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Natura Impact Assessment

Proposed Dredging of the Seaward Approaches to Kilrush Marina

15003

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1 Introduction

1.1 Background

Member States are required to designate Special Areas of Conservation (SACs) and Special Protected Areas (SPAs) under the EU Habitats and Birds Directives, respectively. SACs and SPAs are collectively known as Natura 2000 sites. An 'Appropriate Assessment' (AA) is a required assessment to determine the likelihood of significant impacts, based on best scientific knowledge, of any plans or projects on Natura 2000 sites. A screening for AA determines whether a plan or project, either alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of its conservation objectives.

This AA screening has been undertaken to determine the potential for significant impacts of a proposal to dredge the existing access channel on the seaward approaches to Kilrush Creek, Kilrush, County Clare, on nearby Sites with European conservation designations (i.e. Natura 2000 Sites). The purpose of this assessment is to determine, the appropriateness, or otherwise, of the proposed project in the context of the conservation objectives of such sites.

This Natura Impact Statement has been undertaken by Malachy Walsh and Partners ecologists.

Assessment of potential impacts on other species of national and community interest does not fall within the scope of this report.

1.2 Legislative Context

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and of wild fauna and flora by the designation of SACs and the Birds Directive (79/409/EEC) seeks to protect birds of special importance by the designation of 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.

An Appropriate Assessment is required under Article 6 of the Habitats Directive where a project or plan may give rise to significant effects upon a Natura 2000 Site, and paragraphs 3 and 4 state that:

6(3) *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 the 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.*

6(4) *If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site*

concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.

The current assessment was conducted within this legislative framework and also the recent DoEHLG (2009) guidelines. As outlined in these, it is the responsibility of the proponent of the project in this case the applicant to provide a comprehensive and objective Screening for Appropriate Assessment, which can then be used by the competent authority in order to conduct the Appropriate Assessment (DoEHLG, 2009).

1.3 Stages of AA

A Screening for Appropriate Assessment (AA) has been prepared by Malachy Walsh and Partners, to determine the likelihood of significant impacts, if any, of the proposal to dredge the existing access channel on the seaward approaches to Kilrush Creek in County Clare, on nearby sites with European conservation designations (i.e. Natura 2000 sites).

The AA process is a four-stage process to complete the AA, 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. This proposal has proceeded as far as Stage 2 only.

The first stage of the AA process and that undertaken to determine the likelihood of significant impacts of this proposal is:

- Stage 1: *Screening.*

The second stage of the AA process, not required for this proposal, 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. 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:

- Stage 2: *Natura Impact Statement (NIS).*

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. This stage examines alternative solutions to the proposal:

- Stage 3: *Assessment of alternative solutions.*

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:

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

In summary, the purpose of the screening stage is to determine the necessity or otherwise for a NIS. Screening for AA examines the likely effects of a project or plan, alone and in combination with other projects or plans, upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant. If it is determined during screening that the proposal may have a significant effect on a Natura 2000 site then a NIS will need to be prepared. A screening exercise has been undertaken and concluded that an NIS was required. The screening is outlined in section 2 below. The NIS is outlined in section 3 below.

1.4 Screening Steps

This Screening for AA, or Stage 1 of AA, 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).

Screening for AA involves the following:

- Establish whether the plan is necessary for the management of a Natura 2000 site;
- Description of the Plan;
- Identification of Natura 2000 sites potentially affected;
- Identification and description of individual and cumulative impacts likely to result from the plan;
- Assessment of the significance of the impacts identified above on site integrity; and
- Exclusion of sites where it can be objectively concluded that there will be no significant effects.

Stage 1, Screening, examines whether or not likely effects upon a Natura 2000 site will be significant and determines whether the AA process for the proposed dredging works needs to proceed to Stage 2.

1.5 Assessment Methodologies

A desk study was carried out to collate available information on the site's natural environment. This comprised a review of the following publications and datasets:

- OSI Aerial photography and 1:50000 mapping;
- National Parks and Wildlife Service (NPWS) on-line resources;
- BirdWatch Ireland on-line resources;
- National Biodiversity Centre (NBDC) (on-line map-viewer);
- Teagasc soil area maps (NBDC website);
- Geological Survey Ireland (GSI) area maps;
- Environmental Protection Agency (EPA) water quality data; and
- Shannon International River Basin District (ShIRBD) datasets (Water Framework Directive).

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; and
- Water quality and resource.

In line with the EPA Guidelines (EPA, 2002), the following terms are defined when quantifying duration:

- Temporary: up to 1 year;
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

The criterion for confidence levels of the predicted likely impacts are given here in Table 1. The impact significance criteria follow EPA guidance (EPA, 2002).

Table 1: Significance of impact (EPA, 2002)

Significance of Impacts	Definition
<i>Imperceptible Impact</i>	An impact capable of measurement but without noticeable consequences.
<i>Slight Impact</i>	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities.
<i>Moderate Impact</i>	An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends.
<i>Significant Impact</i>	An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
<i>Profound Impact</i>	An impact which obliterates sensitive characteristics.

2 Stage 1: Screening

2.1 Management of Natura 2000 Site

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

2.2 Description of Project

2.2.1 Brief Project Description

It is proposed to carry out maintenance dredging works on the seaward approaches to Kilrush Creek. The proposed works will be carried out over a period of approximately 10 working days. The intention is to plough the marina approach channel with a plough pulled behind a tug. The dredge area is a 20m wide channel lowered to -2.5m C.D. producing c. 14,800m³ of sediment. The sides of the 20m wide channel will be finished to a gradient of approximately 45°. The material would be ploughed out to beyond the fairway buoy which is in the main E – W channel at approx. -4m CD. The ploughing rate is estimated to be between 40 and 100m³ per hour depending on the length of the haul. The ploughing will commence from the Outermost point and working inshore once the required depth has been achieved.

2.2.2 Purpose of the Project Proposal

Maintenance dredging is required to maintain water depths to previously approved levels in the existing navigation channel on the approaches to Kilrush Creek. Dredging of the approach channel outside the lock gates will provide sufficient under keel clearance for the safe and convenient navigation of craft along the approach channel.

The proposal considered in this report is a continuation of the ongoing programme of maintenance dredging which has been conducted in and around these waters since the completion of Cappagh Pier in the mid nineteenth century and particularly since the completion of the adjacent Kilrush Marina in around 1990.

2.2.3 Site Location

The location of the proposed maintenance dredging works is comprised of the existing navigation channel immediately adjacent to Kilrush Marina. The Marina is an impounded body of water accessed by means of lock gates. The proposed works are situated outside the lock gates within the waters of the main Shannon Estuary. See Figure 1, below.

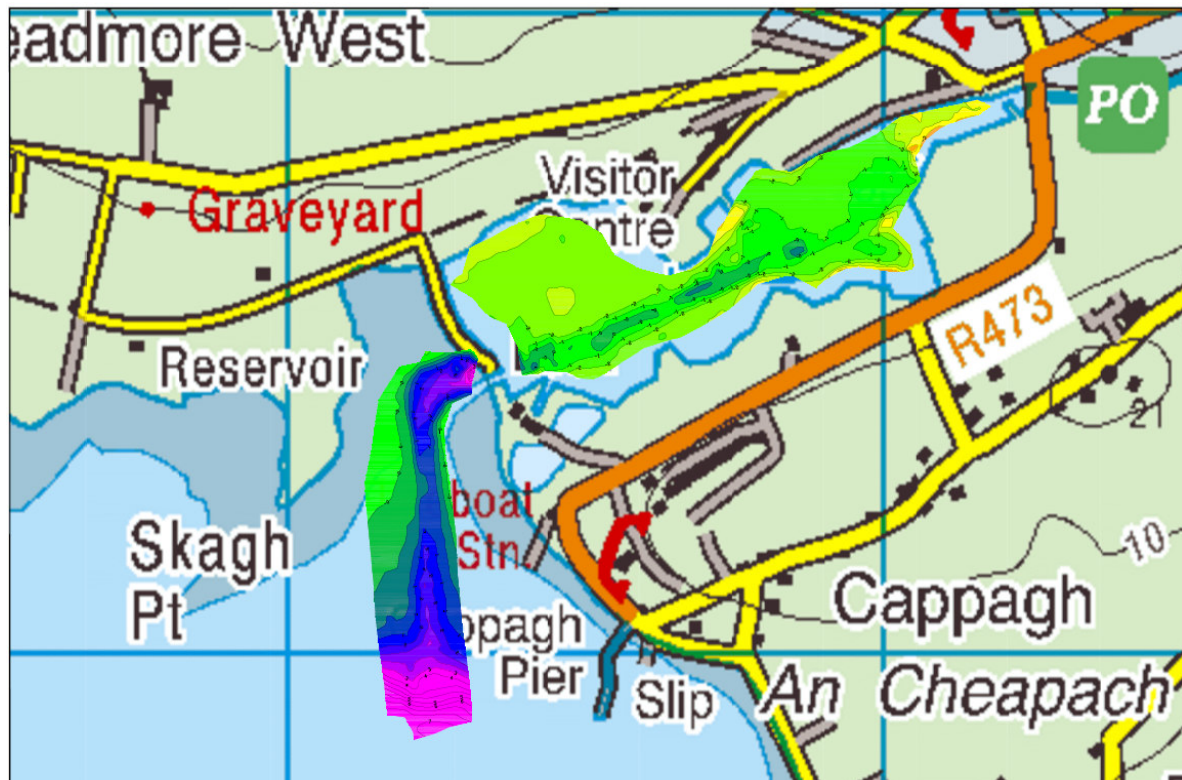


Figure 1: Location of existing access channel requiring maintenance dredging adjacent to Kilrush Creek, County Clare. (Existing access channel indicated in dark blue).

2.2.4 Description of the Site

The proposed dredging works will be conducted in that area of the foreshore that is in public or state ownership. The channel is located in the marine seabed situated below the low tide mark that remains permanently submerged and unexposed. As the silt load from the adjacent Kilrush Creek, a very high percentage of suspended solids are deposited in the inshore area. This load is distributed by the naturally occurring marine and estuarine currents of the locality and drops out of suspension into the dredged channel.

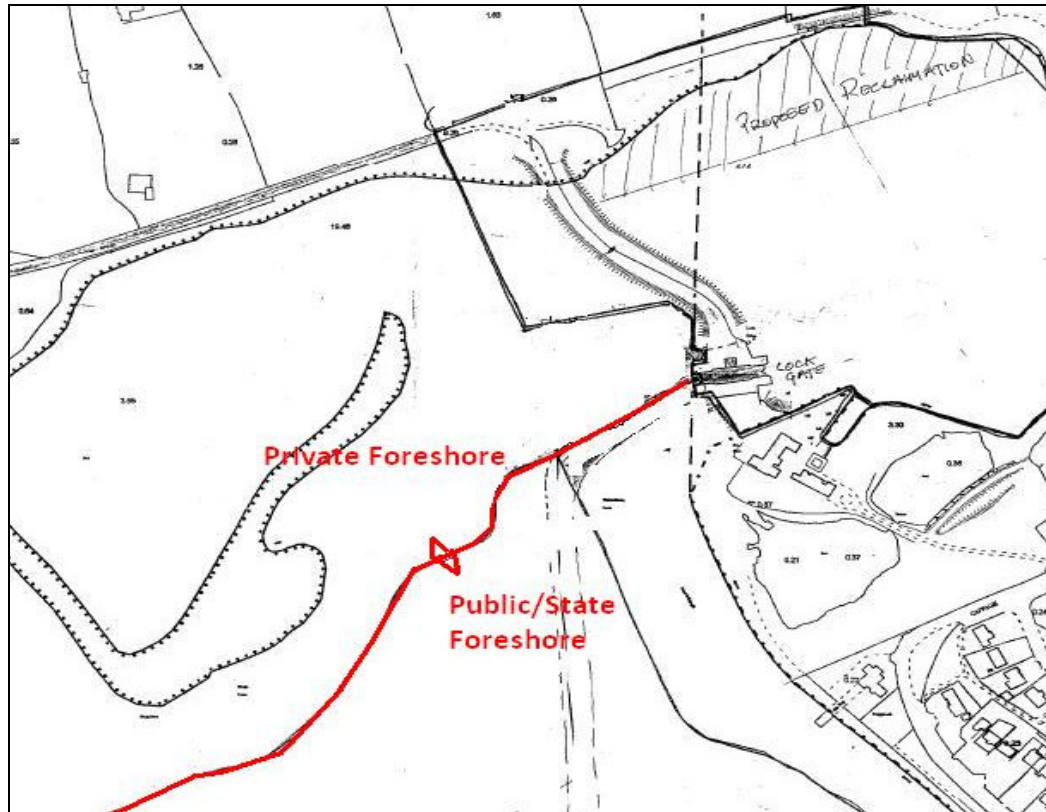


Figure 2: Foreshore ownership outside marina lock gates

2.3 Characteristics of the Project

The proposal is described below.

<i>Size, scale, area, land-take</i>	A channel 605m in length and 20m wide with a slope of 45 ⁰ on average either side shall be dredged lowered to -2.5m C.D. producing c. 14,800m ³ of sediment within the Lower River Shannon cSAC and River Shannon and River Fergus SPA.
<i>Details of physical changes that will take place during the various stages of implementing the proposal.</i>	The removal of sediment within the footprint of the area to be dredged. The potential for this dredged material to accumulate elsewhere.
<i>Description of resource requirements for the construction/operation and decommissioning of the proposal (water resources, construction material, human presence etc).</i>	The channel will be dredged using a plough dredger to open up the approach channel for Kilrush Marina. Once complete no further work would be required within the immediate aftermath. Further dredging would be required in the future as sediment naturally accumulates within the channel. However, this dredging works is outside the remit of this application. No decommissioning is required as the channel will naturally return to its current state.
<i>Description of timescale for the various activities that will take place as a result of implementation (including likely start and finish date).</i>	The proposed works will take place over a period of approximately 10 days.
<i>Description of wastes arising and other residues (including quantities) and their disposal.</i>	Approximately 14,800m ³ of sediment will be dredged during the proposed works with a peak disposal rate of 100m ³ per hour to be dispersed within the channel. This sediment is naturally occurring within the estuary. Other chemicals used include fuels, lubricants associated with the plough dredger.
<i>Identification of wastes arising and other residues (including quantities) that may be of particular concern in the context of the Natura 2000 network.</i>	Approximately 14,800m ³ of sediment will be dredged during the proposed works with a peak disposal rate of 100m ³ per hour.
<i>Description of any additional services required to implement the project or plan, their location and means of construction.</i>	No further services required.

2.4 Identification of Natura 2000 sites

2.4.1 Zone of impact influence

The screening stage of AA involves compiling a 'long list' of European sites within a zone of potential impact influence for later analysis which may or may not be impacted upon by the proposal. All Natura 2000 sites within 15km of the proposal location will be characterised in the context of the rationale for designation and qualifying features, in accordance with NPWS 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. Finally, in the conclusion of the screening stage, the Natura 2000 sites within 15km whose integrity will not be adversely impacted will be ruled out. If screening indicates sites will be affected it will be necessary to proceed to Stage 2, Appropriate Assessment for a more detailed assessment.

2.4.2 Identification of Natura 2000 and Ramsar sites

Adopting the precautionary principle in identifying potentially affected European sites, it has been decided to include all cSACs and SPAs/Ramsar sites, within a 15km radius of the proposal site. The Convention on Wetlands of International Importance especially as Waterfowl Habitat, more commonly known as the Ramsar Convention, was ratified by Ireland in 1984. Ramsar sites are also subject to AA screening. Although not specifically required, it would be considered best practice to include Ramsar sites (classified under the Ramsar Convention 1971) in the appropriate assessment process¹. No Ramsar sites are located within 15km of the proposal site

Table 2 below lists all designated cSACs and classified SPA sites (referred to as designated sites from hereon in) within 15km of the proposal site including their proximity.

Table 2: Designated conservation sites within a 15km radius of the proposal site

No.	Designated Site	Site Code	Distance intervening and direction to Natura 2000 site
1	Lower River Shannon cSAC	002165	Proposal is within the Natura 2000 Site
2	River Shannon and River Fergus SPA	004077	Proposal is within the Natura 2000 Site
3	Tullagher Lough and Bog cSAC	002343	7.4km to the north west
4	Kilkee Reefs cSAC	002264	11km to the north west
5	Mid Clare Coast SPA	004182	11.4km to the north
6	Carrowmore Dunes cSAC	002250	11.4km to the north
7	Carrowmore Point to Spanish Point cSAC	001021	14.9km to the north

¹ EPA, A Note on Waste Water Discharging Licence Appropriate Assessments

2.4.3 Characteristics of Natura 2000 sites

The following table lists the cSACs and SPA sites that lie within 15km of the proposal site with their qualifying features of conservation interests (information pertaining to designated sites is from site synopses, conservation objectives and other information available on www.npws.ie).

Table 3: Natura 2000 sites with Qualifying Ecological Features of Interest

Designated Site (Site Code)	Qualifying Ecological Features of Interest
Lower River Shannon cSAC (002165)	<p>Species Freshwater pearl mussel (<i>Margaritifera margaritifera</i>) [1029] Sea lamprey (<i>Petromyzon marinus</i>) [1095] Brook lamprey (<i>Lampetra planeri</i>) [1096] River lamprey (<i>Lampetra fluviatilis</i>) [1099] Salmon (<i>Salmo salar</i>) [1106] Bottlenose dolphin (<i>Tursiops truncatus</i>) [1349] Otter (<i>Lutra lutra</i>) [1355]</p> <p>Habitats Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats 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] <i>Salicornia</i> and other annuals colonizing mud and sand [1310] <i>Spartina</i> swards (<i>Spartinion maritimae</i>) [1320] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation [3260] <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410] Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0]</p>

Designated Site (Site Code)	Qualifying Ecological Features of Interest
River Shannon and River Fergus SPA (004077)	Cormorant (<i>Phalacrocorax carbo</i>) [A017] Whooper swan (<i>Cygnus cygnus</i>) [A038] Light-bellied Brent goose (<i>Branta bernicla hrota</i>) [A046] Shelduck (<i>Tadorna tadorna</i>) [A048] Wigeon (<i>Anas penelope</i>) [A050] Teal (<i>Anas crecca</i>) [A052] Pintail (<i>Anas acuta</i>) [A054] Shoveler (<i>Anas clypeata</i>) [A056] Scaup (<i>Aythya marila</i>) [A062] Ringed plover (<i>Charadrius hiaticula</i>) [A137] Golden plover (<i>Pluvialis apricaria</i>) [A140] Grey plover (<i>Pluvialis squatarola</i>) [A141] Lapwing (<i>Vanellus vanellus</i>) [A142] Knot (<i>Calidris canutus</i>) [A143] Dunlin (<i>Calidris alpina</i>) [A149] Black-tailed godwit (<i>Limosa limosa</i>) [A156] Bar-tailed godwit (<i>Limosa lapponica</i>) [A157] Curlew (<i>Numenius arquata</i>) [A160] Redshank (<i>Tringa totanus</i>) [A162] Greenshank (<i>Tringa nebularia</i>) [A164] Black-headed gull (<i>Chroicocephalus ridibundus</i>) [A179] Wetlands and waterbirds [A999]
Tullagher Lough and Bog cSAC (002343)	Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Transition mires and quaking bogs [7140] Depressions on peat substrates of the <i>Rhynchosporion</i> [7150]
Kilkee Reefs cSAC (002264)	Large shallow inlets and bays [1160] Reefs [1170] Submerged or partly submerged sea caves [8330]
Mid Clare Coast SPA (004182)	Cormorant (<i>P. carbo</i>) [A017] Ringed plover (<i>C. hiaticula</i>) [A137] Sanderling (<i>Calidris alba</i>) [A144] Purple sandpiper (<i>Calidris maritima</i>) [A148] Dunlin (<i>Calidris alpina</i>) [A149] Turnstone (<i>Arenaria interpres</i>) [A169] Barnacle goose (<i>Branta leucopsis</i>) [A396] Wetlands and waterbirds [A999]
Carrowmore Dunes cSAC (002250)	<i>Vertigo angustior</i> [1014] Reefs [1170] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]
Carrowmore Point to Spanish Point cSAC (001021)	Coastal lagoons [1150] Reefs [1170] Perennial vegetation of stony banks [1220] Petrifying springs with tufa formation (Cratoneurion) [7220]

Site synopses published by the NPWS for each of the sites listed in Table 3 above are included in Appendix 1.

2.4.4 Conservation Objectives

According to the Habitat's Directive, the *conservation status of a natural habitat* will be taken as 'favourable' 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 Habitat's 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' 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.

These conservation objectives are of a wide-ranging nature and most of the conservation objectives developed by NPWS for Natura 2000 sites are adapted from these and are published on-line as 'Generic Conservation Objective' documents. However, more site specific conservation objectives have been developed for the *Lower River Shannon cSAC* and the *River Shannon and River Fergus SPA* sites and these are published on-line, by the NPWS, as comprehensive 'Conservation Objective Series' documents. As each of these documents is in excess of 30 pages in length and because they are available on-line², they are not included in the Appendices to this document. However, a copy of the 'Generic Conservation Objective' document for each of the remaining Natura 2000 sites is included in Appendix 2; these are also available on www.npws.ie.

² Available at npws.ie

2.5 Identification of Potential Impacts

Potential impacts are identified in this section. Only those features of the development that have the potential to impact on qualifying features, conservation interests and conservation objectives of the identified Natura 2000 sites are considered.

<p><i>Description of elements of the project likely to give rise to impacts on Natura 2000 sites.</i></p>	<ul style="list-style-type: none"> • The program of dredging works will be conducted on the seabed of two Natura 2000 sites. • Removal or dredging of sediment built up at the approach channel to Kilrush Marina. • Increased vessel movements during dredging and dumping. • Slight increase in operational noise levels during dredging operations.
<p><i>Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on Natura 2000 sites by virtue of:</i></p> <ul style="list-style-type: none"> • <i>Size and scale;</i> • <i>Land-take;</i> • <i>Distance from Natura 2000 Site or key features of the Site;</i> • <i>Resource requirements;</i> • <i>Emissions;</i> • <i>Excavation requirements;</i> • <i>Transportation requirements;</i> • <i>Duration of construction, operation etc.; and</i> • <i>Other.</i> 	<ul style="list-style-type: none"> • The dredge area is a 20m wide channel lowered to -2.5m C.D. producing c. 14,800m³ of sediment. • The dredging operations could potentially increase the suspended sediment concentrations in the surrounding marine environment through the re-suspension of dredged material (in plumes) over the duration of the dredge phase. However, any potential increase in suspended solids would be temporary and localised to the dredge areas. • Accidental spills from plant and machinery during construction could lead to polluting substances entering the surrounding marine environment. • Noise would be emitted to air and to water during dredging works. • Increased vessel movements would occur during dredging which could affect bird feeding.
<p><i>Describe any likely changes to the site arising as a result of:</i></p> <ul style="list-style-type: none"> • <i>Reduction of habitat area;</i> • <i>Disturbance of key species;</i> • <i>Habitat or species fragmentation;</i> • <i>Reduction in species density;</i> • <i>Changes in key indicators of conservation value; and</i> • <i>Climate change.</i> 	<ul style="list-style-type: none"> • 2.3Ha area reduction/alteration of habitat area will occur within two Natura 2000 sites. • No habitat or species fragmentation nor any reduction in species density is expected to ensue from the proposal. • Some potential resides within the proposal to impair the conservation objectives of the cSAC/SPA by means of adverse water quality impacts which could create disturbance and/or displacement impacts. • Any temporary increase in suspended sediment levels during dredging could result in localised disturbance to fish species. • The deposition of sediment re-suspended by the dredging could affect benthic fauna species in the sub-tidal areas, which could alter the food resource density and diversity for wintering wildfowl and waders. • Should they occur in an uncontrolled manner, accidental spillages of polluting substances could affect benthic fauna and reduce or affect the food resource for wintering wildfowl and waders. • Operational noise, in particular the dredger, could result in short-term disturbance to feeding birds over the duration of the dredging works. This could result in a change in bird populations in the short-term.

Describe any likely impacts on the Natura 2000 site as a whole in terms of:

- *Interference with the Key relationships that define the structure of the site; and*
- *Interference with key relationships that define the function of the site.*

Potential impact to fauna and habitat utilizing the footprint of the dredged area.

2.6 Assessment of Significance of Potential Impacts

This section considers the list of sites identified in section 2.3 above. The magnitude/extent, probability and duration of significant impacts affecting these sites are examined in the following sections.

2.6.1 Natura 2000 sites outside the zone of 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 2 above are designated. It is considered that these Natura 2000 sites are outside the zone of impact influence of the proposed programme of dredging and that no direct 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 2.2 above.

These sites are listed in Table 4, below, and will not be considered further in this document.

Table 4: Natura 2000 site outside the zone of impact influence

Natura 2000 site	Distance intervening and direction to Natura 2000 site
Tullaher Lough and Bog cSAC 002343	cSAC is 7.4km to the north west
Kilkee Reefs cSAC 002264	cSAC is 11km to the north west
Mid Clare Coast SPA 004182	SPA is 11.4km to the north
Carrowmore Dunes cSAC 002250	cSAC is 11.4km to the north
Carrowmore Point to Spanish Point cSAC 001021	cSAC is 14.9km to the north

Therefore, the assessment of significance of potential impacts that follows focuses on the two remaining designated sites. These sites are listed in Table 5 below, with their proximity to the proposal site.

2.6.2 Natura 2000 sites within the zone of impact influence

Table 5 below lists the Natura 2000 sites considered to be within the zone of impact influence of the proposal.

Table 5: Natura 2000 sites within the zone of impact Influence

Natura 2000 site	Distance intervening and direction to Natura 2000 site
Lower River Shannon cSAC 002165	Proposal is located within Natura 2000 site
River Shannon and River Fergus SPA 004077	Proposal is located within Natura 2000 site

The potential for significant impacts arising from the proposal was determined based on a number of indicators including:

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

2.6.3 Habitat Loss and Alteration

The proposal considered in this document is located within the *Lower River Shannon cSAC* and the *River Shannon and River Fergus SPA*. Therefore, there is potential for direct habitat loss or alteration impacts within these Natura 2000 sites as a result of the proposed works.

There is the potential to create indirect habitat loss or alteration impacts by means of adverse water quality impacts may reside in the proposal. These potential impacts are considered in the sections following.

2.6.4 Water Quality

The proposal incorporates some elements, listed below, that have the potential to create water quality impacts within the SPA and cSAC sites:

- Pollution of the estuary with suspended solids released during excavations or dredging;
- Pollution of the estuary with constituents adsorbed or chemically bound to suspended solids released during excavations or dredging;
- Pollution of the estuary with oils or fuels due to runoff from operating machinery or refuelling operations.

Dredging has the potential to cause water quality impacts, by means of an increase in sedimentation within the water column, when the bottom muds and silts are disturbed and agitated during the dredging program. Chemicals and other potential pollutants associated with the proposed works include refuelling have the potential to impair water quality impacts if the potential risk of the agents are not considered during the design of the project.

2.6.5 Disturbance and/or displacement of species.

The proposed project could lead to the potential disturbance and/or displacement of species within the Lower River Shannon cSAC and River Shannon and River Fergus SPA.

2.6.6 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 or populations can include increased isolation of populations or species which can detrimentally impact on the resilience or robustness of the populations reducing overall species diversity and altering species abundance.

2.7 Conclusion of screening stage

In conclusion, to determine the potential impacts, if any, of the proposed dredging on nearby Natura 2000/Ramsar sites, a screening process for AA was undertaken. The proposed development is within 15km of 7 Natura 2000 Sites. There are no Ramsar sites within 15km of the proposed development.

In concluding the above assessments of significance, it has been shown that there will be no potential impact to the following sites as a result of the proposed development:

- **Tullagher Lough and Bog cSAC (002343)**
- **Kilkee Reefs cSAC (002264)**
- **Mid Clare Coast SPA (004182)**
- **Carrowmore Dunes cSAC (002250)**
- **Carrowmore Point to Spanish Point cSAC (001021)**

However, the proposed project could have potential negative ecological affects on two Natura 2000 Sites namely the *Lower River Shannon cSAC and River Shannon and River Fergus SPA*.

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

1. **River Shannon and River Fergus SPA (004077)**
2. **Lower River Shannon cSAC (002137)**

3 Statement for Appropriate Assessment

3.1 Introduction

The main objective of Stage 2 of the Appropriate Assessment process is to consider the impact of the project or plan on the integrity of Natura Site(s) and Ramsar Site(s) with respect to the conservation objectives of the site(s) and to identify and assess mitigation measures against any adverse effects the plan or project are likely to cause. No Ramsar sites have been identified in stage 1. To this regard, the Natura 2000 Site that may potentially be impacted by the proposed dredging works is described below followed by further descriptions and details of the characteristics of the proposal. The potential impacts that may result from the proposed development are then discussed in relation to the conservation objectives of the sites.

3.2 Characteristics of Natura 2000 Sites

The NPWS site synopses of the Natura 2000 Sites are provided in Appendix 1 to describe the site in more detail.

3.2.1 SAC Qualifying Interests

Table 6 below lists the Annex I habitats and Annex II species for which the Lower River Shannon cSAC has been selected.

Table 6: List of qualifying interests of the Lower River Shannon cSAC

Qualifying Interests of the Lower River Shannon cSAC (Site Code: 002165)
Habitats
Mudflats and sandflats not covered by seawater at low tide
Estuaries
Coastal Lagoons
Vegetated sea cliffs of the Atlantic and Baltic coasts
Salicornia and other annuals colonizing mud and sand
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)
Mediterranean salt meadows (<i>Juncetalia maritimi</i>)
Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation
Sandbanks which are slightly covered by sea water all the time
Large shallow inlets and bays
Reefs
Perennial vegetation of stony banks
<i>Spartina</i> swards (<i>Spartinion maritimae</i>)
<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)
Species
River Lamprey <i>Lampetra fluviatilis</i>
Brook Lamprey <i>Lampetra planeri</i>
Sea Lamprey <i>Petromyzon marinus</i>
Atlantic Salmon <i>Salmo salar</i>
Bottlenose Dolphin <i>Tursiops truncatus</i>
Otter <i>Lutra lutra</i>
Freshwater Pearl Mussel <i>Margaritifera margaritifera</i>

3.2.2 SPA Qualifying Interests

Table 7 below lists the bird species for which the River Shannon and River Fergus SPA has been selected.

Table 7: List of qualifying interests of the River Shannon and River Fergus SPA

Qualifying Interests of the River Shannon and River Fergus SPA (Site Code: 004077)
Cormorant (<i>Phalacrocorax carbo</i>)
Whooper Swan (<i>Cygnus cygnus</i>)
Light-bellied Brent Goose (<i>Branta bernicla hrota</i>)
Shelduck (<i>Tadorna tadorna</i>)
Wigeon (<i>Anas penelope</i>)
Teal (<i>Anas crecca</i>)
Pintail (<i>Anas acuta</i>)
Shoveler (<i>Anas clypeata</i>)
Scaup (<i>Aythya marila</i>)
Ringed Plover (<i>Charadrius hiaticula</i>)
Golden Plover (<i>Pluvialis apricaria</i>)
Grey Plover (<i>Pluvialis squatarola</i>)
Lapwing (<i>Vanellus vanellus</i>)
Knot (<i>Calidris canutus</i>)
Dunlin (<i>Calidris alpina</i>)
Black-tailed Godwit (<i>Limosa limosa</i>)
Bar-tailed Godwit (<i>Limosa lapponica</i>)
Curlew (<i>Numenius arquata</i>)
Redshank (<i>Tringa totanus</i>)
Greenshank (<i>Tringa nebularia</i>)
Black-headed Gull (<i>Chroicocephalus ridibundus</i>)
Wetlands & Waterbirds

3.2.3 Conservation Status

According to the Habitat's Directive, the conservation status of a natural habitat will be taken as 'favourable' when:

- its natural range and the area it covers within that range are stable or increasing,
- the specific structure and functions which are necessary for its long-term maintenance exist 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 Habitat's 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' when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats,
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and

- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

3.2.4 Management Plans

There are no management plans completed to date for the Lower River Shannon cSAC and the River Shannon and River Fergus SPA. The conservation objectives for the Natura 2000 Sites are as follows:

Lower River Shannon cSAC (site code: 002165):

Objective 1: To maintain the Annex I habitats for which the cSAC has been selected at favourable conservation status: Large shallow inlets and bays; Estuaries; *Salicornia* and other annuals colonising mud and sand; Vegetated sea cliffs of the Atlantic and Baltic coasts; Mediterranean salt meadows (*Juncetalia maritimi*); Coastal lagoons; Mudflats and sandflats not covered by seawater at low tide; Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); Sandbanks which are slightly covered by sea water all the time; Reefs; Perennial vegetation of stony banks; Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation; *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*).

Objective 2: To maintain the Annex II species for which the cSAC has been selected at favourable conservation status: *Lampetra fluviatilis*, *Lampetra planeri*, *Petromyzon marinus*, *Salmo salar*, *Margaritifera margaritifera*, *Tursiops truncatus* and *Lutra lutra*.

Objective 3: To maintain the extent, species richness and biodiversity of the entire site.

Objective 4: To establish effective liaison and co-operation with landowners, legal users and relevant authorities.

River Shannon and River Fergus SPA (Site Code: 004077)

To maintain the species for which the SPA has been selected at favourable conservation status: Cormorant (*Phalacrocorax carbo*), Whooper Swan (*Cygnus cygnus*), Light-bellied Brent Goose (*Branta bernicla hrota*), Shelduck (*Tadorna tadorna*), Wigeon (*Anas penelope*), Teal (*Anas crecca*), Pintail (*Anas acuta*), Shoveler (*Anas clypeata*), Scaup (*Aythya marila*), Ringed Plover (*Charadrius hiaticula*), Golden Plover (*Pluvialis apricaria*), Grey Plover (*Pluvialis squatarola*), Lapwing (*Vanellus vanellus*), Knot (*Calidris canutus*), Dunlin (*Calidris alpina*), Black-tailed Godwit (*Limosa limosa*), Bar-tailed Godwit (*Limosa lapponica*), Curlew (*Numenius arquata*), Redshank (*Tringa totanus*), Greenshank (*Tringa nebularia*), Black-headed Gull (*Chroicocephalus ridibundus*) and Wetlands and Waterbirds.

Conclusion

Any impact which is likely to cause or contribute to any of the qualifying species and habitats not reaching or maintaining favourable conservation status within these Natura 2000 Sites would be regarded as being in conflict with the management of the sites. In addition, any impact which would hinder the maintenance of the extent, species richness and biodiversity of the sites would also be in conflict with the conservation objectives.

3.2.5 Ecological features not selected for Appropriate Assessment

The species and habitats of qualifying interest that will not be impacted by the proposed development are listed in Table 8. These habitats are not connected to the proposed site either directly within the footprint of the development or via waterways draining the site.

Table 8: List of ecological features not selected for Appropriate Assessment

Feature	Reason for exclusion
Habitat	
Vegetated sea cliffs of the Atlantic and Baltic coasts	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, 2012a).
Coastal lagoons	Habitat not within the zone of influence of the project from examination of the habitat map of Annex I habitats within the Lower River Shannon conservation objectives report for lagoons (NPWS, 2012b). The closest lagoon is on Scattery Island approximately 1.7km from the sea berm.
<i>Salicornia</i> and other annuals colonizing mud and sand	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, 2012a).
Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>)	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, 2012a).
Mediterranean salt meadows (<i>Juncetalia maritimi</i>)	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, 2012a).
Sandbanks which are slightly covered by sea water all the time	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, 2012a).
<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)	Terrestrial habitat not within the zone of influence of the project
<i>Spartina</i> swards (<i>Spartinion maritimae</i>)	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, 2012a).
Mudflats and sandflats not covered by seawater at low tide	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, 2012a).
Estuaries	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, 2012a).
Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation	Habitat not within the zone of influence of the project from examination of the habitat map of Annex I habitats within the Lower River Shannon conservation objectives report for this habitat type (NPWS, 2012c).
Perennial vegetation of stony banks	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, 2012a).
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	Terrestrial habitat not within the zone of influence of the project
Fauna	
Freshwater pearl mussel (<i>Margaritifera margaritifera</i>)	This freshwater species is not expected to be present within the brackish waters of the marina nor in the saline waters of the

Feature	Reason for exclusion
Habitat	
	Shannon Estuary.
Brook lamprey (<i>Lampetra planeri</i>)	This freshwater species is not expected to be present within the brackish waters of the marina nor in the saline waters of the Shannon Estuary.

3.2.6 Ecological features selected for Appropriate Assessment

All of the features of qualifying interest that were deemed relevant to the proposed development were selected for further analysis in respect to likely impacts. In addition, some species of conservation importance such as red listed species were also selected. These features are listed in Table 9 below.

Table 9: List of ecological features selected for Appropriate Assessment.

Feature	Reason for inclusion
Habitats	
Large shallow inlets and bays	From examination of the habitat map for the cSAC habitat is potentially within the zone of influence from the proposal.
Reefs	From examination of the habitat map for the cSAC habitat is potentially within the zone of influence from the proposal.
Fish	
Atlantic salmon (<i>Salmo salar</i>)	A marine/estuary species
Sea lamprey (<i>Petromyzon marinus</i>)	A marine/estuary species
River lamprey (<i>Lampetra fluviatilis</i>)	A marine/estuary species
Mammals	
Bottlenose dolphin (<i>Tursiops truncatus</i>)	Marine species whose range includes the habitats on the cSAC side of the berm / lock gate.
Otter (<i>Lutra lutra</i>)	Potentially utilising habitats all along the cSAC shoreline.
River Shannon and River Fergus SPA	
Birds of conservation interest	Potentially utilise habitats within the zone of influence.

3.2.7 Information sources

Information from the following sources was used to compile the Stage Two Appropriate Assessment:

- National Biodiversity Database (NBDB).
- National Parks and Wildlife Services (NPWS).

Publications that are used here and not referenced specifically include:

- Commission of the European Communities (2003). *Interpretation manual of European Union Habitats-EUR 25*. DG Environment-Nature and Biodiversity. Brussels.

3.2.8 Characteristics of the ecological features selected for Appropriate Assessment

The species of conservation significance to the Natura 2000 Sites selected for Appropriate Assessment are discussed further below. Any impacts on the habitats of these species are also considered here.

3.2.8.1 Large shallow inlets and bays

Large indentations of the coast where, in contrast to estuaries, the influence of freshwater is generally limited. These shallow indentations are generally sheltered from wave action and contain a great diversity of sediments and substrates with a well developed zonation of benthic communities. These communities have generally a high biodiversity. The limit of shallow water is sometimes defined by the distribution of the *Zosteretea* and *Potametea* associations. Several physiographic types may be included under this category providing the water is shallow over a major part of the area: embayments, fjords, rias and voes (CEC, 2003).

The habitat is described as being the Annex I habitat ‘large shallow inlets and bays (1160)’. Figure 4 below illustrates the extent of this habitat type within the cSAC within the greater study area of the proposed dredging works.

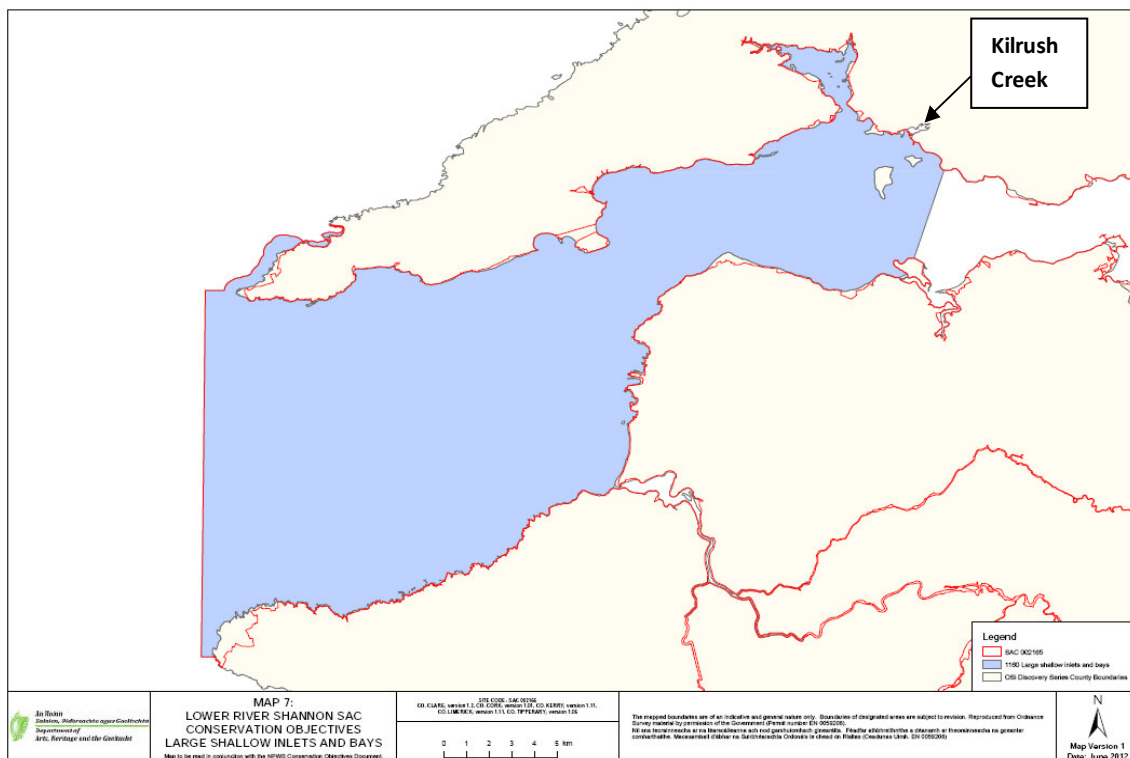


Figure 3: Extend of large shallow inlets and bays habitat (light blue shading) within the Lower River Shannon cSAC (Figure taken from Conservation Objective report for Lower River Shannon, [NPWS 2012a]).

3.2.8.2 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 sublittoral and littoral zone. Reefs may support a zonation of benthic communities of algae and animal species as well as concretions and corallogenic concretions. The habitats on the seaward side of the sea berm are described as being the Annex I habitat ‘Reefs (1170)’. Figure 4 below illustrates the extent reef habitat within the study area. The boundary of the Lower River Shannon cSAC is indicated in red.

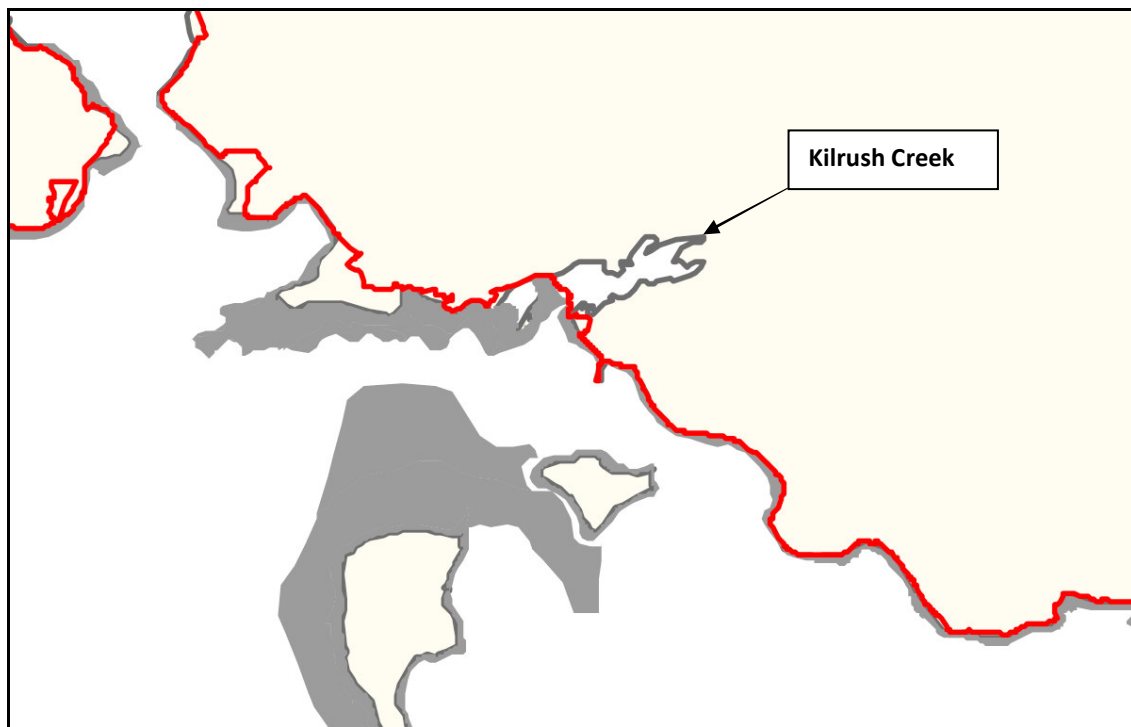


Figure 4: Extent of reef habitat (grey shading) within the surrounding area of Kilrush Creek (Figure taken from Conservation Objective report for Lower River Shannon, [NPWS 2012a]).

3.2.8.3 Bottlenose Dolphin (*Tursiops truncatus*)

Bottlenose dolphins are widespread in 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. Bottlenose dolphins are listed as Annex II species in the EU Habitats Directive and the Shannon Estuary is the only Special Area 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, occur throughout the year and it is an important calving area (Berrow *et al.* 1996; Ingram, 2000 cited in Berrow *et al.* 2010). 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. A population assessment of the bottlenose dolphins in the Lower River Shannon cSAC was undertaken between July and October 2010 (Berrow *et al.*, 2010). Transect surveys were undertaken within the Lower River Shannon cSAC with a section travelling near Scatterry Island and the waters in front of the sea berm impounding Kilrush Creek. Figure 5 below illustrates the combined sightings during all surveys. While there were no sightings directly within the dredging channel there is the potential that the species may utilise these waters on occasion. What is clear for this survey is that dolphin groups are utilising habitats throughout the estuary.

During 12 transects a total of 64 dolphin groups were encountered with 547 individuals recorded. Group sized ranged from 1-50 overall. Lone dolphins were reported on two occasions. Dolphins were located throughout the survey area with concentrations off Kilcredaun Head, Kilbaha, Leck Point in the outer estuary and Carrig buoy in the middle estuary (Berrow *et al.*, 2010).

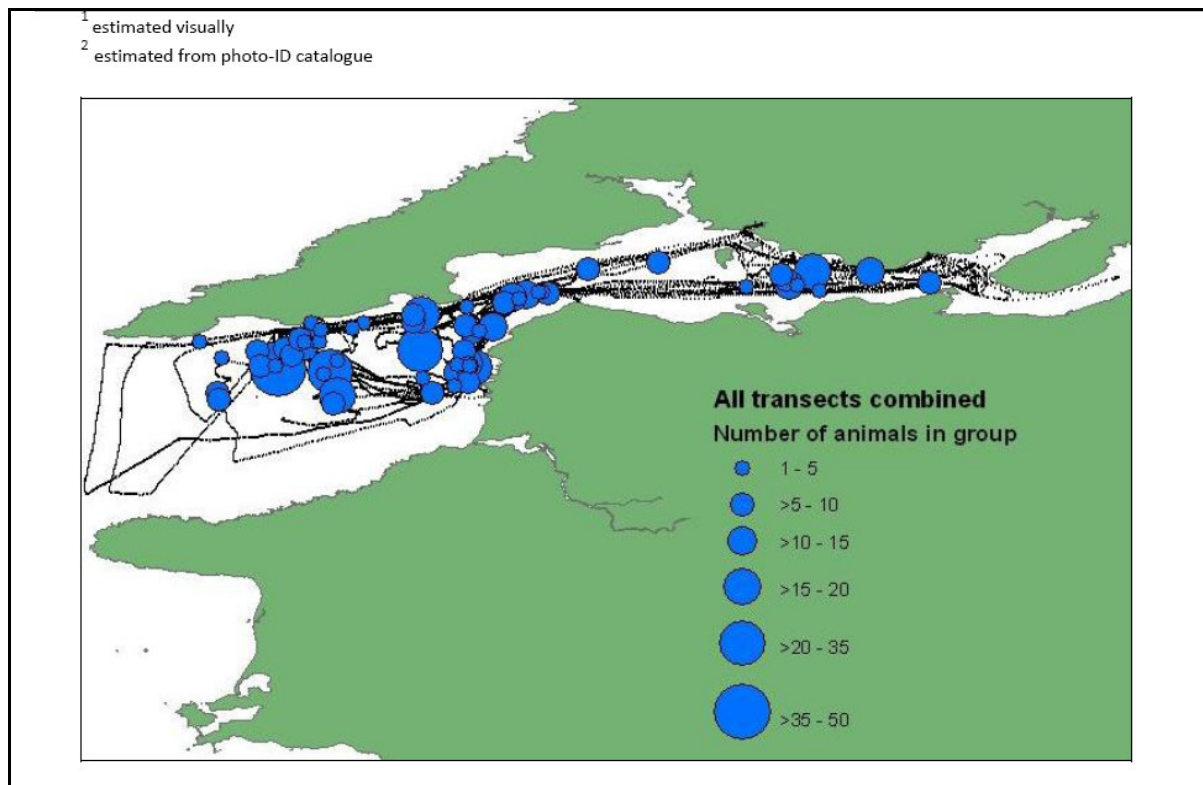


Figure 5: All track-lines from 12 surveys of the Lower River Shannon cSAC carried out in 2010. (Taken from Berrow *et al.* 2010).

3.2.8.4 Atlantic salmon (*Salmo salar*)

Atlantic salmon is a species of qualifying interest for the Lower River Shannon cSAC and the current known range of this species includes the 10km square within which the proposal considered in this document occurs (NPWS, 2008). It is an anadromous species, living in freshwater for at least the first 2 or 3 years of life before migrating to sea. Relatively large cool rivers with extensive gravelly bottom headwaters are essential during their early life. Smolts migrate to sea where they may live for 1 or 2 years before returning to freshwater. A decline in salmon stocks is well recognised in Ireland and throughout the range of the North Atlantic Salmon and is attributed to several factors including the salmon disease Ulcerative Dermal Necrosis (UDN), poor marine survival and some overfishing. The NPWS suggest that agricultural enrichment, forestry related pressures and poor water quality resulting from inadequate sewage treatment are the major pressures affecting Irish salmon rivers (NPWS 2007). 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.

NPWS distribution maps for Atlantic salmon show that the 10km grid square encompassed by the study Q95 is within the range of the species but not within the current distribution (NPWS, 2010).

3.2.8.5 Sea lamprey (*Petromyzon marinus*) and river lamprey (*Lampetra fluviatilis*)

Sea lampreys spend their adult life in marine and estuarine waters, living as external parasites on other fish species. They migrate up rivers to spawn in areas of clean gravels and after they have

spawned, they die. After hatching, the young larvae settle in areas of fine sediment in still water, where they burrow. They live as filter feeders and may remain in fine sediments for several years before transforming into adult fish. Sea lampreys, which can grow up to 1m in length, are widely distributed around the coast. However, they tend to occur in low densities. Overall, the conservation status of the sea lamprey in Ireland is considered to be poor (NPWS, 2008).

NPWS distribution maps for sea lamprey show that the 10km grid squares encompassed by the proposed study area (Q95) along with the 10km grid square immediately upstream (R05) are within the current distribution of sea lamprey but not within the current range of river lamprey (NPWS, 2010). From a review of Kurz and Costello (1999) Kilrush Marina is located within Hydrometric Area 27 and there are no records within the Kilcarroll Stream or any of the other watercourses draining into Kilrush Creek. The closest record was *P. Marinus* reported in the River Fergus at Ennis (*Fitzmaurice and Kennedy* cited in Kurz and Costello, 1999). This was confirmed also within the 2004 paper produced by Igoe *et al*, outlining the distribution of all three lamprey species in Ireland. The sea wall berm and gate system inbounding the marina and at the mouth of Kilcarroll Stream would present a barrier preventing lamprey from entering the river.

3.2.8.6 Otter (*Lutra lutra*)

The otter is a species of qualifying interest for the *Lower River Shannon cSAC* for which the overall conservation status is poor (NPWS, 2008). The otter is widespread throughout the country, in freshwater and coastal habitats, and Ireland has long been considered to hold one of the most important otter populations in Western Europe (Whilde, 1993). Due to a decline in the population in Europe, including Ireland, the otter has been listed in Annex II of the EU Habitats Directive and Appendix II of the Berne Convention. It is also protected under the Wildlife Acts 1976 and 2000. It is listed in the Red Data Book (Whilde, 1993) as vulnerable.

A record for otter at west bridge by Kilrush Creek recorded in 2005 (Q994548). Kilrush Marina noted as a traditional site for otter according to locals with 3-4 spraints recorded containing crab shells (Chapman and Chapman, 1982). Another historical record from the Otter Survey of Ireland 1982 observed four otter spraints in 1980 (Q986540). NPWS distribution maps indicated that the distribution of the species fall encompasses the 10km grid square Q95 (the site of the proposed dredging works) and the neighbouring Q85 and R05 (NPWS, 2010). The species is potential utilising the shoreline extending along the southern land boundary of co. Clare. There are no records of the species at Scatterry or Inisbig Islands but given their close proximity to other records otter it is considered very likely that they are found on these islands also.

3.2.8.7 River Shannon and River Fergus SPA (*Bird species of conservation interest*)

This Natura 2000 site is designated for the protection of twenty one bird species listed in Annex 1 of the Birds Directive (2009/147/EC) and for the additional conservation interest of wetlands and their associated waterbird species. The site's Natura 2000 Standard Data Form indicates that the protected species are comprised exclusively of non breeding, migrant and overwintering populations. The designated populations are present for part of the year only and 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 the ringed plover (*C. hiaticula*), it is considered that the ecological resources within the site, on which the different species rely, have an 'Excellent' degree of conservation; with regard to the ringed plover, it is considered that the features of the site on which this species rely 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 to the needs of the populations in question.

3.3 Potential significant impacts

There follows an evaluation of potential significance of impacts by the proposal on the selected conservation interests, concerns and objectives of the Natura 2000 Sites that have been selected for Appropriate Assessment. To address the potential concerns, desktop and baseline ecological studies were undertaken. These included habitat, non-avian faunal and bird surveys of the area. The purpose of these studies was to provide the necessary information so that a complete impact assessment of the proposal on the qualifying interests of the Natura 2000 Sites could be made. Potential significant impacts include:

- Potential impairment of water quality due to construction works;
- Habitat loss and/or alteration;
- Disturbance and/or displacement of species during construction; and
- Habitat or species fragmentation.

3.3.1 Water Quality

The proposal incorporates some elements, listed below, that have the potential to create water quality impacts within the adjacent cSAC and SPA site:

- Pollution of the estuary with suspended solids released during excavations or dredging;
- Pollution of the estuary with constituents adsorbed or chemically bound to suspended solids released during excavations or dredging; and
- Pollution of the estuary with oils or fuels due to runoff from operating machinery or refuelling operations.

Dredging has the potential to cause water quality impacts, by means of an increase in sedimentation within the water column, when the bottom muds and silts are disturbed and agitated during the dredging program. However, as the disturbed substrate will be comprised of material from the existing natural bottom sediments and because an existing background rate of suspended material is a feature of the processes of erosion, transport and deposition typically associated with estuarine habitats. The potential impact of sedimentation is discussed further in section 3.3.2.1 below.

There is the potential risk of fuel, lubricates and other chemicals associated with a sea vessel and dredger could have a localised impact to water quality if not properly managed. Given the size of the river channel at the location of the proposal, tidal regimes and the scale of works this would not be considered significant.

3.3.2 Habitat Loss and/or Alteration

The proposal considered in this document is located within the Lower River Shannon cSAC and River Shannon and River Fergus SPA. Therefore, there is the potential for direct habitat loss or alteration impacts both within the dredging area and the greater area.

The channel which is to be dredged is located within an area which has accommodated significant traffic of vessels since the completion of Kilrush pier in 1845 with 496 vessels docking at Kilrush pier in 1884 (Hansard, 1885, p.13). The location has also accommodated dredging on a regular basis since at least 1861 (Hansard, 1885 p13.) with dredging carried out in the approach channel up until the construction of the Kilrush Marina in 1990 (Counihan, 2011).

While there is potential for stable benthic communities in the sub tidal seabed habitats located outside of the existing dredged channel, the significant duration and frequency of dredging and the turbulence of propellers from vessels entering and exiting the marina means the seabed habitats within the footprint of the channel have been subject to frequent disturbance.

However there is potential to create indirect habitat loss or alteration impacts by means of adverse water quality impacts resides in the proposal including sedimentation and pollution of the estuary with oils or fuels due to runoff from operating machinery or refuelling operations.

3.3.2.1 *Sedimentation*

The level of sedimentation expected as a result of the proposed dredging works using a dredging plough was assessed in the Sediment Transport Study prepared by Aquafact International Services Ltd in August 2013. The dredge area is a 20m wide channel lowered to -2.5m C.D. producing c. 14,800m³ of sediment. The material would be ploughed out to beyond the fairway buoy which is in the main E – W channel at approximately -4m CD. The ploughing rate is estimated to be between 40 and 100m³ per hour depending on the length of the haul. Ploughing will commence from the outermost point and working inshore once the required depth has been achieved (Aquafact, 2013). Dredging using a plough will not directly remove sediment from the river channel directly. Sediment is pushed out into centre of the watercourse where the higher velocity of flow will disperse the dredged material with the intention of the dredged sediment being carried ultimately out to sea.

In the sediment transport modelling three grain sizes were modelled, a fine sand (15%), a very fine sand (40%) and a silt (45%), with the ploughed dredge material deposited evenly between E98220, N154020 to E98260, N153940 (90 to 100m deposit length). Based on a 10 to 12hour working window each day it is assumed that the ploughing and disposal operation will take place over a 15 day period depositing 14,800m³ of sediment. At a density of 1,800kg/m³ which would be considered reasonably conservative for fine sand and silt material is used giving a total sediment mass to be ploughed and deposited of 26.5million kg or 265,000 tonnes. Over the 15 day period the average deposit rate for the ploughed material is 20.42kg/sec (Aquafact, 2013).

In the model simulations the dredge sediment material is modelled independent of the ambient sediments and suspended solids. The sediment loss due to agitation of the bed by the plough bucket is not considered and that 100% of the material is deposited at the disposal site in the Kilrush Channel off the navigation light. The sediment fractions are modelled as non-cohesive sediments. A 15.5 day tidal simulation is carried out with sediment deposition and suspended rates presented over a tidal cycle at the end of the 15 days plough disposal period (Aquafact, 2013).

The analysis indicated that all the plough material from fine sand to silt deposited in the Kilrush channel is easily re-suspended and transported away with the tidal velocities on both spring and neap tides. The model does not allow for sediment layering at the disposal site and thus mobilises all of the sediment once the critical shear velocity is exceeded. In reality the erosion and re-suspension will progress from top layer to bottom layer. Therefore the sediment erosion and re-suspension rate at the disposal point is likely to be exaggerated to some degree by the model. The tide velocities are sufficiently high to completely erode/re-suspend all of the sediment deposited in a relatively short period in certain parts of the water column.

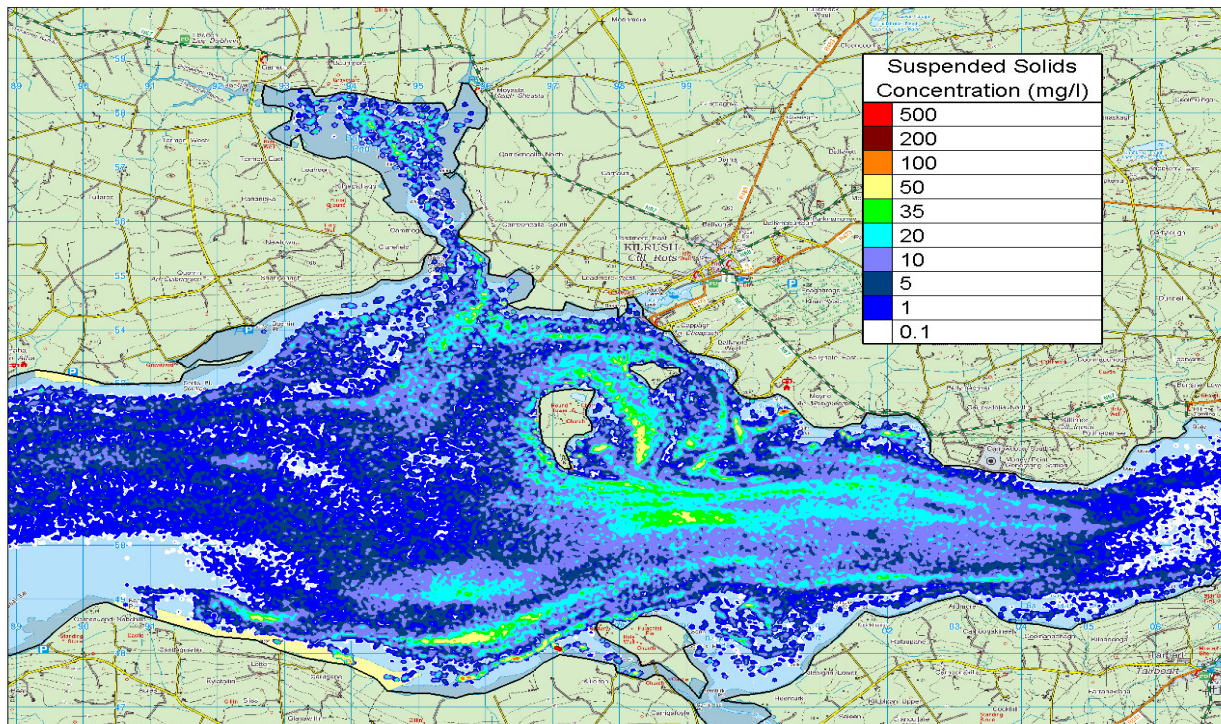


Figure 6: Depth Averaged Suspended Sediment Concentration (mg/l) at 12hrs after 15day plough disposal period (Aquafact, 2013)

The depth averaged suspended sediment concentration (mg/l) at 0hrs after 15 day plough disposal period reached a maximum rate of 500 mg/l along the shoreline south of Kilrush Creek. The level of suspended solids varies throughout the 12hr period following the 15 day ploughing period. The level of suspended solids 12hrs after the 15 day ploughing period showed a maximum of 50 mg/l with a mean of 20-35 mg/l. There is increased sediment throughout the estuary at this period. The model shows patches of the estuary where sedimentation would be more significant and this increase in sediment levels would be present throughout the 15 day period and the potentially last for several days after dredging.

These figures show reasonably good transport and dispersion of the sediment away from plough disposal point with all material removed on both ebbing and flooding tides and wide spread dispersion of the resulting suspended plume within the middle estuary. High concentrations are shown in the plume path from the disposal site and also where deposited sediment is re-suspended.

The deposition Plots are presented over a tidal cycle at the end of the 15day plough disposal period. These plots show deposition primarily of the fine and very fine sand fractions of the sediment back towards the creek channel itself and along the adjacent shoreline area to the east at Cappagh and Ballymote west (Aylevarroo point) and also some deposition around Slattery and Hog Islands. The majority of the dredge material remains in suspension and will eventually disperse throughout the outer and middle estuary. The simulation shows deposition of material off Aylevarroo Point which is unlikely and may be due to the model grid coarseness. It is expected that this material would deposit more eastward into Moyne Bay rather than off Aylevarroo Point.

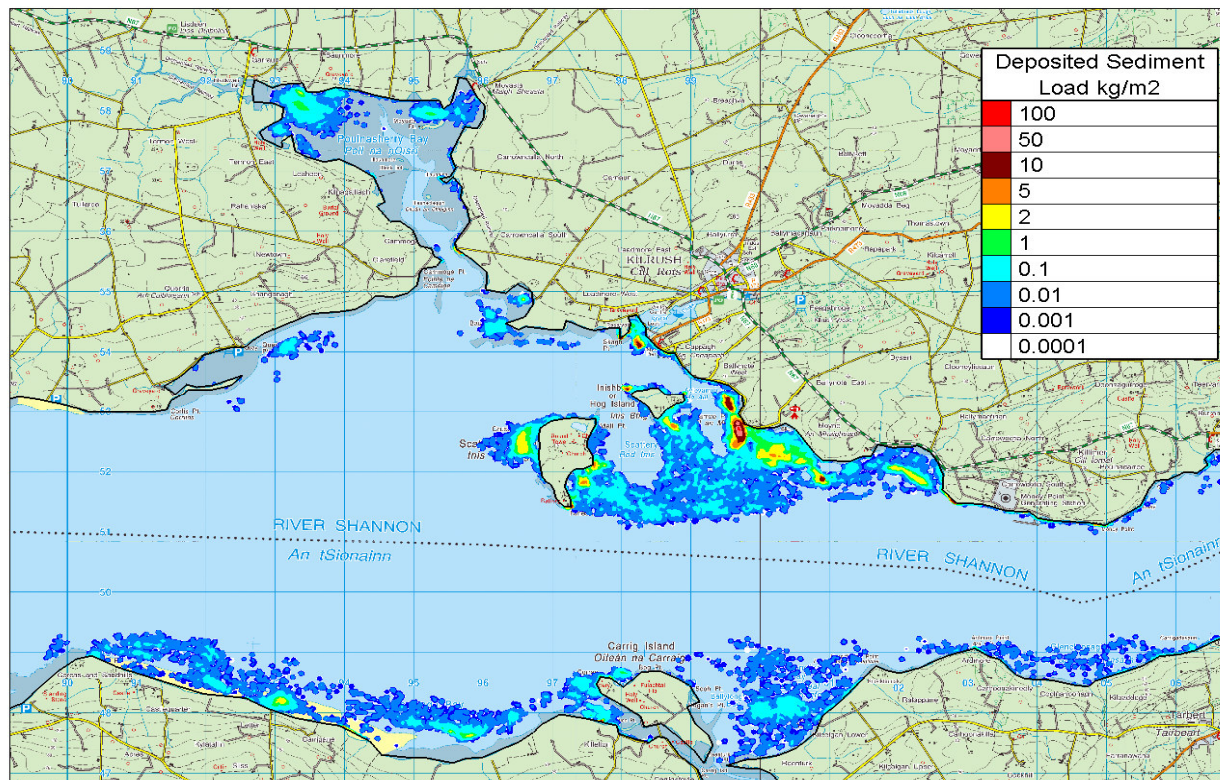


Figure 7: Deposited load in kg/m² at 12hrs after 15day ploughing disposal period (Aquafact, 2013)

From the Sediment Transport Study prepared by Aquafact International Services Ltd it is clear that there could potentially be a significant increase in deposited sediment outside the footprint of the works area following dredging and that the sediment removed shall be dispersed over a large area within the estuary. The figure above indicates the level of deposited material 12hr after the 15 day period. It is clear from deposition that between 50 and 100 kg/m³ may be deposited in places. 1200kg/m³ is the density of fluid mud which is a likely lower bound density for the deposited material. This equates to maximum depth of deposited sediment of 41.67mm to 83.33mm respectively. Given the locations of deposited sediment outside the area of higher velocity within the river channel this deposited material would disperse at a slower rate and could potentially remain for a significant period following dredging. This deposition of sediment long-term could potentially lead to an alteration of habitat types due to smothering vegetative layers and benthic communities. It is outside the scope of the model how these levels will change in time.

An alternative dredging methodology involving the extraction of sediment during dredging for deposition at sea would offer a more assured methodology to reduce the potential for habitat alteration or impacts associated with increased sedimentation.

The dredging of the channel will alter the habitat type and potentially the river bed community directly within the footprint of the proposal however this would be expected to recolonise within a few years.

3.3.3 Disturbance and/or displacement of species

3.3.3.1 Lower River Shannon cSAC

This Natura 2000 site is designated for the protection of one marine species, four freshwater species and one semi aquatic species. Table 10, below lists the species considered to be within the zone of influence of the proposal with their overall conservation status (NPWS 2008).

Table 10: Overall Conservation Status of species for which the Lower River Shannon cSAC is designated

Qualifying interest	Overall conservation status
Sea lamprey (<i>Petromyzon marinus</i>)	Poor
Salmon (<i>S. salar</i>)	Bad
Bottlenose dolphin (<i>T. truncatus</i>)	Good
Otter (<i>L. Lutra</i>)	Poor

3.3.3.2 Aquatic species

Sea lamprey (*Petromyzon marinus*)

As lamprey are not known to occupy Kilcarroll Stream or any of the other watercourses draining into Kilrush Creek the impact envisaged to lamprey as a result of the proposed works is lessened. The study area could potentially act as a corridor with adults essentially passing through the area as they migrating upstream to spawning sites.

Given their requirement for freshwater during the larval stage, and bearing in mind the characteristics of the parasitic phase, this species is not expected to be present in the saline waters of the estuary area in significant numbers. In the unlikely event of lamprey migrating through the study area during dredging works or immediately after the increased sedimentation levels within the water column which would be temporary it is considered extremely unlikely that it would offer a significant risk to the species. The potential risk to lamprey through the contamination of the study area with pollutants is considered to be very low given their temporary occupancy levels within the estuary.

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 would act as a corridor linking the freshwater watercourses upstream for adults returning to spawn and smolts migrating to the Atlantic Ocean to mature. 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 study area during dredging works or immediately after the increased sedimentation levels within the water column which have been temporary and not significant would be extremely unlikely not to have a significant risk to the species. The potential risk to salmon through the contamination of the study area with pollutants is considered to be very low given their temporary occupancy levels within the estuary.

Bottlenose dolphin (*Tursiops truncatus*)

Population studies within the Lower River Shannon cSAC have indicated the presence of the species within the estuary. Populations of the species typically range over a wide area and feed by hunting the schools of pelagic fish found in the deeper waters of the estuary. The population for which the *Lower River Shannon cSAC* is designated is resident in the outer parts of the Shannon Estuary in the waters from Tarbert to Ballybunion and is considered to be vulnerable to underwater aquatic disturbance, entanglement in fishing gear and collision with fast moving craft³.

It is noted that it is proposed to complete maintenance dredging over approximately 10 working days. This aspect of the project will have an attenuating effect on potential impacts as the duration of the works will be temporary and project activities will not be sustained for a prolonged period.

It is objectively concluded that sedimentation within the study area will be temporary in nature but will result in dolphins being displaced from the area during works for a period. Given the location of the proposed works within the main estuary there is a potential impact associated to noise and vibration to dolphins within close proximity to the proposed works. This impact could be classified as a **temporary significant impact** to the species.

3.3.3.3 *Semi-aquatic species*

Otter (*L. lutra*)

The main threat to this species from the proposal is the disturbance associated with noise from dredging and human presence during the excavation; some potential also resides within the proposal for impacts on otters should the proposal lead to a reduction in the availability of prey 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 area of the marina 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 marina 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 ensue from the proposal.

With regard to a reduction in prey availability which might result from adverse water quality impacts, attention is drawn to the assessment made in section 3.3.1. Given the temporary nature of the sedimentation associated with the proposed dredging works and the availability of habitats within the greater area the resultant impact is consider to be low. It is not expected that a reduction in prey availability will result from the proposal.

³ Natura 2000 Standard Data Form Site Code IE0002165 (Available at: <http://www.npws.ie/media/npwsie/content/images/protectedsites/natura2000/NF002165.pdf> [accessed 20/06/2013])

3.3.3.4 River Shannon and River Fergus SPA (Bird species of conservation interest)

Given the nature of the works, calm waters will be required to successfully conduct the proposed dredging works. Works will not be carried out during the height of winter when these species of conservation interest are most abundant with the calmer water during the late spring and summer months favoured for dredging. It is not expected that any of the protected species will be present at the location of the proposal in significant numbers during works. Given the short time scale of the project any potential impact associated with noise and increase human activity for bird would be temporary.

The channel to be dredged while it has not been dredged since 1990 has in the past been subject to frequent dredging. It also has some degree of disturbance in its current capacity as a channel to the marina. Estuarine communities are likely to have been established since the last dredging works over twenty years ago. However, while the proposed works would have an impact on food resources within the footprint of dredging works these resources would re-establish in a few years and would not be affected in the long term. In addition the habitats are frequent throughout the area and their alteration would not have a significant impact on the relevant bird species.

3.3.4 Habitat or Species Fragmentation

The conclusions drawn previously in section 3.3.1 with regard to habitat loss and alteration impacts, in section 3.3.1 with regard to water quality impacts and in section 3.3.3 with regard to disturbance impacts have informed the conclusions drawn in the section hereunder.

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 or populations can include increased isolation of populations or species which can detrimentally impact on the resilience or robustness of the populations reducing overall species diversity and altering species abundance.

3.3.5 Summary

The likely significant impacts (without mitigation) on Natura 2000 Sites are summarised below in Table 12. The criterion for confidence levels of the predicted likely impacts are given here in Table 11 as recommended by IEEM, 2006 and NRA, 2009.

Table 11: Confidence levels of predictions of likely impacts as outlined in NRA (2009) and IEEM (2006).

Confidence level	Category
Near certain	>95% chance of occurring as predicted
Probably	50-95% chance of occurring as predicted
Unlikely	5-50% chance of occurring as predicted
Extremely unlikely	<5% chance of occurring as predicted

Table 12: Summary of likely significance of impacts (without mitigation) of the proposed development on Natura 2000 Sites

Natura Site Potentially Effected	Potential Impact	Description of Impact	Likelihood of impact occurring as predicted
<i>The Lower River Shannon cSAC and River Shannon and River Fergus SPA</i>	Habitat alteration	The deposition of sediment within the SPA and SAC boundary leading to the alteration of habitats which could have the potential (without mitigation) to have an adverse impact on the integrity of these Natura 2000 Sites.	Unlikely-Probable <i>Significance of the impact: Negative significant short-term impact.</i>
<i>The Lower River Shannon cSAC and River Shannon and River Fergus SPA</i>	Impairment of water quality	Suspended solids, chemicals and leachate's produced during the construction phase of the development have the potential (without mitigation) to have an adverse impact on the integrity of Natura 2000 Sites.	Unlikely-Probable <i>Significance of the impact: Negative significant short-term impact.</i>
<i>The Lower River Shannon cSAC</i>	Potential impact of noise and vibration to dolphins	Potential impact of increased noise and/or vibration to dolphins during dredging works.	Unlikely-Probable <i>Significance of the impact: Negative significant short-term impact.</i>
<i>River Shannon and River Fergus SPA</i>	Disturbance	Disturbance during construction due to increase in noise and human activity.	Probable <i>Significance of the impact: Negative negligible short-term impact.</i>
<i>River Shannon and River Fergus SPA</i>	Loss of food resources	Loss of food resources within the footprint of dredging works.	Unlikely-Probable <i>Significance of the impact: Negative Slight short-term impact.</i>

3.4 Potential Impacts

Table 13 below summarises the potential impacts (without mitigation) during the construction phase of the development to ecological features selected for Appropriate Assessment.

Table 14 discusses the potential impact (without mitigation) during the operational phase of the development to ecological features selected for Appropriate Assessment.

Table 13: Summary of potential impacts (without mitigation) to during construction phase of the development to ecological features selected for Appropriate Assessment.

Ecological Feature	Description of Construction Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
Large shallow inlets and bays	Potential alteration of habitat due to increased sedimentation.	High	Temporary	Reversible	Present all year round	Negative
Reefs	Potential alteration of habitat due to increased sedimentation.	High	Temporary	Reversible	Present all year round	Negative
Bottlenose Dolphin (<i>Tursiops truncatus</i>)	<ul style="list-style-type: none"> Potential impact to species due to reduction in water quality. Potential impact for noise and/or vibrations emitted during dredging works. 	<ul style="list-style-type: none"> High High 	<ul style="list-style-type: none"> Temporary Temporary 	<ul style="list-style-type: none"> Reversible Irreversible 	Present all year round	Negative
Atlantic Salmon (<i>Salmo salar</i>)	Potential impact to species due to reduction in water quality.	Negligible	Temporary	Irreversible	Present all year round	Negative
Lamprey sp.	No impact is envisaged.	N/A	N/A	N/A	N/A	Neutral
Otter (<i>Lutra lutra</i>)	Potential impact to species due to reduction in water quality.	Low	Temporary	Reversible	Present all year round.	Negative
<i>River Shannon and River Fergus SPA (bird species of conservation interest)</i>	<ul style="list-style-type: none"> Increase in human activity and noise locally during construction. Loss off potential food resources within the footprint of the proposed dredging works. 	<ul style="list-style-type: none"> Negligible Low 	<ul style="list-style-type: none"> Temporary Temporary 	<ul style="list-style-type: none"> Reversible Reversible 	Present in greater abundance during the overwintering period.	Negative

Table 14: Summary of potential impacts (without mitigation) during the operational phase of the development to ecological features selected for Appropriate Assessment.

Ecological Feature	Description of Operational Impact	Magnitude / Extent	Duration	Reversibility	Timing Frequency /	Positive/ Negative
Large shallow inlets and bays	No Impact envisaged	N/A	N/A	N/A	N/A	Neutral

Ecological Feature	Description of Operational Impact	Magnitude / Extent	Duration	Reversibility	Timing / Frequency	Positive / Negative
Reefs	No Impact envisaged	N/A	N/A	N/A	N/A	Neutral
Bottlenose Dolphin (<i>Tursiops truncatus</i>)	No Impact envisaged	N/A	N/A	N/A	N/A	Neutral
Atlantic Salmon (<i>Salmo salar</i>)	No Impact envisaged	N/A	N/A	N/A	N/A	Neutral
Lamprey sp.	No Impact envisaged	N/A	N/A	N/A	N/A	Neutral
Otter (<i>Lutra lutra</i>)	No Impact envisaged	N/A	N/A	N/A	N/A	Neutral
<i>River Shannon and River Fergus SPA (bird species of conservation interest)</i>	A increase level of boating activity within the study area	Negligible	Permanent	Irreversible	Present in greater abundance during the overwintering period.	Negative

3.5 Cumulative Impacts

As well as singular effects, the potential for in-combination or cumulative effects also need to be considered. A cumulative impact arises from incremental changes caused by another past, present or reasonably foreseeable future actions together with the proposed developments. Relevant plans and projects have been identified in section 2.2.

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 development of the Marina and dredging work associated with the inner inbound Kilrush Creek would be carried out in conjunction with the proposed dredging works discussed in this report. It is determined that there is some potential for cumulative impacts between the proposal and the ongoing dredging outside the lock gates. However, it is noted that the programme of works associated with the proposed marina development does not require any habitat loss in any designated site, potential noise or disturbance impacts will be temporary and the measures incorporated into the Environmental Management Plan will ensure that significant adverse water quality impacts and impacts to dolphins are avoided. Therefore, in the absence of any direct or indirect impacts arising from the proposed marina development which could result in adverse impacts on any Natura 2000 site it is concluded that there is no potential for synergistic effects between the proposal and the ongoing dredging activities in the area adjacent to the lock gates in the Kilrush Creek.

Dredging works are frequent and ongoing throughout the Shannon River estuary with dredging works being carried out or proposed at Foynes and Money point to name but a few. However given the high potential impact predicted due to sedimentation associated with the proposal the cumulative impact associated with this aspect of the project is considered to be high.

3.6 Mitigation

3.6.1 Introduction

A number of mitigation measures have been incorporated into the project design in order to reduce the likely significance of the impacts on the Natura 2000 Sites as outlined above. The main concerns are:

- The alteration of habitats;
- The potential impairment of water quality from pollutants produced during the construction phase of the development;
- Disturbance and/or displacement of species; and
- Habitat or Species Fragmentation.

In order to avoid or reduce the risks associated with these potential impacts, the mitigation measures described in the following sections have been incorporated into the project design.

Construction of the development and dredging is expected to cause temporary (disturbance) adverse impact on Natura 2000 Sites. A number of planned mitigation measures detailed below will reduce these impacts significantly. Many of the mitigation measures below have been based on CIRIA technical guidance on water pollution control (Murnane, E., Heap, A., and Swain, A., 2006).

3.6.2 Environmental Management Plan (EMP)

A number of measures have been incorporated into the project design in order to reduce the likely significance of the impacts on the Natura 2000 sites listed in Table 5, above. The main concern is the potential impact on the water quality of the Shannon Estuary during the construction phase, and the subsequent impacts on the aquatic species of qualifying interest. This plan is designed to avoid or reduce the risks associated with these potential impacts.

3.6.1 Marine Mammal Operator (MMO)

When assessing the potential impact of underwater noise associated with the construction phase of the proposed development on marine mammals and subsequent mitigation measures the NPWS guidance document 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' was utilised. The passage below taken from Page 21 of the document is specifically relevant (NPWS, 2012d).

6. Unless information specific to the location and/or operation/activity is otherwise available to inform the mitigation process (e.g., sound attenuation data), operations should not commence if marine mammals are detected within a 1,000m radial distance of the intended sound source, i.e., within the Monitored Zone. This restriction also applies to any ramp-up procedure where the maximum sound output has not yet been attained.

A Marine Mammal Operator (MMO) shall be employed during the proposed dredging works for the duration of the proposed with dredging not allowed to be carried out if dolphins are present within the 1,000m radial distance referred to above. The Marine Mammal Operator shall be an experience marine ecologist appointed in conjunction with consultation with the Irish Whale and Dolphin Group

prior to construction commencing. The MMO will have the authority to stop works in the event of a marine mammal being recorded within the 1,000m buffer area from the intended noise source.

3.6.2 Water Quality Measures during the Construction Phase

The main risk to the water quality of the marina and the adjacent estuary results from the potential of sedimentation of the marina waters, run-off of pollutants from construction discharging via drains and accidental fuel spillages. These risks arise from both excavation and construction activities. The following measures will be implemented in order to reduce the significance of the potential adverse impacts associated with the construction phase.

3.6.2.1 Protection of Watercourses (General Measures)

The following measures have been incorporated into the design of the development so as to ensure no significant negative impact on the marine water body and features of conservation interest within Natura 2000 sites:

- Fuelling and lubrication of equipment will be carried out under controlled conditions in bunded areas and away from watercourses or drains;
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site and properly disposed of;
- Sufficient oil booms and oil soakage pads will be kept on site to deal with any accidental spillage;
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling; and
- Prior to any work it will be ensured that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids and grease.

3.6.2.2 Fuel and Oil Management Plan

Fuel and oils must not, under any circumstances, discharge into an aquatic zone.

An adequate fuel and oil management plan will be agreed with the civil contractor prior to commencement of construction and incorporated into the EMP. This will outline measures to prevent fuel and oil from entering the marine water body and will describe the emergency procedures designed to control any accidental spillages. All site plant and machinery site e.g. excavators, dumpers etc, will be refuelled in a, bunded, designated area at least 50m from any watercourses, drains or aquatic zones. The management of fuel on site will have regard to the following elements:

- Prior to any work commencing it will be ensured that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids and grease;

- Fuels, lubricants and hydraulic fluids for equipment used will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism and provided with spill containment according to current best practice⁴
- Mobile bowzers, tanks and drums will be stored in a secure, impermeable storage area, at least 50m away from drains and open water;
- Fuel containers will be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses, pipe and pumps must be contained within the bund;
- Fuelling and lubrication of equipment will be carried out in banded areas;
- Taps, nozzles or valves should be fitted with a lock system;
- Fuel and oil stores, including tanks and drums, will be regularly inspected for leaks and signs of damage;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- Oil booms and oil soakage pads will be kept on site to deal with any accidental spillage. In the event of a spill any fluids collected and any contaminated soil will be collected in leak proof containers and removed from the site for disposal by a licensed contractor;
- Refuelling of dredging vessels will use the existing fuelling boom and will comply with procedures and practices as stipulated under any environmental protection clauses of the pertinent bye laws that pertain.

The refuelling will occur within the marina and will, therefore, be controlled by the bye-laws made by Kilrush Town Council and by a range of national and international laws and regulations. These laws and regulations are outlined in the 'Code of Practice for Recreational Craft', published by the Department of Transport⁵, which lists the statutory requirements for owners and operators of recreational craft. Included in the code of practice are provisions which relate to the prevention and control of the pollution of aquatic environments.

Refuelling of the dredger will take place under a controlled environment from a mobile browser at designated refuelling point within the adjacent marina. It is highly unlikely that an accidental fuel spill will occur as it is expected that the nominated contractor will be experienced and competent in working in sensitive marine environments and will comply with the control measures outlined above to prevent any pollution by fuels or oil.

⁴ (Available at <http://www.envirocentre.ie/includes/documents/OilStorageBPG.pdf> [accessed 10/06/2013])

⁵ Available at : <http://www.transport.ie/upload/general/9650-0.pdf>

3.6.2.3 *Waste Control*

The main contractor will engage a waste company to deal with all its wastes during construction, so all waste streams are identified at the outset and a selection of skips and bins are delivered to the contractor's compound at the outset and the waste is then managed throughout the construction phase. The contractor will prepare a Waste Management Plan. Sufficient waste storage should be supplied near to all working areas.

3.6.2.4 *Storage*

The storage of materials, containers, stockpiles and waste, however temporary, will follow best practice at all times and be stored at designated areas.

The storage of materials, containers, stockpiles and waste, however temporary, will follow best practice at all times and be stored at designated areas. Storage will be located:

- At least 50m from drains and any watercourses or drains;
- On an impermeable base;
- Under cover to prevent damage from the elements;
- In secure areas; and
- Well away from moving plant, machinery and vehicles.

All containers will be stored upright and clearly labelled. Sufficient waste storage will be supplied near to all working areas.

Table 15: Summary of mitigation measures and residual direct and indirect impacts on the Natura 2000 Sites

Natura Site / Ramsar Site Potentially Effected	Ecological Feature and Impact	Likelihood of impact occurring as predicted	Mitigation Measure/s	Residual Impact
<i>Lower Shannon and the River Shannon and River Fergus SPA</i>	Habitat alteration	Unlikely-Probable <i>Significance of the impact: Negative significant short-term impact.</i>	-	Unlikely-Probable <i>Significance of the impact: Negative significant short-term impact.</i>
<i>Lower Shannon and the River Shannon and River Fergus SPA</i>	Impairment of water quality - sedimentation	Unlikely-Probable <i>Significance of the impact: Negative significant short-term impact.</i>	-	Unlikely-Probable <i>Significance of the impact: Negative significant short-term impact.</i>
<i>Lower Shannon and the River Shannon and River Fergus SPA</i>	Impairment of water quality - pollutants	Unlikely-Probable <i>Significance of the impact: Negative significant short-term impact.</i>	Proper implementation of a fuel management plan, implementation of best practice guidelines in relation to working within waterways.	Unlikely-Probable <i>Significance of the impact: Negative slight/negligible short-term impact.</i>
<i>Lower Shannon cSAC</i>	Dolphins noise /vibration	Unlikely <i>Significance of the impact: Negative significant short-term impact.</i>	Employment of a marine mammal operator and a 1,000m buffer zone from proposed works.	Probable-Near Certain <i>Significance of the impact: Negative slight/negligible short-term impact.</i>
<i>River Shannon and River Fergus SPA</i>	Disturbance	Probable <i>Significance of the impact: Negative negligible short-term impact.</i>	None required	Probable <i>Significance of the impact: Negative negligible short-term impact.</i>
<i>River Shannon and River Fergus SPA</i>	Loss of food resources	Unlikely-Probable <i>Significance of the impact: Negative Slight short-term impact.</i>	Proper implementation of a fuel management plan, implementation of best practice guidelines in relation to working within waterways.	Unlikely-Probable <i>Significance of the impact: Negative Slight short-term impact.</i>

3.7 Residual impacts

From a review of the Sediment Transport Study prepared by Aquafact International Services Ltd there is a degree of uncertainty about how the proposed dredging works may impact the Lower River Shannon cSAC and the River Shannon and River Fergus SPA. There is a potential for a **significant short-term negative impact** to Annex I habitats within the Lower River Shannon cSAC as a result of deposition. The increased sedimentation within the water column could also potentially result in **significant short-term negative impact** to dolphins within the cSAC due to displacement. The use of marine mammal operator (MMO) and a 1km exclusion zone would go some way to reducing this potential impact.

An alternative dredging methodology involving the extraction of sediment during dredging for transport to a designated deposition area at sea would offer a more assured methodology to reduce the potential for habitat alteration or impacts associated with increased sedimentation. This would reduce greatly the potential for the proposed works to result in a significant impact to Natura 2000 sites.

3.8 Conclusion

- The proposed project has the potential (without mitigation measures) to impact negatively on the Lower River Shannon cSAC (Site code: 002165) and River Shannon and River Fergus SPA (004077).
- The main potential impacts on these protected sites are the risk of underwater noise and vibration to marine mammals, sedimentation, the impairment of water quality and alteration of habitats.
- The main features which could potentially be affected (without mitigation measures) are large shallow inlets and bays; reefs, bottlenose dolphin, Atlantic salmon, sea lamprey, river lamprey and otter within the Lower River Shannon cSAC and bird species of conservation interest within the River Shannon and River Fergus SPA (004077).
- Mitigation measures proposed included the employment of a marine mammal operator (MMO), implementation of a fuel management plan; water quality management plan; implementation of best practice guidelines in relation construction near waterways; waste control; best practice storage guidelines and to ensure that mitigation measures are fully implemented.
- Following the implementation of the mitigation measures it is ***Probable-Near Certain*** that the residual impacts of the proposed development could potentially have a **Significant Negative Impact** on ecological features.
- The cumulative impact assessment concludes that the proposed project could potentially contribute to a significant negative cumulative impact on Natura 2000 Sites concerned.
- It is recommended that an alternative dredging methodology involving the extraction of sediment during dredging for deposition at sea would offer a more assured methodology to reduce the potential for habitat alteration or impacts associated with increased sedimentation.

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Appendix 1

Site Summaries

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 *Nephtys 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 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: TULLAHER LOUGH AND BOG

SITE CODE: 002343

Tullagher Lough and Bog is located 4 km south-east of Doonbeg in the townlands of Carrowmore South, Carrowblough Beg and Tullagher in County Clare. This is a diverse site comprising of raised bog (including areas of high bog and cutover), wet grassland, improved grassland, scrub woodland, alkaline fen and lake. It is bounded to the east by the Doonbeg to Moyasta road, to the west by a local road, to the north by bog tracks and to the south by a conifer plantation.

The site is a candidate Special Area of Conservation selected for active raised bog, degraded raised bog, Rhynchosporion and transition mire, habitats that are listed on Annex I of the E.U. Habitats Directive. Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. The Rhynchosporion habitat occurs in wet depressions, pool edges and erosion channels where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some of the following associated species, Bog Asphodel (*Narthecium ossifragum*), Sundews (*Drosera* spp.), Deergrass (*Scirpus cespitosus*), Carnation Sedge (*Carex panicea*).

The raised bog habitat consists of a small dome of high bog with extensive cutover to the west and south. The high bog is flat with slopes to the south-west associated with marginal drainage. There are wet hollows and a large pool with quaking margins, at the centre of the high bog. There are also a number of small flushes. The extensive cutover consists of numerous old peat cuttings with turf banks and hollows. A mineral ridge with improved grassland adjoins the high bog to the north-west and there is semi-improved wet grassland to the north-east.

The high bog has vegetation typical of a raised bog consisting of Ling Heather (*Calluna vulgaris*), Common Cottongrass (*Eriophorum angustifolium*) and Bog Asphodel with occasional Lousewort (*Pedicularis sylvatica*) a species typical of western raised bogs. Bog mosses (*Sphagnum* spp.) are abundant with 95% moss cover. Extensive lawns of *Sphagnum capillifolium* and *S. papillosum* occur with occasional *S. magellanicum*. The bog mosses *S. cuspidatum* and *S. auriculatum* occur in wet hollows. The large pool in the centre of the high bog probably has mineral input as indicated by the presence White Water-lily (*Nymphaea alba*), Bottle Sedge (*Carex rostrata*) and Water Avens (*Geum rivale*). A dense quaking carpet of bog moss (*S. cuspidatum*) occurs at the pool margin. Ling Heather, Purple Moor-grass (*Molinia caerulea*), Cranberry (*Vaccinium oxyoccos*) and Common Cottongrass are also present. The flushes are dominated by Purple Moor-grass, Ling Heather and Bog

-myrtle (*Myrica gale*). The old peat cuttings are dominated by Purple Moor-grass with Ling Heather on dry turf banks.

The vegetation of the low-lying areas beside the open water bodies of Tullaher Lough is dominated by Common Reed (*Phragmites australis*). Extensive quaking *Sphagnum* lawns with low hummocks, corresponding to the E.U. Habitats Directive Annex I habitat transition mire, also occur. These are separated from the reedbeds by small-sedge vegetation. To the north of Tullaher Lough there is a small area of Birch (*Betula* sp.) wood and scrub. Species-rich hay meadows occur to the south-west of Tullaher Lough and there is improved grassland along the western boundary. The grasslands are not fertilised and are cut in late Summer.

Several noteworthy species occur at the site including Pipewort (*Eriocaulon aquaticum*), Six-stamened Waterwort (*Elatine hexandra*), Quillwort (*Isoetes echinospora*) and Brown Beak-sedge.

The site is important for over-wintering Greenland White-fronted Geese, a species that is listed on Annex I of the E.U. Birds Directive, which regularly use the grasslands to the west of Tullaher Lough – average of 47 birds over the four winters 1994/95 to 1998/99. Small numbers (less than 20) of Whooper Swan also occur.

The great bulk of the site has been heavily exploited in the past by drainage and turf cutting and some areas have been reclaimed. Current landuse of the site consists of domestic peat cutting and grazing. Peat cutting is restricted to the cutover to the west with no active peat cutting at the high bog margins. The area of high bog is small, but is quite intact with no active peat cutting or drainage. The cutover to the east of the high bog has been reclaimed for agriculture and cattle graze on these grasslands and the improved grassland on the mineral ridge to the north. Damaging activities associated with these landuses include drainage and occasional burning. These activities have resulted in habitat loss and damage to the hydrological status of the high bog and pose a continuing threat to its viability.

Tullaher Lough and Bog is a site of considerable conservation significance comprising as it does a diverse site with lake, transition mire and raised bog habitats. The site contains one of the few remaining examples of raised bog in County Clare and represents the western extreme of the range of raised bogs in Ireland. Raised bog is a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. Ireland has a high proportion of the total E.U. resource of raised bog (over 60%) and so has a special responsibility for its conservation at an international level. The presence of a good example of transition mire is also of particular significance. Its value as a wintering ground for Greenland White-fronted Geese is also noteworthy.

SITE SYNOPSIS

SITE NAME: KILKEE REEFS

SITE CODE: 002264

The Kilkee Reefs are situated north of the River Shannon estuary on the Co. Clare coast. The site stretches for approximately 12 km from Ballard Bay to Castle Point. The reefs are exposed to the full force of Atlantic swells from the west. A small shallow bay, Moore Bay, offers some shelter from wave action and a beach is present. The bedrock is Carboniferous Millstone Grit and Flagstone. A few small islands are included, the largest being Bishop's Island.

This area contains two habitats listed on Annex I of the EU Habitats Directive: shallow bay and reefs. The reefs are very exposed to wave action and support excellent examples of communities for this habitat including one dominated by the mussel (*Mytilus edulis*). Deep rock-pools have the brown alga *Bifurcaria bifurcata*, whereas the shallower pools towards the low shore have the sea urchin *Paracentrotus lividus*. The low shore has communities characterised by the brown thong weed *Himanthalia elongata* and *Alaria esculenta*. These communities, which are typical of western Ireland, are quite distinct from communities in similar habitats elsewhere in Ireland or north-western Europe. Sub-tidally there are good examples of a variety of reef communities. In shallow water the reefs are steeply sloping with kelp forests of algal species tolerant to sand scour. Communities with less dense kelp and red foliose algae occur and may be very species rich. In deeper water the gently sloping rock is characterised by good examples of the Axinellid sponge community with the sea-fan *Eunicella verucosa*. The sponge *Phakellia vermiculata*, which is rare in shallow water, is present. Vertical cliff faces are characterised by the jewel anemone (*Corynactis viridis*) in both shallow and deep water.

The rocky shores within the site are extensive platforms with short vertical steps and have good examples of the range of communities found on shores that are extremely exposed to wave action. There are extensive zones of lichens, channel wrack *Pelvetia canaliculata* and barnacles. The upper shore has an extensive community (300m) of barnacles and limpets on an even platform of bedrock. Cracks and crevices provide a refuge for anemones (*Actinia equina*), mussels and snails (*Littorina saxatilis* and *Nucella lapillus*). The mid shore has an extensive community of *Fucus vesiculosus* with the barnacles *Chthamalus montagui*, *Chthamalus stellatus* and *Semibalanus balanoides* and the limpet *Patella vulgata*. Deep rock-pools are characterised by pink encrusting coralline algae and *Corallina officinalis* under a canopy of brown algae (*Laminaria saccharina*, *Himanthalia elongata*, *Bifurcaria bifurcata*, *Laminaria digitata* and *Fucus serratus*).

The lower mid shore is characterised by extensive, dense beds of mussels, mixed with barnacles on higher, less exposed rock and with *Corallina officinalis* in damp, protected areas. This zone may also be very wide (300m). Shallow pools with pink coralline crusts and the purple sea urchin *Paracentrotus lividus* living in pits, are

abundant. The subtidal fringe is characterised by a narrow band of *Himanthalia elongata*, *Alaria esculenta* on exposed vertical faces and *Laminaria hyperborea* and *Laminaria digitata* on horizontal surfaces. The walls of a surge gully are characterised by a dense faunal turf with the hydroid *Tubularia indivisa* and the jewel anemone *Corynactis viridis* the most abundant species. The boulders at the base of the gully support a kelp community with foliose and filamentous red algae, snails and crabs. The surge gully contains a diverse biota, with 86 species recorded.

The shallow sublittoral reefs are steeply sloping and extremely or moderately exposed to wave action. They are characterised by communities typical of this level of wave exposures. Cliff faces are populated by the jewel anemone, *Corynactis viridis*. Red algae grow on the ledges and the overhanging faces support the sponge *Haliclona viscosa* and bryozoans (*Scrupocellaria scruposa* and *Crisia eburnea*). These reef communities may be very species rich. *Laminaria hyperborea* and sand scour tolerant red algae such as *Polyides rotundus* and *Ahnfeltia plicata* characterise the horizontal surfaces in moderately exposed areas of Moore Bay. The kelp species, *Laminaria saccharina* and *Saccorhiza polyschides* are also present. With increasing depth the *Laminaria hyperborea* forest thins to a park and the brown alga *Dictyota dichotoma* becomes more common. The kelp was not recorded below 24 m. Horizontal surfaces are dominated by red algae (*Delesseria sanguinea*, *Rhodymenia pseudopalmata*, *Heterosiphonia plumosa* and *Rhodophilis divaricata*). With a further increase in depth there are fewer algae and sponges, (*Polymastia boletiformis* and *Cliona celata*), bryozoans become more common on the ledges and the sea fan *Eunicella verrucosa* and sea slug *Crimora papillata* are present. Vertical surfaces are colonized by the sponges *Pachymatisma johnstonia* and *Thymosia guernei* while the sea cucumber *Aslia lefevrei* occupies the crevices.

At depth below 25 m the reefs have animal-dominated communities with sparse algae. The vertical bedrock is characterised by the jewel anemone *Corynactis viridis* and the sponges *Cliona celata*, *Pachymatisma johnstonia* and *Haliclona viscosa*. Gently sloping and upward facing reefs at 31–36 m are characterised by the Axinellid cup sponge community with a high diversity of sponges including *Phakellia vermiculata*, the sea fan *Eunicella verrucosa* and its associated sea slug *Tritonia nilsodhneri*. The red soft coral *Alcyonium glomeratum*, the hydroid *Gymnangium montagui*, the starfish *Stichastrella rosea*, the bryozoans *Pentapora foliacea* (rose ‘coral’) and *Porella compressa* (staghorn ‘coral’) are also present.

The sandy beach at Kilkee is composed of brown-coloured, poorly sorted sand and is fairly flat over most of its width. There is a small amount of drift weed on the strand line and a sandhopper community is present. In the midshore, the polychaete worms (*Scolelepis foliosa* and *Arenicola marina*) are occasional to abundant. At the low shore, polychaete worms (*Nephtys hombergii*, *Scolelepis foliosa* and *Arenicola marina*) are abundant and amphipod crustaceans (*Bathyporeia pelagica*) are common.

This site is of conservation importance as it has excellent examples of reefs, a habitat that is listed on Annex I of the EU Habitats Directive. Furthermore, the site includes a small though significant example of a shallow bay, a habitat that is also listed on Annex I of the Directive.

03.09.2001

SITE SYNOPSIS

SITE NAME : CARROWMORE DUNES

SITE CODE : 002250

Carrowmore Dunes are situated on the south-western coast of County Clare, roughly midway between Milltown Malbay and Kilkee, and extends from Carrowmore Point in the north to Doonbeg Bay in the south. Fine sandy beach merges into a cobble beach on the seaward side of a sand dune system. Exposed bedrock marks the northern and southern boundaries of the site. Seaward, the site extends for 500m from the shore to include shallow marine waters. The geology of the site comprises Upper Carboniferous sandstone and shale. Pure sand dominates the soils on the seaward side, with increasing organic content further inland.

The site is an SAC selected for fixed dunes, Marram dunes, embryonic shifting dunes and reefs, habitats that are listed on Annex I of the E.U. Habitats Directive, and for *Vertigo angustior*, a species of snail that is listed on Annex II of this directive.

Fixed dune with herbaceous vegetation is the largest dune habitat present within the site. Typically, the high dunes have an abundant Marram (*Ammophila arenaria*) cover and in places attain a height of up to 25 m. At the landward side, in the drier sheltered hollows a closed grassy community with Red Fescue (*Festuca rubra*), White Clover (*Trifolium repens*), Bulbous Buttercup (*Ranunculus bulbosus*), Ribwort Plantain (*Plantago lanceolata*) and Field Wood-rush (*Luzula campestris*) has developed. Species diversity is generally higher in these undisturbed areas, with Lady's Bedstraw (*Galium verum*), Daisy (*Bellis perennis*), Bird's-foot Trefoil (*Lotus corniculatus*), Common Mouse-ear (*Cerastium fontanum*) and Yarrow (*Achillea millefolium*) being well represented. Notable species present include Squinancywort (*Asperula cynanchica*) and a pansy, *Viola cf. lutea*. Generally, there is little bare sand and a good cover of mosses (*Homalothecium lutescens* and *Calliergon cuspidatum* most commonly) and lichens (particularly *Peltigera canina*).

Marram dunes occur on the steeper, seaward slopes of the dunes above the beach and at the edges of blow-outs. Typically the cover of Marram is high and there is little ground vegetation over bare sand. Common Scurvygrass (*Cochlearia officinalis*) and Coltsfoot (*Tussilago farfara*) occur occasionally amongst the Marram on the seaward side, with Red Fescue, Ragwort (*Senecio jacobaea*), White Clover and Cat's-ear (*Hypochoeris radicata*) increasing inland. Due to the exposure and high levels of coastal erosion at this site, the embryonic shifting, or fore dunes are not significantly developed, and consist of a loose sand slope grading into the back of the beach. Characteristically, there is much bare sand (typically associated with the first stages of dune building) and the habitat is species-poor, being dominated by Sand Couch (*Elymus farctus*). Unlike similar habitat types in east coast dunes, the intensity of the erosional processes are greater than the depositional ones, so that separate ridges of different ages are not clearly discernible in this dune system.

Intertidal reefs occur on the seaward side of the site, and are particularly well-developed about Magrath's Point at the southern end of the site. Here the shore is moderately exposed to wave action and comprises a wide expanse of shallowly sloping bedrock that is stratified and set at an incline to form shallow ridges and furrows running obliquely or horizontally across the shore. There are extensive rock pools in the mid-shore and, below this, an area of unstable boulders, cobbles, pebbles and gravel. The reef is particularly rich in algal and invertebrate species and supports a number of rare taxa, including the snapping shrimp (*Alpheus macrocheles*) and the algae *Phyllophora sicula* and *Pterosiphonia pennata*.

This site contains a relatively small area of intertidal sandflats, comprised of fine to coarse sand. The main expanse of sandflats occurs along the length of the site before merging northwards and southwards with low exposed reefs. Other than occasional Eelgrass (*Zostera marina*), plant species are typically scarce. The sandflats provide feeding areas for wintering wildfowl and waders.

The site supports a population of the rare snail, *Vertigo angustior*, a species that is listed on Annex II of the E.U. Habitats Directive.

The site is used by a number of bird species, including Chough, a species that is listed on Annex I of the E.U. Birds Directive, Curlew, Dunlin, Oystercatcher, Ringed Plover, Lapwing, Wigeon, Black-headed Gull and Common Gull. A number of other species are intermittent visitors and use a range of other sites along this coastline.

The Carrowmore Dunes site is of considerable conservation significance, supporting as it does, good examples of four habitats that are listed on Annex I of the E.U. Habitats Directive, as well as a population of the rare Annex II snail, *Vertigo angustior*.

SITE SYNOPSIS

SITE NAME : LOWER RIVER SHANNON

SITE CODE : 002165

This very large site stretches along the Shannon valley from Killaloe 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. The Shannon and Fergus 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. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarne. Rivers within the sub-catchment of the Mulkear include the Killeenagarraff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The site is a candidate SAC selected for lagoons and alluvial wet woodlands, both habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for floating river vegetation, *Molinia* meadows, estuaries, tidal mudflats, Atlantic salt meadows, Mediterranean salt meadows, *Salicornia* mudflats, sand banks, perennial vegetation of stony banks, sea cliffs, reefs and large shallow inlets and bays all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive – Bottle-nosed Dolphin, Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Atlantic Salmon and Otter.

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 Maigne 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 Eel-grass beds (*Zostera* spp.) 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: 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 triquetrus*), 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 compass of Common Saltmarsh-grass (*Puccinellia maritima*) and Hard-grass (*Parapholis strigosa*).

Saltmarsh vegetation also occurs around a number of lagoons within the site. The two which have been surveyed as part of a National Inventory of Lagoons are Shannon Airport Lagoon and Clooncneen Pool. Clooncneen 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*), Sea Campion (*Silene maritima*), Thrift and Plantains (*Plantago* spp.). A rare endemic Sea Lavender (*Limonium recurvum* subsp.

pseudotranswallinum) 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 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 in the pcSAC.

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 *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 18m. 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 the following:

- stony beaches and bedrock shores - these shores support a typical zonation of seaweeds (*Fucus* spp., *Ascophyllum nodosum* and kelps).
- shingle beaches - the more stable areas of shingle support characteristic 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 – there is a known occurrence of sand/gravel beds in the area from Kerry Head to Beal Head.
- sand dunes - a small area of sand dunes occurs at Beal Point. The dominant species is Marram Grass (*Ammophila arenaria*).

Flowing into the estuaries are a number of tidal rivers.

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 being broad, generally slow-flowing and naturally eutrophic; the Fergus being 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, however, improved grassland is most common. 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 and sedges and supporting a diverse and species-rich vegetation, including such uncommon species as Blue-eyed Grass (*Sisyrinchium bermudiana*) and Pale Sedge (*Carex pallescens*).

Floating river vegetation characterised by species of Water-crowfoot (*Ranunculus* spp.), Pondweeds (*Potamogeton* spp.) and the moss *Fontinalis 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 county 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 50m 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 sally (*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 riverside 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 Oak (*Quercus robur*), Elm (*Ulmus glabra*, *U. procera*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and the shrubs Guelder-rose (*Viburnum opulus*) and willows. The ground flora is species-rich.

Woodland is infrequent within the site, however Cahiracon Wood contains a strip of old Oak woodland. Sessile Oak (*Quercus 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 telmateia*) 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 2km 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 feature prominent Greater wood-rush and Bilberry (*Vaccinium myrtillus*) with a typical range of woodland herbs. Where there is more light available, Bracken (*Pteridium aquilinum*) features.

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 approx. 5km north west of Cappamore Co. Limerick. The bog contains some wet areas with good moss (*Sphagnum*) cover. Species of particular interest include the Cranberry (*Vaccinium oxycoccos*) and the White Sedge (*Carex curta*) along with two other regionally rare mosses including *S. fimbriatum*. The site is being invaded by Birch (*Betula pubescens*) scrub woodland. Both commercial forestry and the spread of rhododendron has greatly reduced the overall value of the site.

A number of plant species that are Irish Red Data Book species occur within the site - several are protected under the Flora (Protection) Order, 1999:

- Triangular Club-rush (*Scirpus triquetrus*) - in Ireland this protected species is only found in the Shannon Estuary, where it borders creeks in the inner estuary.
- Opposite-leaved Pondweed (*Groenlandia densa*) - this protected pondweed is found in the Shannon where it passes through Limerick City.
- Meadow Barley (*Hordeum secalinum*) - this protected species is abundant in saltmarshes at Ringmoylan and Mantlehill.
- Hairy Violet (*Viola hirta*) - this protected violet occurs in the Askeaton/Foynes area.
- Golden Dock (*Rumex maritimus*) - noted as occurring in the River Fergus Estuary.
- Bearded Stonewort (*Chara canescens*) - a brackish water specialist found in Shannon Airport lagoon.
- Convergent Stonewort (*Chara connivens*) - presence in Shannon Airport Lagoon to be confirmed.

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 (1062; 1995/96), Curlew (1504; 1995/96), Redshank (3228; 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 Peregrine 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 (4010 individuals at Loop Head, 1987)

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary consisting of at least 56-68 animals (1996). This is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. 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 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 landuses 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, reflecting the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences by 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 habitat lagoon, 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.

6.10.2006

SITE SYNOPSIS

SITE NAME: CARROWMORE POINT TO SPANISH POINT AND ISLANDS

SITE CODE: 001021

This site extends along the Clare coastline from Spanish Point (3 km west of Milltown Malbay), in a south-south- westerly direction to Carrowmore Point. It comprises a strip of coastline, several offshore islands and rocks (notably Mutton Island), and the open marine water of Mal Bay between the islands and the mainland. Lough Donnell is a lagoon found near Carrowmore Point at the southern end of the site. Underlying the site are Carboniferous grits which are bedded at a low angle and which give rise to surf conditions in places along the coast. The headlands experience some of the most severe conditions of exposure in Ireland.

The site is a candidate SAC selected for lagoon and petrifying springs, both priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for other habitats listed on Annex I of the directive – perennial vegetation of stony banks and reefs.

A further range of marine and coastal habitats are represented on the site, including mud/sandflats, sand dunes, sandy, shingle and boulder beaches, clay and rocky sea cliffs, bedrock shores, the associated wetland communities of the lagoon and a short section of the Annageeragh River.

The priority habitat of petrifying springs with tufa formations is well represented at the site and occurs along the sea cliffs at the south end of Spanish Point beach. Species typical of tufa formations found at the site include *Palustriella commutata*, *Cratoneuron filicinum*, *Eucladium verticillatum*, *Leiocolea turbinata* and *Pellia endiviifolia*.

The intertidal reefs have both good zonation of communities down the shore and excellent examples of communities which occur in areas very exposed to moderately exposed to wave action. Spanish Point holds a very high number of littoral reef communities (13 different community types). The low shore and subtidal fringe at both Spanish Point and Cloghaunicy Point have high species richness that ranged from 71 to 85 species. Subtidally, the area is important for its deep, exposed reef communities that are characterized erect sponges and the fragile sea fan *Eunicella verrucosa*. There are a number of rare species present including the sponge *Tetilla zetlandica* which has only known from 4 localities in Ireland between Galway Bay and the Kerry Head Shoal. Algal communities are well developed, with an excellent diversity of red and brown algae species.

Small sand dune systems are found near Spanish Point, about Lurga Point and further south. The northern dune system is somewhat degraded, while that near Lurga Point is less damaged and more stable, and includes areas of foredune and fixed dune.

Shingle banks are found at the base of cliffs and at the head of bays. Due to their exposure these support a sparse vegetation with species such as Sea Beet (*Beta vulgaris* subsp. *maritima*), Orache (*Atriplex* spp.), Sea Mayweed (*Matricaria maritima*) Silverweed (*Potentilla anserina*) and Sea-milkwort (*Glaux maritima*). This is an important habitat that is listed on Annex I of the EU Habitats Directive.

Lough Donnell is a shallow (generally <1 m), sedimentary lagoon. It has an impressive cobble barrier approximately 7 m high and 40 m wide, modified by installation of a large concrete tunnel which forms a permanent inlet/outlet. Seawater enters through this tunnel, perhaps on most tides and also by percolation through the barrier. A small river, the Annageeragh River enters the lagoon from the east. Salinity is assumed to be oligohaline as relatively large volumes of fresh water entering the lagoon appear to prevent appreciable amounts of seawater entering on most tides. Geomorphologically, Lough Donnell is a classic lagoon with one of the most impressive barriers in the country. Floristically, the most notable feature of the lagoon is the presence of the lagoonal specialist Beaked Tasselweed (*Ruppia maritima*). Marginal vegetation, which is best developed on the eastern and southern shores, consists mostly of Common Reeds (*Phragmites australis*), Bulrush (*Schoenoplectus tabernaemontani*) and Sea Club-rush (*Scirpus maritimus*). The faunal assemblage reflects the predominance of freshwater over marine influence throughout the lagoon. A total of 32 aquatic faunal taxa were recorded of which 5 species are regarded as lagoonal specialists (*Palaemonetes varians*, *Sigara stagnalis*, *Jaera nordmanni*, *Neomysis integer*, *Notonecta viridis*). *Notonecta viridis* is a rare brackish water species in Ireland. A Red Data Book plant species, Corky-fruited Water-dropwort (*Oenanthe pimpinelloides*), occurs along the Annageeragh River.

The stretch of coastline between Quilty and Lurga Point has extensive areas of mud/sand flats and supports nationally important bird populations. The following counts are average maxima over five winters 1994/95-1998/99: wintering Purple Sandpiper (239i), Dunlin (1540i), Turnstone (476i), Ringed Plover (170i) and Sanderling (189i). Other species which occur in winter include Grey Plover, Oystercatcher, Lapwing, Curlew, Redshank and Golden Plover.

The offshore islands, Mutton Island and Mattle Island, and rocks, Carrickaneelwar and Seal Rock are important for the seabirds that breed on them, i.e. Storm Petrel (Mutton Island and Mattle Island, the only colonies in Clare, though recent studies are uncertain), Cormorant (Mattle Island, 60p in 1990), Shag (Mattle Island and Mutton Island, c. 30p in 1990), Great Black-backed Gull, Lesser Black-backed Gull and Herring Gull. Mutton Island also holds an internationally important wintering flock of Barnacle Geese (c. 350 individuals in 1994, with up to 480 recorded previously). This species is also occasionally seen on Mattle Island and on adjacent parts of the mainland. A variety of 'terrestrial' birds, e.g. Skylark, Meadow Pipit, Rock Pipit, Pied Wagtail, Raven, Swallow, Wheatear, Stonechat, amongst others, also use the islands (mainly Mutton Island) and are presumed to breed there.

Lough Donnell is used by a variety of birds, mainly waders (numbers in parentheses are based on a single count in one season between 1984/85 and 1986/87): Wigeon (16), Golden Plover (65), Grey Plover (12), Lapwing (170), Dunlin (65), Curlew (230) and Shag (52). Sand Martin nest in low clay cliffs to the north of the lake. Mutton

Island and Mattle Island are designated Special Protection Areas for their birds; the former is also a Wildfowl Sanctuary. Barnacle Goose, Storm Petrel and Golden Plover are listed on Annex I of the E.U. Birds Directive.

Grey Seal are regular in the area and haul out on all of the islands. Mutton Island has a high density of Irish hares.

The coastline around Spanish Point is an amenity and tourist resort and the sand dune system here has become degraded by overuse. Other areas of sand dune on the site have been damaged by overgrazing and erosion.

The site contains a diversity of habitats, plant and animal communities and species and is notable for the occurrence of several habitats listed on Annex I of the E.U. Habitats Directive, namely reefs, lagoons and perennial vegetation of stony banks. The presence of a lagoon, a habitat accorded priority status on this annex, is of particular significance. The range of birds that use the site and the large populations of several of these that are found add considerably to the importance of the site. Additionally, the site has been highly rated for the diversity of marine plant and animal species it supports.

SITE SYNOPSIS

SITE NAME: MID-CLARE COAST SPA

SITE CODE: 004182

This site extends along the Co. Clare coastline in a south-south-westerly direction from Spanish Point (3 km west of Milltown Malbay) to just west of Doonbeg Bay, a distance of some 14 km. It comprises the mainland shoreline, Mutton Island and Mattle Island, a series of rocky reefs and the open marine water of Mal Bay between the islands and the mainland. Underlying the site are Carboniferous grits which are bedded at a low angle and which give rise to surf conditions in places along the coast. The headlands and islands experience some of the most severe conditions of exposure in Ireland.

The mainland shoreline is mostly rocky or stony, though there are several sandy beaches and areas of intertidal flats. There are excellent examples of littoral reef communities, which have extremely high species richness and include uncommon species such as *Paracentrotus lividus* and *Bifurcaria bifurcata*. Sublittorally, the area is important for its deep, exposed reef communities that are characterized by unusual and delicate, erect sponges, including the fragile anthozoan *Eunicella verrucosa*, the rare sponge *Tetilla zetlandica* and the anthozoan *Parazoanthus axinellae*.

Shingle or stony banks are found at the base of cliffs and at the head of bays. Due to their exposure these support a sparse cover of vegetation including such species as Sea Beet (*Beta vulgaris* subsp. *maritima*), Orache (*Atriplex* spp.), Sea Mayweed (*Matricaria maritima*), Silverweed (*Potentilla anserina*) and Sea-milkwort (*Glaux maritima*). Small sand dune systems are found near Spanish Point, about Lurga Point and further south. The stretch of coastline between Quilty and Lurga Point has extensive areas of mud and sand flats and supports nationally important bird populations. Further intertidal flats occur at Doughmore Bay and Doonbeg Bay.

Mutton Island is a medium-sized, uninhabited, island situated approximately 1 km from Lurga Point. It is a fairly low-lying island, rising to 28 m in the west where some cliffs occur. The south and eastern shores are low-lying and comprised of cobbles and boulders. Several small sandy coves exist. Much of the interior of the island is unmanaged dry grassland with a maritime character. Some of the plants present reflect the past agricultural activities. Wet grassland also occurs and, in places, heath vegetation has developed. A small freshwater pond occurs on the island. The island is grazed in summer. A group of littoral reefs occur to the north, notably Carrickaneelwar and Seal Rock. Mattle Island is a small island situated approximately 2 km south of Mutton Island. It is a low-lying island, rising to only 12 m in the central area. The island is highly exposed to the force of the Atlantic Ocean. The terrestrial component of the island is dominated by maritime grassland.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Barnacle Goose, Ringed Plover, Sanderling, Purple Sandpiper, Dunlin and Turnstone. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The site is of ornithological importance for a range of both breeding and wintering birds. Storm Petrel has long been known to breed on Mutton Island, though there has never been a quantitative estimate and there is no recent proof of breeding. Rats are common on the island and if a colony still exists it is likely to be small. It is possible that Storm Petrel could also breed on Mattle Island but there is no proof of this.

Mattle Island supports a nationally important breeding colony of Cormorant, with 60 nests present in May 1990. Both Mutton and Mattle have breeding Shag, estimated at less than 40 pairs in total in 1990. Both islands have nesting Herring Gull (probably less than 40 pairs) and Great Black-backed Gull (possibly up to 70 pairs), while Mutton Island has Lesser Black-backed Gull (24 pairs in 1995) and Common Gull (c. 10 pairs in 1995). Black Guillemot breed at least on Mutton Island (7 pairs in 1990). The nesting seabirds utilise the shallow waters which surround the island for foraging and socializing. An up-to-date survey of all breeding seabirds on the islands is required.

An important population of Barnacle Goose winters on Mutton Island, with birds occasionally visiting Mattle Island and feeding sites on the mainland. Mutton provides both feeding and roosting sites. The population is of national importance though at times exceeds the threshold for international importance (350 birds were present in spring 1994 and 215 in spring 1999).

The mainland shore is important for wintering waders, especially Ringed Plover (316), Purple Sandpiper (393), Dunlin (2,708), Sanderling (272) and Turnstone (571) - figures given are average peaks for the 5 winters 1995/96-1999/00; all of these populations exceed the respective thresholds for national importance. Other species which occur in winter include Golden Plover, Grey Plover, Oystercatcher, Lapwing, Curlew and Redshank. Some of the waders may commute to the islands. The shallow seas are frequented by both Great Northern Divers and Red-throated Divers.

A variety of terrestrial birds occur on the island and are presumed to breed there. These include Skylark, Meadow Pipit, Rock Pipit, Pied Wagtail, Raven, Swallow, Wheatear and Stonechat.

Grey Seal occur regularly in the area and haul out on the islands. Mutton Island has a high density of hares, and also has rabbits and feral goats.

The presence of rats on Mutton Island, and possibly Mattle, is considered to be an important reason for the relatively low numbers of nesting seabirds. Grazing by goats and rabbits on Mutton Island could lead to soil erosion. Increase in the number of tourists to Mutton Island could also affect breeding birds.

This site is of high ornithological importance. It supports a nationally important population of wintering Barnacle Goose, as well as nationally important numbers of five wader species. In summer it has nationally important breeding colonies of Cormorant and Great Black-backed Gull, as well as range of other seabird species. Storm Petrel may still breed. Of particular note is that Barnacle Goose, Storm Petrel, Golden Plover, Great Northern Diver and Red-throated Diver are listed on Annex I of the E.U. Birds Directive.

Appendix 2

Conservation Objectives

Conservation Objectives for Tullaher Lough and Bog SAC [002343]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area 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.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, 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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- ◆ [7110] * Active raised bogs
- ◆ [7120] Degraded raised bogs still capable of natural regeneration
- ◆ [7140] Transition mires and quaking bogs
- ◆ [7150] Depressions on peat substrates of the *Rhynchosporion*

Citation:

NPWS (2011) Conservation objectives for Tullaher Lough and Bog SAC [002343]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning



Conservation Objectives for Kilkee Reefs SAC [002264]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area 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.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, 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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- ◆ [1160] Large shallow inlets and bays
- ◆ [1170] Reefs
- ◆ [8330] Submerged or partly submerged sea caves

Citation:

NPWS (2011) Conservation objectives for Kilkee Reefs SAC [002264]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning



Conservation Objectives for Carrowmore Dunes SAC [002250]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area 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.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, 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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- ◆ [1014] *Vertigo angustior*
- ◆ [1170] Reefs
- ◆ [2110] Embryonic shifting dunes
- ◆ [2120] Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- ◆ [2130] * Fixed coastal dunes with herbaceous vegetation ("grey dunes")

Citation:

NPWS (2011) Conservation objectives for Carrowmore Dunes SAC [002250]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Carrowmore Point to Spanish Point and Islands SAC [001021]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area 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.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, 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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- ◆ [1150] * Coastal lagoons
- ◆ [1170] Reefs
- ◆ [1220] Perennial vegetation of stony banks
- ◆ [7220] * Petrifying springs with tufa formation (*Cratoneurion*)

Citation:

NPWS (2011) Conservation objectives for Carrowmore Point to Spanish Point and Islands SAC [001021]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning



Conservation Objectives for Mid-Clare Coast SPA [004182]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area 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.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, 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.

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

◆ <i>Phalacrocorax carbo</i>	[breeding]
◆ <i>Charadrius hiaticula</i>	[wintering]
◆ <i>Calidris alba</i>	[wintering]
◆ <i>Calidris maritima</i>	[wintering]
◆ <i>Calidris alpina</i>	[wintering]
◆ <i>Arenaria interpres</i>	[wintering]
◆ <i>Branta leucopsis</i>	[wintering]
◆ Wetlands	[]

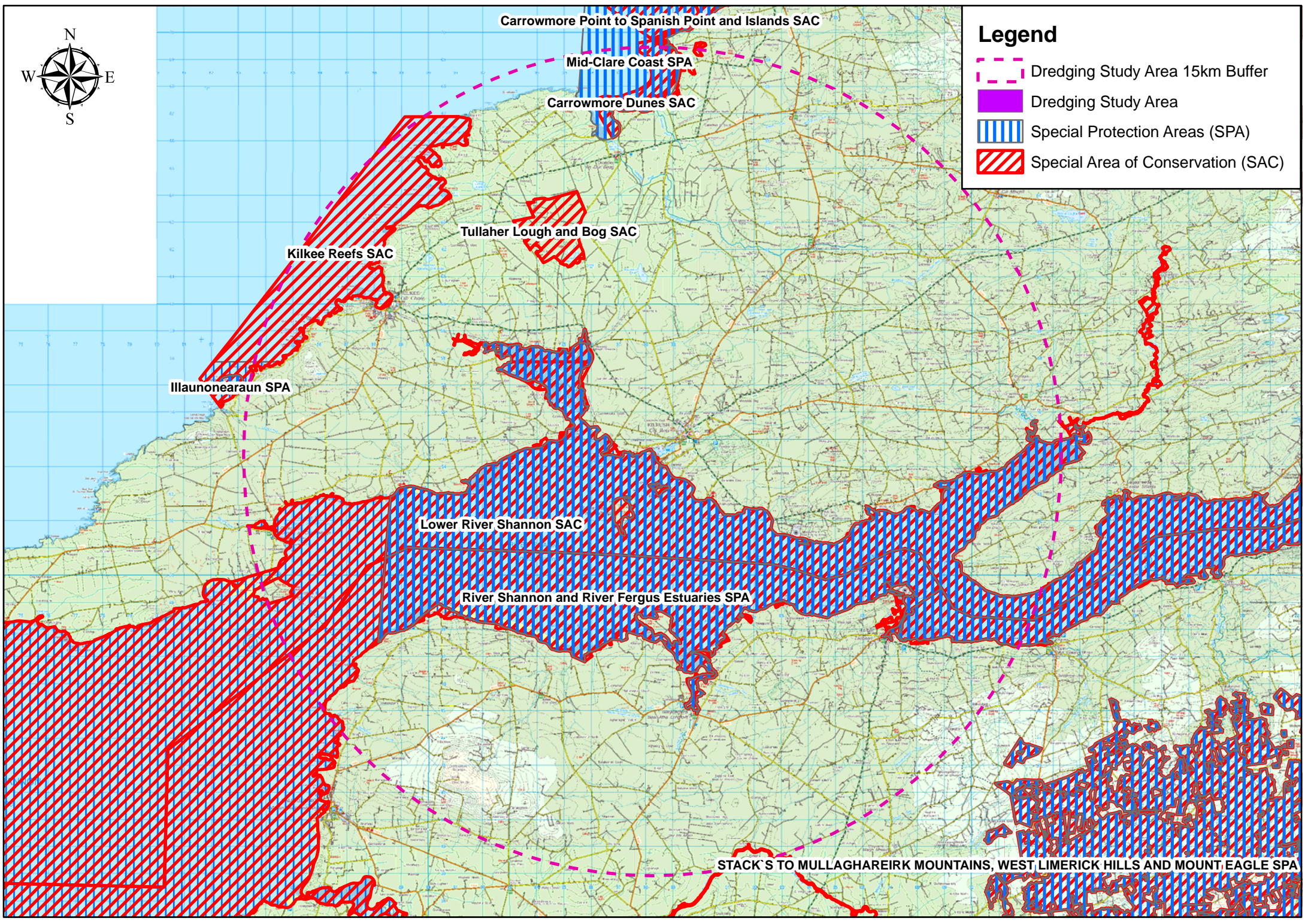
Citation:

NPWS (2011) Conservation objectives for Mid-Clare Coast SPA [004182]. Generic Version 4.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Appendix 3

Figure of Natura 2000 Sites within 15km of the proposal



Legend

- Dashed magenta line: Dredging Study Area 15km Buffer
- Solid magenta area: Dredging Study Area
- Blue and white vertical stripes: Special Protection Areas (SPA)
- Red and white diagonal stripes: Special Area of Conservation (SAC)

Carrowmore Point to Spanish Point and Islands SAC

Mid-Clare Coast SPA

Carrowmore Dunes SAC

Tullaheer Lough and Bog SAC

Kilkee Reefs SAC

Illaunoneraun SPA

Lower River Shannon SAC

River Shannon and River Fergus Estuaries SPA

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