhawk feed over the reedbeds and scrubland areas of the site.

Land use in the area is quite intensive, with improved grassland extending down relatively steep slopes to the edge of the fens/loughs. New drainage or the deepening of existing drains poses a threat to the aquatic habitats at the site. In some instances, the fens appear to be drying out.

This site is of conservation value because it supports two fen types, each of which exhibit many sub-types. *Cladium* fen is listed as an Annex I priority habitat under the E.U. Habitats Directive. These wetland habitats of fen, reedbeds, open water, marsh and wet grassland are also valuable in that they supply a refuge for fauna in an otherwise intensively managed countryside.

SITE SYNOPSIS

SITE NAME: RIVER SHANNON AND RIVER FERGUS ESTUARIES SPA

SITE CODE: 004077

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises all of the estuarine habitat west from Limerick City and south from Ennis, extending west as far as Killadysert and Foynes on the north and south shores respectively of the River Shannon (a distance of some 25 km from east to west). Also included are several areas in the outer Shannon estuary, notably Clonderalaw Bay and Poulnasherry Bay, as well as the intertidal areas on the south shore of the Shannon between Tarbert and Beal Point.

The site has vast expanses of intertidal flats. The main macro-invertebrate community present is a *Macoma-Scrobicularia-Nereis* community which provides a rich food resource for the wintering birds. Other species occurring include Common Cockle (*Cerastoderma edule*), Lugworm (*Arenicola marina*), the polychaete *Nepthys hombergii*, the gastropod *Hydrobia ulvae* and the crustacean *Corophium volutator*. Eelgrass (*Zostera* spp.) is present in places, along with green algae (e.g. *Ulva* spp. and *Enteromorpha* spp.). Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Characteristic species occurring include Common Saltmarsh-grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea-milkwort (*Glaux maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*) and Saltmarsh Rush (*Juncus gerardi*). In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Common Reed (*Phragmites australis*) and club-rushes (*Scirpus maritimus, S. lacustris* subsp. *tabernaemontani)*. Also found is the nationally rare Triangular Club-rush (*Scirpus triqueter*). Elsewhere in the site the shoreline comprises stony or shingle beaches.

The site is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl (mean of 59,183 for the 4 seasons 1996-97 to 1999/00), a concentration easily of international importance. The site has internationally important populations of Dunlin (14,987), Black-tailed Godwit (706) and Redshank (1,983) - all figures are average peaks for 3 of the 5 seasons in the 1995/96-1999/00 period. A further 16 species have populations of national importance, i.e. Cormorant (148), Whooper Swan (141), Greylag Goose (88), Shelduck (895), Wigeon (3,025), Teal (1,558), Pintail (40), Shoveler (56), Scaup (76), Golden Plover (4,073), Grey Plover (564), Lapwing (13,007), Knot (686), Bar-tailed Godwit (481), Curlew (1,231) and Greenshank (33). The site is among the most important in the country for several of these species, notably Dunlin (11% of national total), Grey Plover (7.5% of total), Lapwing (6.5% of total), Redshank (6% of total) and Shelduck (6.0% of total). The site is also used by Oystercatcher (363), Ringed Plover (70), Brent Goose (135), Great Crested Grebe (47), Red-breasted Merganser (14), Mallard (247), Turnstone (71), Mute Swan (54), Grey Heron (25), Black-headed Gull (1,233) and Common Gull (194).

The Shannon / Fergus system was formerly frequented by a Greenland White-fronted Goose population but this declined during the 1980s and 1990s and the birds now appear appear to have abandoned the area. The site provides both feeding and roosting areas for the wintering birds. Habitat quality for most of the estuarine habitats is good. Some species, particularly Whooper Swan and Greylag Goose, utilise areas outside of the site for feeding.

Apart from the wintering birds, large numbers of some species also pass through the site whilst on migration in spring and/or autumn. Regular species include Black-tailed Godwit, Whimbrel and Greenshank.

Much of the land adjacent to the rivers and estuaries has been reclaimed and improved for agriculture and is protected by embankments (especially along the River Fergus estuary). Further reclamation, especially near to the urbanised and industrial areas continues to pose a threat. The site receives pollution from several sources, including industry and agriculture, but it is not known if this has any significant impacts on the wintering birds. Aquaculture occurs in some areas of the site – future increases in this activity could cause disturbance to the habitats and the associated birds. Common Cord-grass (*Spartina anglica*) is well-established and may threaten some of the estuarine habitats. Some disturbance occurs from boating activities.

This site is of great ornithological interest, being of international importance on account of the numbers of wintering birds it supports. It also supports internationally important numbers of three species, i.e. Dunlin, Black-tailed Godwit and Redshank. In addition, there are 16 species that have populations of national importance. For several of the bird species, it is the top site in the country. Also of note is that three of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover and Bar-tailed Godwit. The site is most effectively censused from the air and this is carried out in most winters.

SITE SYNOPSIS

SITE NAME: STACK'S TO MULLAGHAREIRK MOUNTAINS, WEST LIMERICK HILLS AND MOUNT EAGLE SPA

SITE CODE: 004161

The Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA is a very large site centred on the borders between the counties of Cork, Kerry and Limerick. The site is skirted by the towns of Newcastle West, Ballydesmond, Castleisland, Tralee and Abbeyfeale. The mountain peaks included in the site are not notably high or indeed pronounced, the highest being at Knockfeha (451 m). Other mountains included are Mount Eagle, Knockanefune, Garraunbaun, Taur, Rock Hill, Knockacummer, Mullaghamuish, Knight's Mt, Ballincollig Hill, Beennageeha Mt, Sugar Hill, Knockanimpuba and Knockathea, amongst others. Many rivers rise within the site, notably the Blackwater, Owentaraglin, Owenkeal, Glenlara, Feale, Clydagh, Allaghaun, Allow, Oolagh, Galey and Smerlagh.

The site consists of a variety of upland habitats, though almost half is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and post-thicket stands present. Substantial areas of clear-fell are also present at any one time. The principal tree species present are Sitka Spruce (*Picea sitchensis*) and Lodgepole Pine (*Pinus contorta*). A substantial part (28%) of the site is unplanted blanket bog and heath, with both wet and dry heath present. The vegetation of these habitats is characterised by such species as Ling Heather (*Calluna vulgaris*), Bilberry (*Vaccinium myrtillus*), Common Cottongrass (*Eriophorum angustifolium*), Hare's-tail Cottongrass (*Eriophorum vaginatum*), Deergrass (*Scirpus cespitosus*) and Purple Moor-grass (*Molinia caerulea*). The remainder of the site is mostly rough grassland that is used for hill farming. This varies in composition and includes some wet areas with rushes (*Juncus* spp.) and some areas subject to scrub encroachment.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for Hen Harrier.

This SPA is a stronghold for Hen Harrier and supports the largest concentration of the species in the country. A survey in 2005 resulted in 40 confirmed and 5 possible breeding pairs, which represents over 29% of the national total. A similar number of pairs had been recorded in the 1998-2000 period. The mix of forestry and open areas provides optimum habitat conditions for this rare bird, which is listed on Annex I of the E.U. Birds Directive. The early stages of new and second-rotation conifer plantations are the most frequently used nesting sites, though some pairs may still nest in tall heather of unplanted bogs and heath. Hen Harriers will forage up to *c.* 5 km from the nest site, utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. Birds will often forage in openings and gaps within forests. In Ireland, small birds and small mammals appear to be the most frequently taken prey.

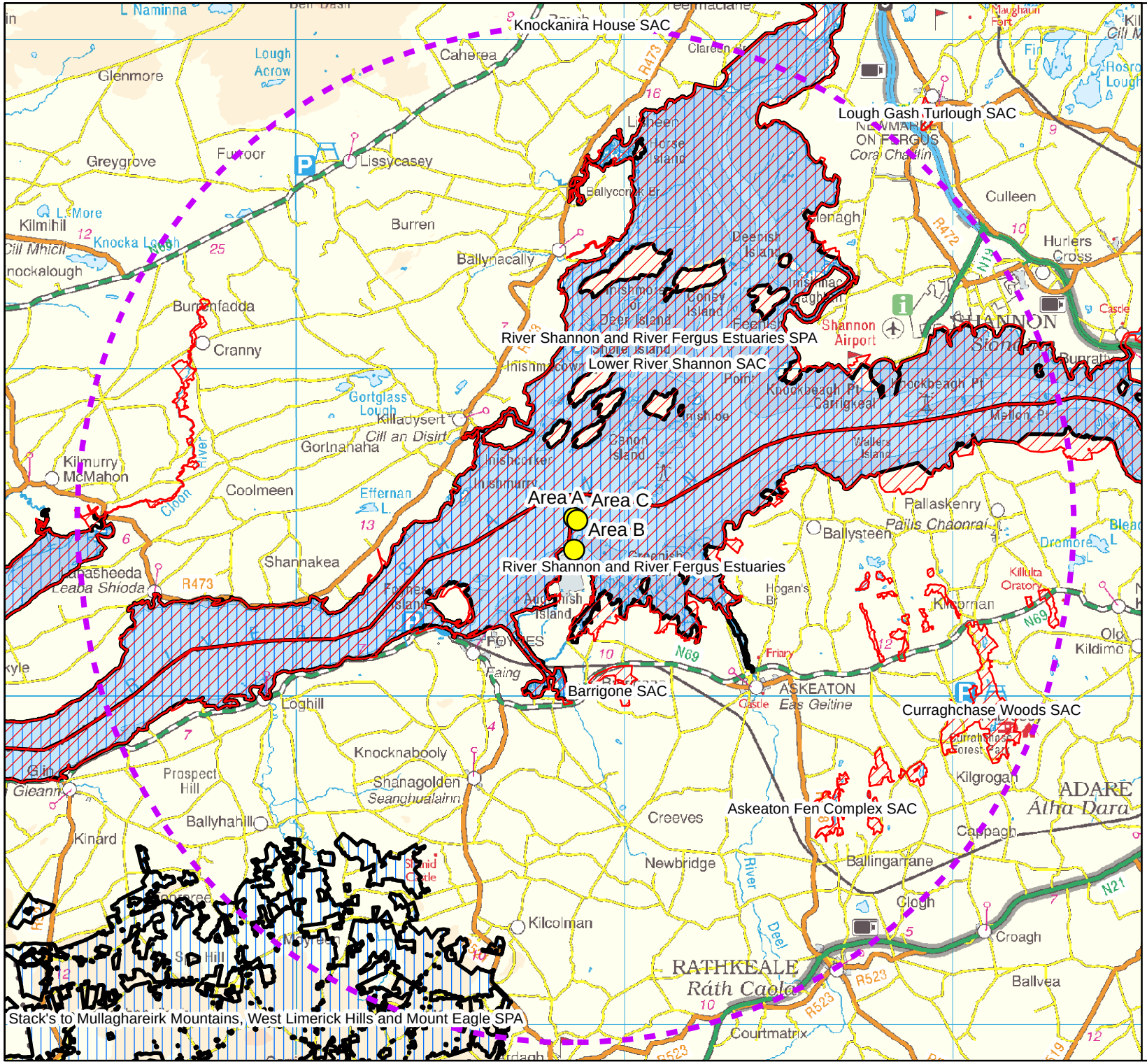
Short-eared Owl, also listed on Annex I of the E.U. Birds Directive and very rare in Ireland, has been known to breed within the site. Nesting certainly occurred in the late 1970s and birds have been recorded intermittently since. The owls are considered to favour this site due to the presence of Bank Voles, a favoured prey item. Merlin, a further E.U. Birds Directive Annex I species, also breeds but the size of the population is not known. Red Grouse is found on some of the unplanted areas of bog and heath – this is a species that has declined in Ireland and is now Red-listed.

The main threat to the long-term survival of Hen Harriers within the site is further afforestation, which would reduce and fragment the area of foraging habitat, resulting in possible reductions in breeding density and productivity. The site has a number of wind farm developments but it is not yet known if these have any adverse impacts on the Hen Harriers.

Overall, the site provides excellent nesting and foraging habitat for breeding Hen Harrier, and is considered to be among the top two sites in the country for the species.

Appendix 3

Designated sites within 15km of Proposal Site



Project Title:
Aughinish Dredging

Drawing Title:
SAC and SPA sites within 15km of Dredging Areas

Client: Rusal Aughinish

Drawn by: JK
Checked by: HT
Drawing Date: 18/02/2016
Drawing Size: A4

Legend

- Dredging Area Locations
- Dredging Areas 15km Buffer
- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)

0 3.25 6.5 km

N

Malachy Walsh and Partners
Engineering and Environmental Consultants