Russell Environmental and Sustainability Services Limited

PART 1

STAGE 1 SCREENING

FOR APPROPRIATE ASSESSMENT

WHITEBOX STUDENT CAMPUS, GROODY ROAD, NEWCASTLE, CASTLETROY, LIMERICK
22nd of January 2025

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1.0 Introduction

In preparation for the planning application for Whitebox Student Campus Development at Groody Road, Newcastle, Castletroy, Limerick, this Stage 1 Screening has been prepared to determine the likelihood of any significant effects on any designated European Sites in the area. The location of the site in relation to European Sites is detailed in Figures 2 and 3.

1.1 Background and Legislative Context

Article 6(1) and article 6(2) of Council Directive 92/43/EEC of 21st May 1992 on the conservation of natural habitats and of wild fauna and flora aims to promote the maintenance of biodiversity. It forms the cornerstone of Europe's nature conservation policy with the Birds Directive and establishes the EU wide Natura 2000 ecological network of protected areas, safeguarded against potentially damaging developments." (EEC, 1992).

Article 6(1) and 6(2) are concerned with Special Areas of Conservation (SAC) and Special Protection Areas (SPA), whereby Member States are required to establish necessary conservation measures and appropriate statutory measures to ensure the protection of natural habitat types in Annex I and the species in Annex II present on the sites. This includes the avoiding the deterioration of natural habitats as well as the disturbance of any species included in Annex II (EHLG, 2009, p18).

The focus of Appropriate Assessment (AA) is targeted specifically on Natura 2000 sites and their conservation objectives. Articles 6(3) and 6(4) of the Habitats Directive (including the Birds Directive) place strict legal obligations on Member States, with the outcomes of AA fundamentally affecting the decisions that may lawfully be made. Articles 6(3) and 6(4) also detail the procedures to be completed when a development is likely to or has affected a Natura 2000 site. There are a number of Special Areas of Conservation (SAC) and a Special Protection Area (SPA) within 15km of the site. As both SAC and SPA sites are European sites and thus Natura 2000 sites, the likely effect of the proposed development requires screening for appropriate assessment (EHLG, 2009, p18).

Articles 6(3) and 6(4) are detailed as follows:

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 (EHLG, 2009, p18).

1.1.1 Stage 1 and 2 Appropriate Assessment

There are four stages involved in completing an AA. Stages 1-2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of Article 6(3) or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

Stage 1. Screening for Appropriate Assessment Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3):

i) whether a plan or project is directly connected to or necessary for the management of the site.
ii) whether a plan or project, 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.

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA) (EHLG, 2009, p27).

Stage 2 for Appropriate Assessment

This stage considers whether the plan or project, alone or in combination with other project or plans, will have adverse effects on the integrity of a Natura 2000 site, and includes any mitigation measures to avoid, reduce or offset negative effects. The proponent of the plan or project will be required to submit a Natura Impact Statement i.e., the report of targeted professionals' scientific examination of the plan or project and the relevant Natura 2000 sites, to identify and characterise any possible implications for the site in view of the conservation objectives, taking into account of in combination effects (EHLG, 2009, p28).

As the site is within 15km to a number of SACs and SPAs, a Stage 1 Screening for Appropriate Assessment is required to determine the likely effect that the proposed development will have on the Annex I habitat and Annex II species as per Article 6(3) and 6(4), that detail the procedures to be completed when a development is likely to or has affected a Natura 2000 site.

1.2 Description of the Proposed Development

Groody Developments Limited seeks planning permission for development of a Purpose-Built Student Accommodation (PBSA) scheme on land fronting the Groody Road and Dublin Road, Castletroy, in the townland of Newcastle, Limerick for a period of seven years.

The development consisting of 196 no. Bed Clusters, is distributed across 5 no. separate blocks, ranging in height from 5 - 8 storeys, with a total of 1,400 no. student bedspaces to be delivered in two phases of development including: (i) Block A comprising 8 storeys providing for (a) 28 no. bed clusters and 224 no. bedspaces; (b) Student library; (c) Student union; (d) Plant room; (e) Bin store; (f) Bicycle store; (ii) Block B comprising 7 storeys providing for (a) 52 no. bed clusters and 400 no. bedspaces; (b) Reception and Office; (c) Post room; (d) Laundry room; (e) Student canteen; (f) Maintenance store; (g) Plant room; (h) ESB substation &; switch room; (i) Bin Storage; (j) and Bicycle store; (iii) Block C comprising 6 storeys providing for (a) 51 no. bed clusters and 355 no. bedspaces; (b) Student Gym; (c) Maintenance store; (d) Plant room; (e) ESB substation &; switch room; (f) Bin Storage; (g) and Bicycle store; (iv) Block D comprising 6 storeys providing for (a) 32 no. bed clusters and 211 no. bedspaces; (b) Reception &; Office; (c) Post room; (d) Laundry room; (e) Student canteen; (f) Student supply retail unit (60m2); (g) Plant room; (h) Maintenance store; (i) Bin Storage; and (k) Bicycle Storage; (v) Block E comprising 5 storeys providing for (a) 33 no. bed clusters and 210 no. bedspaces; (b) Reception &; Office; (c) Laundry room; (d) Maintenance store; (e) Bicycle store; and (f) Plant room; and (vi) ancillary site development works including car and bicycle parking provision; boundary treatments; roof plant; public lighting; water supply; foul and surface water drainage infrastructure; signage; and a temporary construction access to facilitate Phase 2.

Vehicular access to the site will be from the Groody Road with pedestrian access to the Dublin Road. Extensive landscaping proposals, including (a) landscaped courtyards; (b) pedestrian and cycle connections from the Groody Road to the Groody Green Wedge; (c) natural landscaping and public walkways within the Groody Green Wedge; and (d) a Wetland area adjacent to the Groody River are also proposed. Planning permission is also sought for use of the accommodation, outside of student term time, for short-term letting purposes.

1.3 Author of the Report

Russell Environmental and Sustainability Services Limited (RESS Ltd.) were contracted by Groody Developments Limited, to complete a Stage 1 Screening for Appropriate Assessment. This was in preparation for the planning application for Whitebox Student Campus Development at Groody Road, Newcastle Castletroy, Limerick. The site is within 15 km of SACs and SPAs; therefore, it was deemed necessary to prepare a Screening report. The site was surveyed on the 6th of January 2024 by qualified ecologists from Russell Environmental and Sustainability Services Limited.

2.0 Site Description and Baseline Information

2.1 Site Location and Topography

The site is located approximately 3.7Km from Limerick City centre and adjacent to the L5173, Groody Road and the Groody River (Figure1). The Longitude is -8.5800219 and Latitude: 52.6632073 (EPA, 2024).

The site has its highest point to the east of the site at approximately 9m above sea level and the lowest point to the west at 4m above sea level (OSI, 2024).

Figure 1. Location map (EPA, 2024)

2.2 Geology and Soils

The site has bedrock geology of calcareous, basalts and other volcanic rocks (Geological Survey of Ireland (GSI), 2024).

The soil type overlying the bedrock geology on the site is basic deep, poorly drained, mineral soil derived from marine and estuarine sediments (Teagasc, 2024).

2.3 Hydrology

The building footprint of the development is outside of the flood zone. However, adjacent to the River Groody to the west of the site and outside of the redline is within the flood zone (Figure 2) (OPW, 2024). However, it should be noted that this part of Limerick is currently under review for flood mapping.

Running adjacent to the west of the site is the Groody River that discharges directly into the River Shannon and therefore the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SAC downriver (Figure 3).

The most recent Water Framework Directive (WFD) Report on the river Groody states that this river has a 'Moderate' status and is at risk from achieving its WFD objectives as a result of agricultural discharge and diffuse urban runoff (EPA, 2024).

Figure 2 Proximity of the site to the flood plain showing indicative fluvial mapping for High probability, where probability is 1 in 10 for rivers (OPW, 2024).

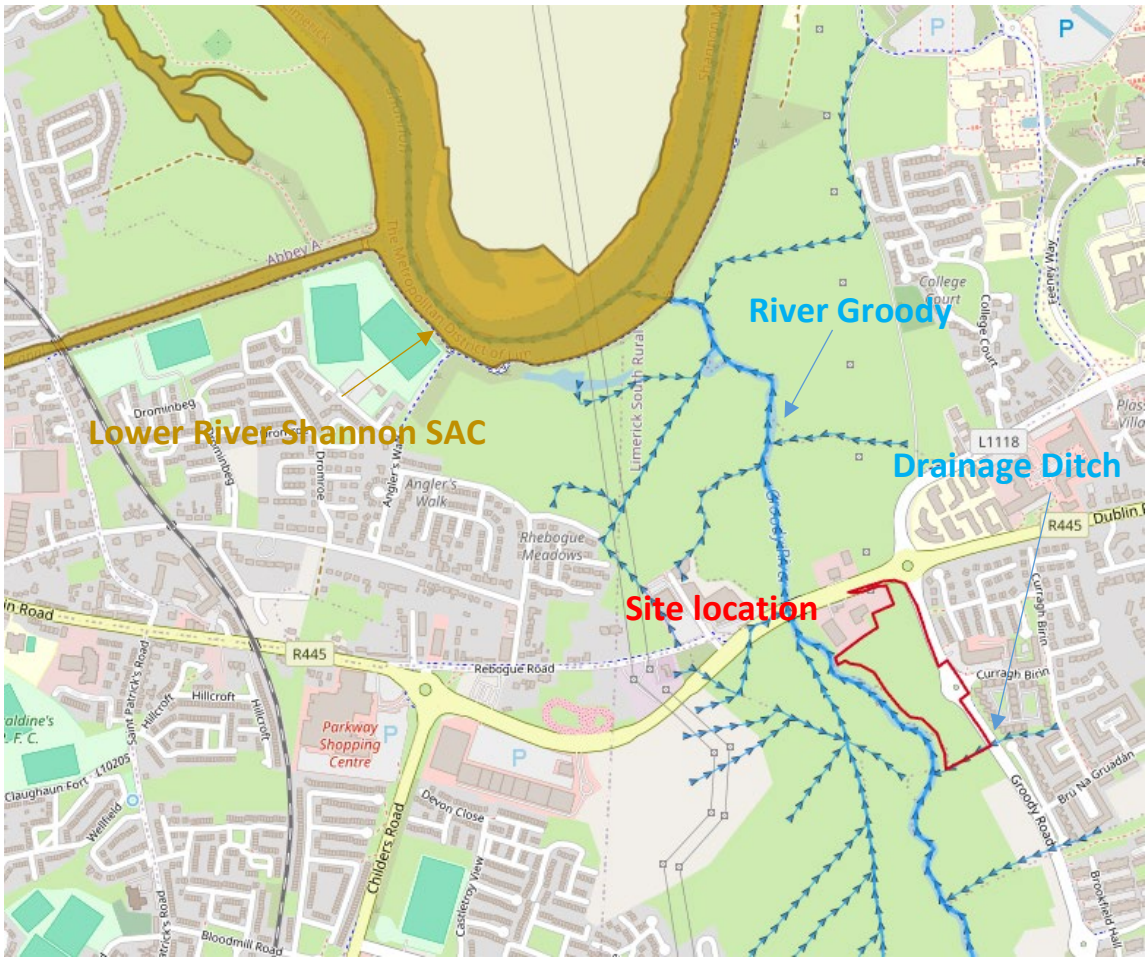

Figure 3 Flow network and connection with Lower River Shannon SAC

2.4 Desk Based Study

A desk-based study was undertaken to determine the proximity of any designated sites within the vicinity of the proposed site.

The EPA provides the AA Geotool that is a database of the protected sites and associated flow network for water courses within Ireland. The flow network as detailed in Section 2.3 identified an adjacent drainage ditch that flows into the River Groody. The River Groody, also adjacent to the site, flows into the River Shannon and thus the Lower River Shannon SAC. Downriver the River Shannon and River Fergus Estuaries SPA also occupies the River Shannon as well as the Lower River Shannon SAC (Figure 3).

The NBDC provides a national database of biological records from Ireland. The database was consulted with regard to species distributions within the vicinity of the site.

The National Parks and Wildlife website was consulted to review the Site Synopsis and Conservation Objectives for the identified European Sites.

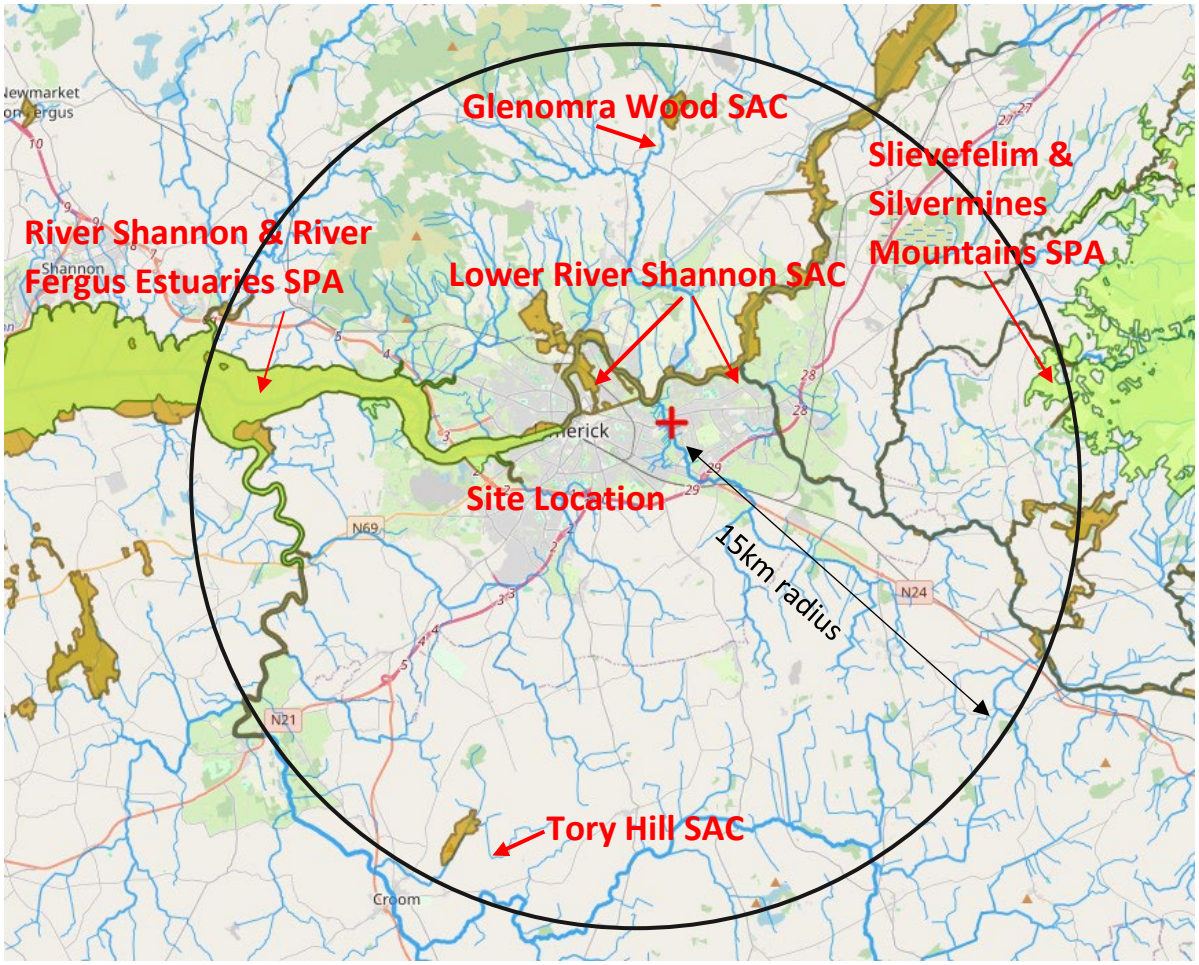

Figure 4 Proximity to European sites within a 15km radius (EPA, 2024)

Source-Pathway-Receptor Model

Although there are a number of sites within the 15km radius of the site as indicated in Figure 4, a more accurate assessment is where the Source-Pathway-Receptor (SPR) model is applied together with the Zone Of Influence (ZOI), which in the case of rivers may be outside of the 15km radius. Therefore Table 1 identifies the European Sites where there may be a potential impact as a result of the SPR model (OPR, 2021).

The source in this instance is likely to be pollutants and particulate matter during the construction phase and surface water runoff during the operation phase, the pathway is the drainage ditch and the River Groody (on the western boundary of the site), the latter which connects into the River Shannon and thus the Lower River Shannon SAC (as identified in Figure 3). The River Shannon and River Fergus Estuaries SPA is a short distance down river from where the River Groody connects with the River Shannon. The River Shannon and River Fergus Estuaries SPA overlaps with the Lower River Shannon SAC. The receptors are the species and habitats of the potentially impacted European Sites identified in Table 1. Each Qualifying Interest (QI) has been evaluated for likely significant effect in Tables 4 and 5.

Name of Site	Approximate distance	Direction	Potential Risk
Lower River Shannon SAC 002165	780m following water courses	Northwest	Yes - Potential Hydrological connectivity and therefore potential pathway for impacts
River Shannon and River Fergus Estuaries SPA 004077	4.5Km following water courses	Northwest	Yes - Potential Hydrological connectivity and therefore potential pathway for impacts
Glenomra Wood SAC 0001013	10km	North	No, hydrological connectivity and sufficient geographical separation, so no potential pathway for impacts
Tory Hill SAC 000439	14.93km	Southwest	No, hydrological connectivity and sufficient geographical separation, so no potential pathway for impacts
Slievefelim & Silvermines Mountains SPA 04165	12.1km	East	No, sufficient geographical separation and no hydrological pathway for impacts

Table 1 Designated sites and their distance from the proposed Phase 5 site (EPA, 2023).

As detailed in Table 1, there is a potential source pathway for impacts on the receptors for two European Sites, the Lower River Shannon SAC and River Shannon and the River Fergus Estuaries SPA as detailed in Figures 5 and 6.

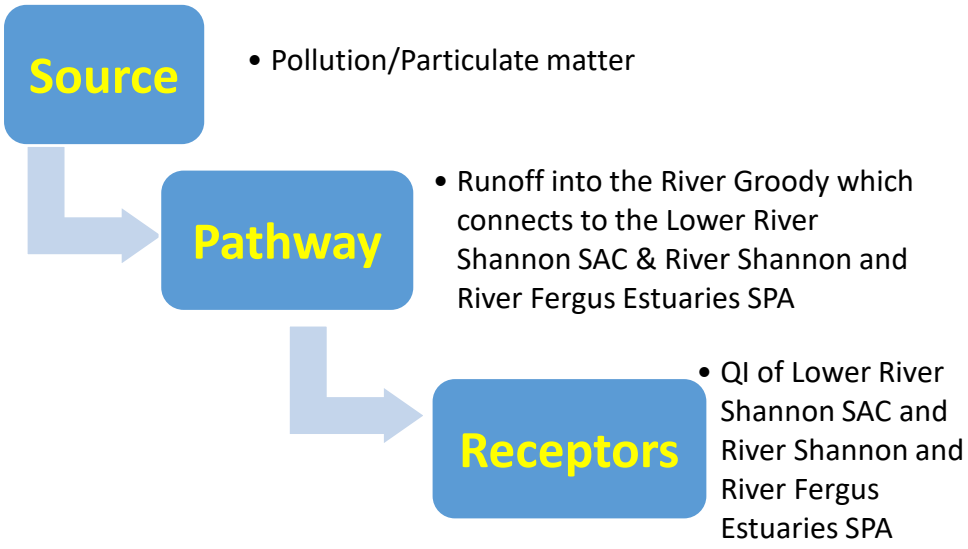

Figure 5 Source-Pathway-Receptor Model for the construction phase

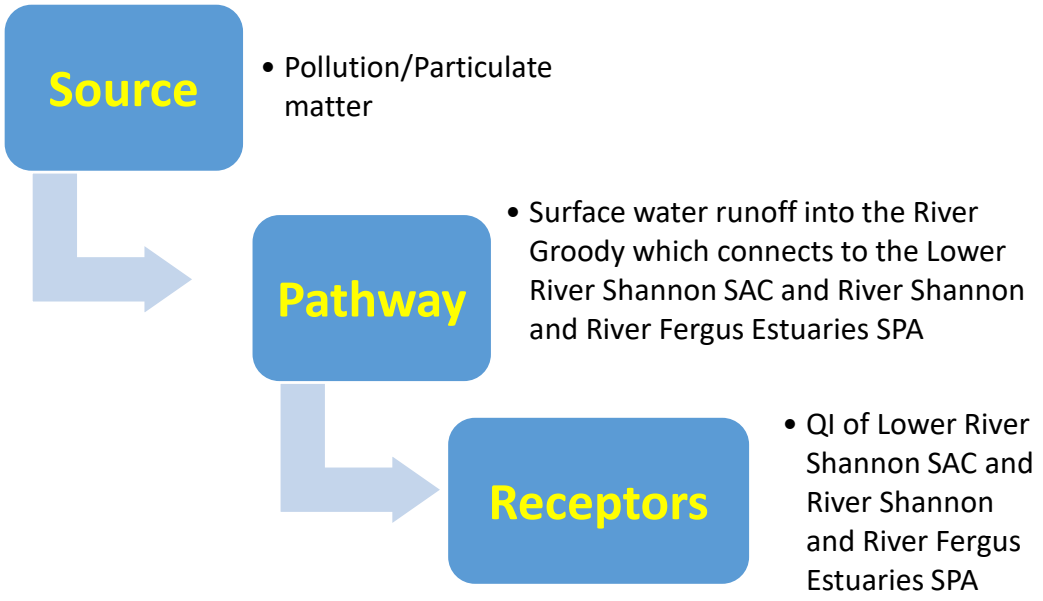

Figure 6 Source-Pathway-Receptor Model for the operation phase

2.5 Field Survey

Flora

The field survey that took place was based on the Best Practice Guidance for Habitat Surveying and Mapping (Smith *et al.*, 2011) whereby the habitats are classified according to Fossitt (2000). In addition, the habitats mapped were compared with the habitats and indicator species for the SACs and SPA.

The letter and number codes i.e., GA1 for *Improved grassland* are the standard codes for habitat classification in Ireland (Fossitt, 2000). The vegetation was also mapped to the habitats listed on Annex I/II of the E.U. Habitats Directive

This report presents the results of a site visit by ecologists from RESS Ltd. on 6th of January 2024 when the site was surveyed. The conditions were dry and there were no constraints to the survey.

Within the site (and adjacent to it), there were six vegetation habitats identified (Fossitt, 2000). These are detailed in Appendix i and the species present are as follows:

GA1 Improved Agricultural Grassland

This type of habitat occupies the majority of the site and is typical of a heavily grazed grass sward of Perennial rye-grass *Lolium perenne*, Common bent *Agrostis tenuis,* Creeping bent *Agrostis stolonifera* and Yorkshire Fog *Holcus lanatus.* The predominant broadleaved species present is predominantly Creeping buttercup *Ranunculus repens* with Bartsia *Odontites vernus*, Broadleaf plantain *Plantago major*, Clover (white) *Trifolium repens,* Clover (red) *Trifolium pratense,* Daisy (Common) *Bellis perennis*, Dandelion *Taraxacum officinale*, Dock *Rumex acetosa,* Knapweed *Centaurea nigra,* Meadow buttercup

Ranunculus acris, Meadow sweet *Filipendula ulmaria*, Nipplewort *Lapsana communis*, Ragwort *Jacobaea vulgaris,* Ribwort plantain *Plantago lanceolata,* Teasel *Dipsacus fullonum,* Square stalked St John's wort *Hypericum tetrapterum*, Tormentil *Potentilla erecta* and Yarrow *Achillea millefolium* (Figure 7).

At the northern boundary of the site Buddleia *Buddleja davidii*, Butterbur *Petasites pyrenaicus* and occasional Dogwood *Cornus sanguinea* are also present.

There are also some small wet areas where Bulrush *Typha latifolia* is present.

In addition, there are a number of large boulders present with Delicate fern moss *Thuidium delicatulum* and Silvergreen bryum moss *Bryum argenteum.*

Figure 7 Improved Agricultural Grassland

FW2 Depositing Lowland River and FW4 Drainage Ditch

To the south of the site is a drainage ditch which flows directly into the Groody River which flows adjacent to the western boundary of the site. Bulrush *Typha latifolia* Common reed *Phragmites australis*, Rush (Conglomerate) *Juncus conglomeratus,* Rush (Hard) *Juncus inlfexus* and Pendulous sedge *Carex pendula* are present on the banks and at the edges of the river and drainage ditch (Figure 9). In the drainage ditch itself Common Water-starwort *Callitriche stagnalis* and Greater spearwort *Ranunculus lingua* are present. The water in the River Groody at the time had a relatively fast flow compared with the

drainage ditch which at the time of surveying was not flowing. The banks of the River Groody in this location were quite steep (Figure 8). There were clear riparian zones in both water courses.

Figure 8 FW2 Depositing Lowland River

Figure 9 FW4 Drainage Ditch

WD5 Scattered Trees

There are occasional scattered immature trees that are predominantly Grey willow *Salix cinerea.* Just outside of the redline boundary for the site is one mature White willow *Salix alba* and a small stand of Silver birch *Betula pendula* to the north-west.

WS1 Scrub

There are occasional scrub areas with Grey willow *Salix cinerea* and Gorse *Ulex europaeus* (Figure 10).

Figure 10 WS1 Scrub and Treeline outside of boundary fence.

WL2 Treeline

The drainage ditch is bordered on both sides by trees which are predominantly Grey willow *Salix cinerea* and Goat willow *Salix caprea*. Also present are Bramble *Rubus fruiticosus agg.,* Dog rose *Rosa canina* and Nettle *Urtica dioica.*

There were no invasive species (e.g., Himalayan Balsam or Japanese Knotweed) present on the site at the time of surveying.

Fauna

The site is currently grazed by horses. There was no evidence of other mammals on the site at the time of surveying.

The bird species identified at the time of surveying were Blackbird *Tardus merula,* Goldfinch *Carduelis carduelis*, Great tit *Parus major*, Magpie *Pica,* Robin *Erithacus rubecula,* Song thrush *Turdus philomelos,* Starling *Sturnus vulgaris,* Willow warbler *Phylloscopus trochilus* and Wren *Troglodytes troglodytes.*

No overwintering waterfowl species were identified on the site.

No evidence of Otters were recorded (holts, spraint or tracks) on the site at the time of surveying.

3.0 Identification of Relevant European Sites

3.1 Background to European Sites

The Habitats Directive (92/43/EEC) together with the Birds Directive (2009/147/EC) form the cornerstone of Europe's nature conservation policy. It is built around two pillars: the Natura 2000 network of protected sites and the strict system of species protection. All in all, the Habitats Directive protects over 1,000 animal and plant species and over 200 "habitat types" (e.g., special types of forests, meadows, wetlands, etc.), which are of European importance. With the introduction of the EU Habitats Directive and Birds Directive which were transposed into Irish law as S.I. No. 94/1997 European Communities (Birds and Natural Habitats) Regulations 1997, the European Union formally recognised the significance of protecting rare and endangered species of flora and fauna, and importantly, their habitats.

The 1997 Regulations and their amendments were subsequently revised and consolidated in S.I. No. 477/2011- European Communities (Birds and Natural Habitats) Regulations 2011. This legislation requires the establishment and conservation of a network of sites of particular conservation value that are to be termed 'European Sites'.

Based on the desk-based study, Table 1 and Figure 3 both identify the designated sites located within a 15km radius of the site as per the DEHLG Guidance (2010). However, the Source-Pathway-Receptor model was the main consideration for potential impact of the development as this is more realistic than the arbitrary 15km (OPR, 2021). The Zone of Influence has been identified to include the Lower River Shannon SAC as the site is Hydrologically connected in close proximity (following the course of the River Groody a distance of 780m) and the River Shannon and River Fergus Estuaries SPA (which following the watercourses is 4.5km from the point of connection with the northern most section of the site). As there is no hydrological connection with the other European Sites listed in Table 1, they are therefore outside of the ZOI.

The sites listed in Table 1 are European Sites which are designated as Special Areas of Conservation (SAC) and/or Special Protection Areas (SPA) (Figure 4).

4.0 Assessment of likely significant effects on the European Sites

The Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA are hydrologically linked to the site by the drainage ditch to the south of the site and the Groody River adjacent to the west of the site that flows directly into the River Shannon. A full assessment of the impacts are detailed below in Table 2

Likely direct, indirect or secondary impacts of the proposed works on the European site	
Size and scale	The size and scale of the proposed development covers an area of 4.6ha.
Land-take	The development will take place on a green field site.
Distance from the European site	The distance from the European sites is detailed in Table 1. The potential pathways for indirect impacts are the hydrological connections between the site (via the drainage ditch and the River Groody) with the River Shannon and the two European Sites
Resource requirements	There will be no exploitation of resources within any of the European Sites listed in Table 1.
Emissions	The likely emissions are those of particulate laden run off and pollution during high rainfall into the drainage ditch and River Groody during the construction phase and runoff from the roads and man-made surfaces on completion of the development
Excavation requirements	There will be no works undertaken within any of the European Sites and therefore no directs impacts
Transportation requirements	As the proposed works are located outside of the European Sites there will be no direct impacts. Access to the site will be through existing roads.
Duration of construction, operation, decommissioning	As detailed above there is a potential likely impact during both the construction phase and following completion of the development, runoff during periods of high rainfall/storms into the drainage ditch and River Groody which are

	hydrologically linked to the European Sites.
Cumulative impacts with other projects or plans	Searches were made of LCC planning portal the EIA Portal. See details in Table 3

Table 2 Likely Impacts of the proposed work on the European Sites (Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA)

Planning Reference/EIA Reference	Location and Details	Reports
22950	Towlerton, Ballysimon, Limerick Lidl supermarket, offices and apartments	CEMP, Stage Screening and NIS, SuDs
2023045	Castletroy Wastewater Treatment Plant, Dromroe, Castletroy, Co. Limerick	EIAR, NIS
2360712	University of Limerick, Redevelopment of sprots pitches and construction of changing rooms	NIS, SuDs

Table 3 Recent developments that may be likely to create cumulative effects (LCC, 224; EIA Portal (2024).

With reference to Table 3, the projects listed have been assessed and where an NIS was required mitigation measures have been included to prevent any impacts on the Lower River Shannon SAC or the River Shannon and River Fergus Estuaries SPS. Therefore, there is unlikely to be a cumulative impact with regard to other plans or projects in the vicinity. . However, as the River Groody has water quality of 'Moderate' status and is at risk from agricultural discharges together with diffuse urban runoff there is a potential for a cumulative effect as a result of the potential runoff of pollutants and particulate matter during the construction and operational phases of the proposed development.

As the European sites are not directly involved in the proposed works, there are no likely changes anticipated.

In the assessment of possible impacts on the structure and function of the European Sites, there are potential likely threats anticipated as there is the potential impact for interference with the key relationships that define the structure of a European Site as a result of runoff into the drainage ditch and River Groody identified in Figure 2, that are hydrologically linked to the Lower River Shannon SAC and downriver the River Shannon and River Fergus Estuaries SPA.

In the assessment of the indicators of significance, there is not any anticipated loss, fragmentation, disruption or changes to the key elements of any of the habitats of the European Sites (Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA) as they are not directly involved in the proposed works.

4.1 Statement of Screening

Of the European Sites within the identified ZOI of the proposed development the Lower River Shannon water quality and thus protected species such as Otter *Lutra lutra* etc., as detailed in Table 4 could potentially be impacted during the construction phase and operational phase (Appendix ii).

Similarly, there is a pathway for source pollutants/particulate matter to enter the River Shannon and River Fergus Estuaries SPA is also within the ZOI of the proposed development and hence the species and habitats detailed in Table 5 could potentially be impacted indirectly during the construction and operational phase (Appendix iii).

The Lower River Shannon is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (numbers are Natura 2000 codes) (Table 4).

Habitat Code	Habitat	Potential for Significant Impacts
1110	Sandbanks	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts as water dilution would minimise impacts
1130	Estuaries	Yes, potential as in ZOI. Located at the connection point with the River Groody
1140	Tidal Mudflats and Sandflats	Yes, potential as in ZOI. Located at the connection point with the River Groody
1150	Coastal Lagoons*	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts
1160	Large Shallow Inlets and Bays	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts
1170	Reefs	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts
1220	Perennial Vegetation of Stony Banks	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts

1230	Vegetated Sea Cliffs	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts
1310	Salicornia Mud	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts
1330	Atlantic Salt Meadows	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts
1410	Mediterranean Salt Meadows	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Yes, potential as in ZOI. Located in Grid R55Y.
6410	*Molinia* meadows	No, down river and some distance from the site and therefore geographical separation, so no potential pathway for impacts
91E0	Alluvial Forests*	Upriver and therefore geographical separation, so no potential pathway for impacts
Species Code	**Species**	**Potential for Significant Impacts**
1029	Freshwater Pearl Mussel (*Margaritifera margaritifera*)	Upriver, therefore geographical separation, so no potential pathway for impacts
1095	Sea Lamprey (*Petromyzon marinus*)	Upriver, therefore geographical separation, so no potential pathway for impacts
1096	Brook Lamprey (*Lampetra planeri*)	Not in the flow network at this point or down river so no potential pathway for impacts
1099	River Lamprey (*Lampetra fluviatilis*)	Not in the flow network at this point or down river so no potential pathway for impacts
1106	Atlantic Salmon (*Salmo salar*)	Not in the flow network at this point or down river so no potential pathway for impacts
1349	Bottle-nosed Dolphin (*Tursiops truncates)*	Possible, indirect as in Grid R566567 (requires further investigation)
1355	Otter (*Lutra lutra*)	Yes, direct as in Grids R613584 R600578, R575576 R573571 and potential to inhabit the site

Table 4 Qualifying habitats and species of the Lower River Shannon SAC (NPWS, 2012b).

The River Shannon and River Fergus Estuaries is a Special Protection Area (SPA) selected for the following habitats and/or species listed on Annex I / II of the E.U. Birds Directive (numbers are Natura 2000 codes) (Table 5).

Species Code	**Species**	**Potential for Significant Impacts**	**Grid location Biodiversity Ireland**
A017	Cormorant (*Phalacrocorax carbo*)	Yes, indirect	R580599
A038	Whooper Swan (*Cygnus cygnus*)	Yes, indirect	R55T
A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes, possible indirect	No records
A048	Shelduck (*Tadorna tadorna*)	Yes, indirect	R55I
A050	Wigeon (*Anas penelope*)	Yes, indirect	R528565
A052	Teal (Anas crecca)	Yes, indirect	R65E
A054	Pintail (*Anas acuta*)	Yes, indirect	R55I
A056	Shoveler (*Anas clypeata*)	Yes, indirect	R528565
A062	Scaup (*Aythya marila*)	Yes, indirect	R55Z
A137	Ringed Plover (*Charadrius hiaticula*)	Yes, indirect	R55I
A140	Golden Plover (*Pluvialis apricaria*)	Yes, indirect	R678587
A141	Grey Plover (*Pluvialis squatarola*)	Yes, indirect	R35T
A142	Lapwing (*Vanellus vanellus*)	Yes, indirect	R605571
A143	Knot (*Calidris canutus*)	Yes, indirect	R45D
A149	Dunlin (*Calidris alpina*)	Yes, indirect	R55M
A156	Black-tailed Godwit (*Limosa limosa*)	Yes, indirect	R5256
A157	Bar-tailed Godwit (*Limosa lapponica*)	Yes, indirect	R45
A160	Curlew (*Numenius arquata*)	Yes, indirect	R603578
A162	Redshank (*Tringa totanus*)	Yes, indirect	R5256
A164	Greenshank (*Tringa nebularia*)	Yes, indirect	R55I/55M
A179	Black-headed Gull (*Chroicocephalus ridibundus*)	Yes, indirect	R631572
Habitat Code	**Habitat**	**Potential for Significant Impacts**	
A999	Wetland and Waterbirds	Yes, indirect	River Groody/River Shannon and adjacent lands

Table 5 Qualifying habitats and species of the River Shannon and River Fergus Estuaries SPA (NPWS, 2012a).

In relation to the effects to the qualifying species and habitats of the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA, there is a potential risk during periods of high rainfall/storm periods of runoff into the drainage ditch and River Groody and subsequently the European Sites.

Therefore, the development cannot be 'screened out' and a Stage 2 Appropriate Assessment (AA) is required for the Lower River Shannon SAC IE0002165 and River Shannon and River Fergus Estuaries SPA IE004077.

This Stage 1 Screening has demonstrated that, the proposed development has a potential indirect effect on the qualifying species or habitats of the European Sites.

It is not anticipated that the proposed development, for which planning is required, should have a direct effect (apart from Otter), however there is a potential indirect risk to the species and habitats in Table 4 and Table 5, as outlined in Table 2.

The proposed development will avoid any direct impacts on the species (apart from Otter) and habitats of European Sites (Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA), however potential pathways for indirect impacts and effects have been identified. Therefore, an Appropriate Assessment in relation to this site is required.

4.2 Conclusion

In conclusion, with reference to Table 1, Table 2, Table 4 and Table 5 and Appendix ii and Appendix iii, the effects to the qualifying species and habitats of the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA, there is a potential indirect risk from particulate laden runoff and pollution runoff from the development site into the adjacent drainage ditch and River Groody into the European Sites during both the construction and operation phases

As a result, the development cannot be 'screened out' and a Stage 2 Appropriate Assessment (AA) is required for the Lower River Shannon Estuaries SAC IE0002165 and River Shannon and River Fergus SPA IE004077.

This report has demonstrated that, the proposed development has a potential indirect likely effect on qualifying species and or habitats of the European Sites and potential direct effect on the qualifying species, Otter *Lutra lutra.*

This assessment has been undertaken on the basis of the best scientific knowledge in the field and the Precautionary Principle.

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Russell Environmental and Sustainability Services Limited

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NPWS (2015) *Site Synopsis, River Shannon and River Fergus Estuaries SPA 004077.* Department of Arts, Heritage and the Gaeltacht.

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APPENDICES


Appendix i Habitat Map
N
Dublin Road
R445
R445
R445
Dublin Road
Dublin Road
Curragh Birin
Groody Student Park
Groody Student Park
Brú na Gruada
Legend
WD5 Scattered Trees
WL2 Treeline
FW4 Drainage Ditch
FW2 Lowland River
WS1 Scrub
GA1 Improved Agricultural Grassland
Boundary
Russell Environmental and Sustainability Services Limited
0 0.020.04 0.09 Kilometers
Esri Community Maps Contributors, Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Maxar, Microsoft

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Lower River Shannon SAC 002165

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:
NPWS (2012) Conservation Objectives: Lower River Shannon SAC 002165. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

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.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002165 Lower River Shannon SAC

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

Please note that this SAC overlaps with River Shannon and River Fergus Estuaries SPA (004077), Loop Head SPA (004119), Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161), Slievefelim to Silvermines Mountains SPA (004165) and Kerry Head SPA (004189). It is also adjacent to Clare Glen SAC (00930). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title: Aspects of brook lamprey (*Lampetra planeri* Bloch) spawning in Irish waters

Year: in press

Author: Rooney, S.M.; O'Gorman, N.M.; Green, F.; King, J.J.

Series: Biology and Environment

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Coastal lagoons [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Marine habitats and species [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Coastal habitats [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Woodland habitats [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Intertidal Hard and Soft Bottom Investigations in Lower River Shannon cSAC (Site Code: IE002165)/Shannon Fergus Estuary SPA (Site Code: IE004077)

Year: 2011c

Author: Aquafact

Series: Unpublished Report to NPWS

Title: Reef Investigations in Lower River Shannon cSAC (cSAC Site Code: IE002165)

Year: 2011b

Author: Aquafact

Series: Unpublished Report to NPWS

Title: Subtidal Benthic Investigations in Lower River Shannon cSAC (cSAC Site Code: IE002165)
Year: 2011a
Author: Aquafact
Series: Unpublished Report to NPWS

Title: National survey and assessment of the conservation status of Irish sea cliffs
Year: 2011
Author: Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.
Series: Irish Wildlife Manuals No. 53

Title: Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland
Year: 2011
Author: Gargan, P. G.; Roche, W. K.; Keane, S.; King, J.J.; Cullagh, A.; Mills, P.; O'Keeffe, J.
Series: J. Appl. Ichthyol. 27 (Suppl. 3), 66–72

Title: Fine-scale population genetic structuring of bottlenose dolphins in Irish coastal waters
Year: 2011
Author: Mirimin, L.; Miller, R.; Dillane, E.; Berrow, S.D.; Ingram, S.; Cross, T.F.; Rogan, E.
Series: Animal Conservation 2011: 1–12

Title: The use of Cork Harbour by bottlenose dolphins (*Tursiops truncatus* (Montagu, 1821))
Year: 2011
Author: Ryan, C.; Cross, T.F.; Rogan, E.
Series: Irish Naturalists' Journal 31(1): 1-9

Title: Irish cetacean review (2000-2009)
Year: 2010
Author: Berrow, S.D.; Whooley, P.; O'Connell, M.; Wall, D.
Series: Irish Whale and Dolphin Group

Title: Bottlenose Dolphin SAC Survey 2010
Year: 2010
Author: Berrow, S.D.; O'Brien, J.; Groth, L.; Foley, A.; Voigt, K.
Series: Unpublished Report to NPWS

Title: Otter tracking study of Roaringwater Bay
Year: 2010
Author: De Jongh, A.; O'Neill, L.
Series: Unpublished Draft Report to NPWS

Title: Second Draft Cloon (Shannon Estuary) Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)
Year: 2010
Author: DEHLG
Series: Unpublished Report to NPWS

Title: Social structure within the bottlenose dolphin (*Tursiops truncatus*) population in the Shannon Estuary, Ireland

Year: 2010

Author: Foley, A.; McGrath, D.; Berrow, S.D.; Gerritsen, H.

Series: Aquatic Mammals 36(4): 372-381

Title: Irish Semi-natural Grasslands Survey. Annual report no. 3: Counties Donegal, Dublin, Kildare & Sligo

Year: 2010

Author: O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; McNutt, K.E.; Perrin, P.M. ; Delaney, A.

Series: Unpublished Report to NPWS

Title: A provisional inventory of ancient and long-established woodland in Ireland

Year: 2010

Author: Perrin, P.M.; Daly, O.H.

Series: Irish Wildlife Manuals No. 46

Title: Monitoring and Assessment of Irish Lagoons for the purpose of the EU Water Framework Directive

Year: 2010

Author: Roden, C.M,; Oliver, G.

Series: EPA

Title: Report of the standing scientific committee to the DCENR. The status of Irish salmon stocks in 2010 and precautionary catch advice for 2011

Year: 2010

Author: SSC

Series: Unpublished Report to DCENR

Title: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. [S.I. 296 of 2009]

Year: 2009b

Author: Government of Ireland

Series: Irish Statute Book

Title: The European Communities Environmental Objectives (Surface Water) Regulations 2009. [S.I. 272 of 2009]

Year: 2009a

Author: Government of Ireland

Series: Irish Statute Book

Title: Winter distribution of bottle-nosed dolphins (*Tursiops truncatus* (Montagu)) in the inner Shannon Estuary

Year: 2009

Author: Berrow, S.D.

Series: Irish Naturalists' Journal 30(1): 35-39

Title: Towards a bottlenose dolphin whistle ethogram from the Shannon Estuary, Ireland

Year: 2009

Author: Hickey, R.; Berrow, S.D.; Goold, J.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 109B (2), 89–94

Title: Saltmarsh Monitoring Report 2007-2008

Year: 2009

Author: McCorry, M.; Ryle, T.

Series: Unpublished Report to NPWS

Title: Cetaceans in Irish waters: A review of recent research

Year: 2009

Author: O'Brien, J.; Berrow, S.D.; McGrath, D.; Evans, P.G.H.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 109B (2): 63-88

Title: A note on long-distance matches of bottlenose dolphins (*Tursiops truncatus*) around the Irish coast using photoidentification

Year: 2009

Author: O'Brien, J.; Berrow, S.D.; Ryan, C.; McGrath, D.; O'Connor, I.; Pesante, G.; Burrows, G.; Massett, N.; Klotzer, V.; Whooley, P.

Series: Journal Cetacean Res. Mgmt. 11: 69–74

Title: An updated population status report for bottlenose dolphins using the Lower River Shannon SAC in 2008

Year: 2008

Author: Englund, A.; Ingram, S.; Rogan, E.

Series: Unpublished Report to NPWS

Title: National Survey of Native Woodlands 2003-2008

Year: 2008

Author: Perrin, P.; Martin, J.; Barron, S.; O'Neill, F.; McNutt, K.; Delaney, A.

Series: Unpublished Report to NPWS

Title: Rapid Assessment of *Margaritifera margaritifera* (L.) populations in Ireland: Rivers assessed in 2007

Year: 2008

Author: Ross, E.D.

Series: Unpublished Report to NPWS

Title: Marine surveys of two Irish sandbank cSACs

Year: 2007

Author: Aquafact

Series: Unpublished Report to NPWS

Title: Population status report for bottlenose dolphins using the Lower River Shannon SAC, 2006-2007

Year: 2007

Author: Englund, A.; Ingram, S.; Rogan, E.

Series: Unpublished Report to NPWS

Title: Evolutionary history of lamprey paired species *Lampetra fluviatilis* (L.) and *Lampetra planeri* (Bloch) as inferred from mitochondrial DNA variation

Year: 2007

Author: Espanhol, R.; Almeida, P.R.; Alves, M.J.

Series: Molecular Ecology 16, 1909-1924

Title: Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps
Year: 2007
Author: NPWS
Series: Unpublished Report to NPWS

Title: A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments
Year: 2007
Author: O'Connor, W.
Series: Irish Wildlife Manuals No. 26

Title: Inventory of Irish coastal lagoons
Year: 2007
Author: Oliver, G.
Series: Unpublished Report to NPWS

Title: Using T-PODs to investigate the echolocation of coastal bottlenose dolphins
Year: 2007
Author: Philpott, E.; Englund, A.; Ingram, S.; Rogan, E.
Series: Journal of Marine Biological Association, UK. 87: 11-17

Title: Otter Survey of Ireland 2004/2005
Year: 2006
Author: Bailey, M.; Rochford, J.
Series: Irish Wildlife Manuals No. 23

Title: Whistle Production by Bottlenose Dolphins *Tursiops truncatus* in the Shannon Estuary
Year: 2006
Author: Berrow, S.D.; O'Brien, J.; Holmes, B.
Series: Irish Naturalists' Journal. 28(5): 208-213

Title: The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams
Year: 2006
Author: Geist, J.; Porkka, M.; Kuehn, R.
Series: Aquatic Conservation: Marine and Freshwater Ecosystems 16, 251–266

Title: Otters - ecology, behaviour and conservation
Year: 2006
Author: Kruuk, H.
Series: Oxford University Press

Title: A survey of rare and scarce vascular plants in County Limerick
Year: 2006
Author: Reynolds, S.; Conaghan, J.; Fuller, J.
Series: Unpublished Report to NPWS

Title: National Inventory of sea cliffs and coastal heaths

Year: 2005

Author: Browne, A.

Series: Unpublished Report to NPWS

Title: Developing sustainable whalewatching in the Shannon estuary

Year: 2003

Author: Berrow, S.D.

Series: p198-203; In Marine Ecotourism: Issues and Experiences. Garrod, B and Wilson. J. (Eds.) Channel View Publications

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Title: Identifying lamprey. A field key for sea, river and brook lamprey

Year: 2003

Author: Gardiner, R.

Series: Conserving Natura 2000 rivers, Conservation techniques No. 4. English Nature, Peterborough

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Title: Monitoring the river, sea and brook lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*

Year: 2003

Author: Harvey, J.; Cowx, I.

Series: Conserving Natura 2000 Rivers Monitoring Series No. 5. English Nature, Peterborough

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Title: Bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary and selected areas of the west-coast of Ireland

Year: 2003

Author: Ingram, S.; Rogan, E.

Series: Unpublished Report to NPWS

Title: The ecology of seabirds and marine mammals in a fluctuating marine environment

Year: 2003

Author: Rogan, E.; Kelly, T.; Ingram, S.; Roycroft, D.

Series: Unpublished Report to Higher Education Authority of Ireland

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Title: Irish Whale and Dolphin Group cetacean sighting review (1991-2001)

Year: 2002

Author: Berrow, S.D.; Whooley, P.; Ferriss, S.

Series: Irish Whale and Dolphin Group

Title: Organochlorine concentrations in resident bottlenose dolphins (*Tursiops truncatus*) in the Shannon estuary, Ireland

Year: 2002

Author: Berrow, S.D.; McHugh, B.; Glynn, D.; McGovern, E.; Parsons, K.; Baird, R.W.; Hooker, S.D.

Series: Marine Pollution Bulletin 44: 1296-1313

Title: Identifying critical areas and habitat preferences of bottlenose dolphins (*Tursiops truncatus*)

Year: 2002

Author: Ingram, S.; Rogan, E.

Series: Marine Ecology Progress Series 244: 247-255

Title: Reversing the habitat fragmentation of British woodlands

Year: 2002

Author: Peterken, G.

Series: WWF-UK, London

Title: An extensive survey of bottlenose dolphins (*Tursiops truncatus*) on the west coast of Ireland

Year: 2001

Author: Ingram, S.; Englund, A.; Rogan, E.

Series: Unpublished Report to the Heritage Council

Title: The ecology and conservation of bottlenose dolphins in the Shannon Estuary, Ireland

Year: 2000

Author: Ingram, S.

Series: Unpublished PhD thesis, University College Cork

Title: A survey of bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary

Year: 2000

Author: Rogan, E.; Ingram, S.; Holmes, B.; O'Flanagan, C.

Series: Marine Institute Marine Resource Series No. 9

Title: Tour boats and dolphins: A note on quantifying the activities of whale watching boats in the Shannon estuary, Ireland

Year: 1999

Author: Berrow, S.D.; Holmes, B.

Series: Journal of Cetacean Research and Management 1(2): 199-200

Title: Diet of Otters *Lutra lutra* on Inishmore, Aran Islands, west coast of Ireland

Year: 1999

Author: Kingston, S.; O'Connell, M.; Fairley, J.S.

Series: Biol & Environ Proc R Ir Acad B 99B:173–182

Title: National Shingle Beach Survey of Ireland 1999

Year: 1999

Author: Moore, D.; Wilson, F.

Series: Unpublished Report to NPWS

Title: The saltmarshes of Ireland: an inventory and account of their geographical variation

Year: 1998

Author: Curtis, T.G.F.; Sheehy-Skeffington, M.J.

Series: Biology and Environment, Proceedings of the Royal Irish Academy 98B: 87-104

Title: A survey of intertidal sediment biotopes in estuaries in Ireland

Year: 1997

Author: Falvey, J.P.; Costello, M.J.; Dempsey, S.

Series: Unpublished Report

Title:	Distribution and Abundance of Bottle-nosed Dolphins *Tursiops truncatus* (Montagu) in the Shannon Estuary, Ireland
Year:	1996
Author:	Berrow, S.D.; Holmes, B.; Kiely, O.
Series:	Biology and Environment: Proceedings of the Royal Irish Academy 96B (1), 1-9

Title:	The spatial organization of otters (*Lutra lutra*) in Shetland
Year:	1991
Author:	Kruuk, H.; Moorhouse, A.
Series:	J. Zool, 224: 41-57

Title:	Otter survey of Ireland
Year:	1982
Author:	Chapman, P.J.; Chapman, L.L.
Series:	Unpublished Report to Vincent Wildlife Trust

Spatial data sources

Year:	Interpolated 2012
Title:	Sandbank Survey 2007
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1110 (map 3)
Year:	Interpolated 2012
Title:	Sandbank survey 2007; subtidal benthic survey 2010; reef survey 2010; intertidal hard and soft bottom survey 2010
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used for:	Marine community types, 1110, 1140, 1170 (maps 3, 5, 8, 9)
Year:	2010
Title:	EPA WFD transitional waterbody data
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1130 (map 4)
Year:	Revision 2011
Title:	Inventory of Irish Coastal Lagoons. Version 3
GIS operations:	Clipped to SAC boundary
Used for:	1150 (map 6)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. EPA WFD transitional waterbody data erased from extent. Expert opinion used as necessary to resolve any issues arising
Used for:	1160 (map 7)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used for:	Marine community types base data (map 9)
Year:	Revision 2012
Title:	National Shingle Beach Survey
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1220 (map 10)
Year:	2011
Title:	National Survey and assessment of the conservation status of Irish sea cliffs
GIS operations:	Clipped to SAC boundary
Used for:	1230 (map 11)

Year:	Revision 2010
Title:	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Coastal CO data investigated and resolved with expert opinion used
Used for:	1310, 1330, 1410 (map 12)
Year:	Derived 2012
Title:	Internal NPWS files
GIS operations:	Dataset created from spatial references supplied by NPWS experts. Expert opinion used as necessary to resolve any issues arising
Used for:	3260 (map 13)
Year:	Revision 2010
Title:	National Survey of Native Woodlands 2003-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	91E0 (map 14)
Year:	2012
Title:	NPWS rare and threatened species database
GIS operations:	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used for:	1029 (map 15)
Year:	Revision 2012
Title:	Margaritifera Sensitive Areas data
GIS operations:	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used for:	1029 (map 15)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Low Water Mark (LWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1349 (map 16)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the terrestrial side of the river banks data; creation of 20m buffer applied to canal centreline data. These datasets are combined with the derived EPA WFD Waterbodies data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on marine side of HWM to highlight potential commuting points
Used for:	1355 (map 17)

Year:	2010
Title:	EPA WFD Waterbodies data
GIS operations:	Creation of a 20m buffer applied to river and stream centreline data; creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets are combined with the derived OSi data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

Year:	Revision 2011
Title:	Inventory of Irish Coastal Lagoons. Version 3
GIS operations:	Creation of 80m buffer on the aquatic side of lagoon data; creation of 10m buffer on the terrestrial side of lagoon data. These datasets are combined with the derived OSi data and EPA WFD Waterbodies data for the 1355 CO. Overlapping regions are investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain at 7km. See map 15	This conservation objective applies to the freshwater pearl mussel population in the Cloon River, Co. Clare only (see also the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (Government of Ireland, 2009b)). The Cloon population is confined to the main channel and is distributed from Croany Bridge to approx. 1.5km upstream of Clonderalaw Bridge (Ross, 2008; DEHLG, 2010)
Population size	Number of adult mussels	Restore to 10,000 adult mussels	The Cloon population was estimated as less than 10,000 in 2009 (DEHLG, 2010)
Population structure: recruitment	Percentage per size class	Restore to least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. No juvenile or young mussels were found in the Cloon in 2007, with the smallest mussel measuring 80.3mm (Ross, 2008). A single 'young mussel' measuring 61.3mm was recorded in 2009 (DEHLG, 2010)
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. The Cloon failed the target for dead shells in 2009, with 31% dead shells across the single transect counted. There were no previous data on the number of live adults (DEHLG, 2010)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat extent	Kilometres	Restore suitable habitat in more than 3.3km (see map 15) and any additional stretches necessary for salmonid spawning	The species' habitat covers stretches of a short coastal river; and is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only those salmonid spawning areas that could regularly contribute juvenile fish to the areas occupied by adult mussels should be considered. The availability of mussel habitat and fish spawning and nursery habitats are determined by flow and substratum conditions. The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles (DEHLG, 2010). The target is based on the stretches of river identified, from a combination of dedicated survey and incidental records, as having habitat for the species
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality-macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93	These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). The habitat in the Cloon failed both standards during 2009 sampling for the Sub-basin Management Plans (DEHLG, 2010). See also The European Communities Environmental Objectives (Surface Water) Regulations 2009 (Government of Ireland, 2009a)
Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants)	Percentage	Restore substratum quality-filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	The habitat in the Cloon failed both standards during 2009 sampling for the Sub-basin Management Plans, with cover abundance values of up to 50% recorded for filmentous algae and 80% for macrophytes (DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrata

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Substratum quality: sediment	Occurrence	Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The habitat for the species is currently unsuitable for the recruitment of juveniles owing to sedimentation of the substratum. In many locations, it is also unsuitable for the survival of adult mussels (DEHLG, 2010). Significant sedimentation has been recorded during all recent mussel monitoring surveys (Ross, 2008; DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. Redox potential measurements in 2009 yielded losses of 32.3 - 43.5% (average of 39%) at 5cm depth (DEHLG, 2010)
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval form of the freshwater pearl mussel and, thus, they are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, both because of the habitat overlaps and the development of immunity with age in the fish. Fish presence is considered sufficient, as higher densities and biomass of fish are indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movement patterns must be such that 0+ fish in the vicinity of the mussel habitat remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. The Cloon freshwater pearl mussel population appears to favour native brown trout, with 17.2% of 1+ and older trout caught in 2009 hosting glochidia (DEHLG, 2010). Therefore, it is particularly important that trout are not out-competed by stocked fish

1095 Sea Lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. See Gargan et al. (2011). Specific barriers serve to constrain the up-river migration of sea lamprey. The upper extent of the SAC in the R. Fergus is delineated by a barrier to migration. Barriers are also present in the Mulkear and Feale
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007)
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Lampreys spawn in clean gravels. Surveys by Inland Fisheries ireland (IFI) commonly indicated accumulations of redds downstream of major weirs. (See also Gargan et al., 2011)
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Despite observed spawning activity, sampling for ammocoetes consistently fails to find these in many samplling stations and never in any great numbers

1096 Brook Lamprey *Lampetra planeri*

To maintain the favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to brook lampreys' migration, both up- and downstream, thereby possibly limiting the species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Spawning site and redd attributes established by IFI (Rooney et al., in press)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unublished data)

1099 River Lamprey *Lampetra fluviatilis*

To maintain the favourable conservation condition of River Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to river lampreys' migration, both up- and downstream, thereby possibly limiting species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between river and brook lamprey juveniles in the field (Gardiner 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of river/brook lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unpublished data)

1106 Atlantic Salmon *Salmo salar* (only in fresh water)

To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. The large hyrdo-electric station at Ardnacrusha and the Parteen regulating weir present considerable obstructions to upstream passage of salmon on the Shannon main channel. While both have fish passes installed, upstream migration of salmon is still problematical. Further weirs upstream on the Shannon also restrict access to spawning habitat. No such obstacles, causing significant fish passage issues for salmon are present on the Feale and Mulkear rivers
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The salmon stocks in the Shannon above the impoundments are significantly below their Conservation Limits. Salmon stocks in the Feale and Mulkear rivers are above CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL). The abundance of salmon fry at monitored sites on the Shannon main channel, above the hydro-electric station, is significantly below this target
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*). On the Shannon main channel, salmon smolt abundance may be significantly affected by mortality passing through hydro-electric turbines
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat on the Shannon main channel

1106 Atlantic Salmon *Salmo salar* (only in fresh water)

To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1110 Sandbanks which are slightly covered by sea water all the time

To maintain the favourable conservation condition of Sandbanks which are slightly covered by sea water all the time in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	The distribution of sandbanks is stable, subject to natural processes. See map 3	Distribution established using the Valentia Island to River Shannon Admiralty Chart (no. 1819_0)
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated as 1,353ha using the Valentia Island to River Shannon Admiralty Chart (no. 1819_0)
Community distribution	Hectares	Conserve the following community type in a natural condition: Subtidal sand to mixed sediment with *Nephtys* spp. community complex. See map 9	The likely area of the community was derived from a sandbank survey in 2007 (Aquafact, 2007) and a subtidal survey in 2010 (Aquafact, 2011a). See marine supporting document for further details

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 4	Habitat area was estimated as 24,273ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community. See map 9	The likely area of these communities was derived from intertidal and subtidal surveys undertaken in 2010 (Aquafact, 2011a and c). See marine supporting document for further details

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 5	Habitat area was estimated using OSi data as 8,808ha
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex. See map 9	The likely area of these communities was derived from an intertidal survey in 2010 (Aquafact, 2011c). See marine supporting document for further details

1150 *Coastal lagoons

To restore the favourable conservation condition of Coastal lagoons in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes. Favourable reference area 33.4ha- Shannon Airport Lagoon 24.2ha; Cloonconeen Pool 3.9ha; Scattery Lagoon 2.8ha; Quayfield and Poulaweala Loughs 2.5ha. See map 6	Areas calculated from spatial data derived from Oliver, 2007. Site codes IL031- IL034. See lagoon supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6	Sites IL031-IL034 in Oliver, 2007. See lagoon supporting document for further details
Salinity regime	practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	The lagoons in the site vary from oligohaline to euhaline. See lagoon supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Lagoons listed for this site are all considered to be shallow. See lagoon supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	The lagoons within this site exhibit a variety of barrier types including cobble/shingle, karst and artificial embankment. See lagoon supporting document for further details
Water quality: chlorophyll a	µg/L	Annual median chlorophyll a within natural ranges and less than 5µg/L	Target based on Roden and Oliver (2010). See lagoon supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges and less than 0.1mg/L	Target based on Roden and Oliver (2010). See lagoon supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural ranges and less than 0.15mg/L	Target based on Roden and Oliver, 2010). See lagoon supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to maximum depth of lagoons	As these lagoons are all shallow, it is expected the macrophytes should extend to their deepest points. See lagoon supporting document for further details
Typical plant species	number and m^2	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoon supporting document for further details
Typical animal species	number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoon supporting document for further details
Negative indicator species	Number and % cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutrient levels increase the threat of un-natural encroachment by reedbeds

1160 Large shallow inlets and bays

To maintain the favourable conservation condition of Large shallow inlets and bays in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 7	Habitat area was estimated as 35,282ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and *Laminaria*-dominated community complex. See map 9	The likely area of these communities was derived from intertidal and subtidal surveys in 2010 (Aquafact, 2011a and c). See marine supporting document for further details

1170 Reefs

To maintain the favourable conservation condition of Reefs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	The distribution of Reefs is stable, subject to natural processes. See map 8	Distribution is established from intertidal and subtidal reef surveys in 2010 (Aquafact, 2011b and c)
Habitat area	Hectares	The permanent habitat area is stable, subject to natural processes. See map 8	Habitat area was estimated as 21,421ha from the 2010 intertidal and subtidal reef survey (Aquafact 2011b and c)
Community distribution	Hectares	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and *Laminaria*-dominated community complex. See map 9	Based on the 2010 intertidal and subtidal reef survey (Aquafact, 2011b and c). See marine supporting document for further details

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession	Current area unknown. It was recorded to be present but extent was not mapped from nine sub-sites during the National Shingle Beach Survey (Moore and Wilson, 1999): Ross Bay, Kilbaha Bay, Cloonconeen Lough and Rinevella Bay, Carrigholt Bay, Ballymacrinan Bay, Bunaclugga Bay, Corcas and Sandhills, Bromore and Ballybunnion. NB further unsurveyed areas maybe present within the site
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 10 for recorded locations	Full distribution currently unknown. An excellent array of shingle beaches is known to occur, including three that are ranked of high interest (Ross Bay, Bunaclugga Bay and Cloonconeen Lough and Rinevella), the last of which is associated with a lagoonal system (Moore and Wilson, 1999). Habitat likely to be more widespread. See coastal habitats supporting document for further details. See also the conservation objective for coastal lagoons (1150)
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Moore and Wilson (1999). Shingle features are relatively stable in the long-term and shingle beaches within this SAC appear to be functioning naturally with few artifical restrictions to beach dynamics (Moore and Wilson, 1999). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Moore and Wilson (1999). Lichens are present at Ross Bay and Cloonconeen and Rinevella Bay indicating a degree of stability. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain the typical vegetated shingle flora including the range of sub-communities within the different zones	The Carrigaholt sub-site is a small site with a diverse flora. The Bunaclugga Bay sub-site supports yellow horned-poppy (*Glaucium flavum*), which contributes to the site's high interest ranking. Based on data from Moore and Wilson (1999). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Moore and Wilson (1999). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable or increasing, subject to natural processes, including erosion. For sub-sites mapped: Kilbaha- 4.1km; Ladder Rock- 1.0km; Moyarta- 0.9km; Lisheencrony- 1.1km; Burrane- 0.2km; Kerry Head- 33.4km; Ballybunion- 15.6km; Kilclogher- 4.9km; Loop Head- 6.1km. See map 11	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). Nine sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer. The length of each cliff was measured (in some cases the cliff was measured in sections) to give a total estimated area of 67.3km within the SAC. Cliffs are linear features and are therefore measured in kilometres. Length of cliff likely to be underestimated. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 11	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). Most of the SAC west of Kilcredaun Point and Kilconly Point is bounded by high rocky sea cliffs. Both hard and soft cliffs occur in this SAC (ISCS; Browne, 2005). See coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). Maintaining natural geomorphological processes including natural erosion is important for the health of vegetated sea cliff. Hydrological processes maintain flushes and in some cases tufa formations that can be associated with sea cliffs. Freshwater seepage was noted from the cliffs at Loop Head and Kilclogher. Stream or cascade was noted from Kerry Head. Sea coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). At Loop Head sub-site the zones recorded were: splash, crevice ledge and ungrazed coastal grassland on hard cliffs. At Kerry Head sub-site the zones recorded were: splash, pioneer, crevice ledge, ungrazed/grazed coastal grassland on hard cliffs and coastal grassland on soft cliffs. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in the Irish Sea cliff survey (Barron et al., 2011)	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath to be less than 10%. Cover of woody species on grassland and/or heath to be less than 20%	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle - 0.005ha; Inishdea, Owenshere - 0.003ha; Knock - 0.029ha; Querin - 0.185ha; Rinevilla Bay - 0.001ha. See map 12	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Habitat recorded at five of the ten sub-sites surveyed and mapped, giving a total estimated area of 0.223ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 12 for known distribution	Based on data from McCorry and Ryle (2009). Habitat recorded at six out of ten sub-sites by McCorry and Ryle (2009). NB further unsurveyed areas maybe present within the site. *Salicornia* is an annual species, so its distribution can vary significantly from year to year. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Sediment supply is particularly important for this pioneer saltmarsh community, as the distribution of this habitat depends on accretion rates. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks deliver sediment throughout saltmarsh system. Creeks and pan structures well developed in the larger sections of the marsh at Carrigafoyle, Shepperton/Fergus Estuary and Inishdea/Owenshere. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	This pioneer saltmarsh community requires regular tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species and sub-communities	Percentage cover	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	Based on data from McCorry and Ryle (2009). Species of local distinctiveness recorded include sea wormwood (*Seriphidium maritimum*), meadow barley (*Hordeum secalinum*) and hard grass (*Parapholis strigosa*) (McCorry and Ryle, 2009; internal NPWS files). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* was recorded at all sub-sites and is considered a significant threat to the habitat. See coastal habitats supporting document for further details

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

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 6.774ha; Barrigone, Aughinish- 10.288ha; Beagh- 0.517ha; Bunratty- 26.939ha; Shepperton, Fergus Estuary- 37.925ha; Inishdea, Owenshere- 18.127ha; Killadysert, Inishcorker- 2.604ha; Knock- 0.576ha; Querin- 3.726ha; Rinevilla Bay- 11.883ha. See map 12	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle 2009). Ten sub-sites that supported Atlantic salt meadow were mapped (119.36ha) and additional areas of potential saltmarsh (376.07ha) were identified from an examination of aerial photographs, giving a total estimated area of 495.43ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 12 for mapped distribution	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common and ASM is the dominant saltmarsh habitat. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). Embankments along much of the shoreline are a feature of this SAC. These embankments were erected in the past and much of the site has been remodelled and large areas of land reclaimed as a result. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks and pan structures well developed at the larger sections of ASM in the Carrigafoyle sub-site. At the ASM at Shepperton, Fergus Estuary, the larger patches still retain a natural creek and salt pan structure. At Inishdea, Owenshere sub-site within some of the intact saltmarsh, there is a complex network of creeks, salt pans and depressions. At Killadysart, Inishcorker and Querin, creek and pan development is generally poor. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details

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

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Zonations to other saltmarsh habitats as well as brackish and terrestrial habitats were recorded at all sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). All of the sub-sites are grazed to some extent. Overgrazing was noted from Carrigafoyle, Shepperton, Fergus Estuary and Knock sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of the saltmarsh area vegetated	Based on data from McCorry and Ryle (2009). Some poaching was noted from most of the sub-sites. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* is a major element of the vegetation at all sub-sites in this SAC. See coastal habitats supporting document for further details

1349 Bottlenose Dolphin *Tursiops truncatus*

To maintain the favourable conservation condition of Bottlenose Dolphin in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 16 for suitable habitat	See marine supporting document for further details
Habitat use: critical areas	Location and hectares	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition. See map 16	Attribute and target based on Ingram and Rogan (2002), Englund et al. (2007), Englund et al. (2008), Berrow (2009), Berrow et al. (2010) and review of data from other studies. See marine supporting document for further details
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site	See marine supporting document for further details

1355 Otter *Lutra lutra*

To restore the favourable conservation condition of Otter in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in Shannon catchment estimated at 70.5% (Bailey and Rochford 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 596.8ha above high water mark (HWM); 958.9ha along river banks/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 4,461.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometers	No significant decline. Length mapped and calculated as 500.1km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 125.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 17	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 4.193ha; Barrigone, Aughinish- 2.407ha; Bunratty- 0.865ha; Inishdea, Owenshere- 11.609ha; Killadysert, Inishcorker- 0.705ha; Knock- 0.143ha, Querin- 0.008ha; Rinevilla Bay- 2.449ha. See map 12	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Eight sub-sites that support Mediterranean salt meadow were mapped (22.379ha) and additional areas of potential saltmarsh (25.646ha) were identified from an examination of aerial photographs, giving a total estimated area of 48.025ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 12 for known distribution	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). Embankments along much of the shoreline are a feature of this SAC. These embankments were erected in the past and much of the site has been remodelled and large areas of land reclaimed because of them. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). The MSM at Carrigafoyle contains some large salt pans. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Mediterranean salt meadow is found high up in the saltmarsh but requires occasional tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Zonations to other saltmarsh habitats as well as brackish and terestrial habitats were recorded at most sub-sites. See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). All of the sub-sites are grazed to some extent. Overgrazing was noted from Inishdea, Owenshere and Knock sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). Some poaching was noted from most of the sub-sites. See coastal habitats supporting document for further details
Vegetation composition: typical species	Percentage cover	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* is a major element of the vegetation at all sub-sites in this SAC. See coastal habitats supporting document for further details

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

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	Three sub-types of high conservation value are know to occur in the site. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details. **Note: rooted macrophytes should be absent or trace (< 5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Cloon River within this SAC, because the mussel requires environmental conditions closer to natural background levels**
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 13	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: tidal influence	Daily water level fluctuations - metres	Maintain natural tidal regime	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: freshwater seepages	Metres per second	Maintain appropriate freshwater seepage regimes	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Substratum composition: particle size range	Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)	Although many of the high-conservation-value sub-types are dominated by coarse substrata, for certain sub-types, notably triangular club-rush (*Schoenoplectus triqueter*) and opposite-leaved pondweed (*Groenlandia densa*), fine substrata are required. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details

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

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality: nutrients	Milligrammes per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	The specific targets may vary among sub-types. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Floodplain connectivity	Area	The area of active floodplain at and upstream of the habitat should be maintained	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Riparian habitat	Area	The area of riparian woodland at and upstream of the bryophyte-rich sub-type should be maintained	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details. See also the conservation objective for Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (91E0)

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Full extent of this habitat in this site is currently unknown- see distribution below
Habitat distribution	Occurrence	No decline, subject to natural processes	This habitat has been recorded on the eastern bank of the Shannon, just north of Castleconnell, Co. Limerick (NPWS internal files). Full distribution of this habitat in this site is currently unknown and it almost certainly occurs elsewhere. The Irish semi-natural grasslands survey will cover Co. Limerick in 2012 and additional information is likely to be available following this survey
Vegetation structure: broadleaf herb: grass ratio	Percentage	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2010)
Vegetation structure: sward height	Percentage	30-70% of sward between 10 and 80cm high	Attribute and target based on O'Neill et al. (2010)
Vegetation composition: typical species	Number	At least 7 positive indicator species present, including 1 "high quality" species	List of positive indicator species, including high quality species, identified by O'Neill et al. (2010). Note that purple moor-grass (*Molinia caerulea*) is a positive indicator species, but not necessarily an essential component of the habitat
Vegetation composition: notable species	Number	No decline, subject to natural processes	A number of notable species have been recorded in this habitat at this site including smooth brome (*Bromus racemosus*), pale sedge (*Carex pallescens*) and blue-eyed grass (*Sisyrinchium bermudiana*) (Reynolds et al., 2006)
Vegetation composition: negative indicator species	Percentage	Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%. Non-native invasive species, absent or under control	List of negative indicator species identified by O'Neill et al. (2010)
Vegetation composition: negative indicator moss species	Percentage	Bog mosses (*Sphagnum* spp.) not more than 10% cover; hair mosses (*Polytrichum* spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2010)

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: woody species and bracken (*Pteridium aquilinum*)	Percentage	Cover of woody species and bracken not more than 5% cover	Attribute and target based on O'Neill et al. (2010)
Physical structure: bare ground	Percentage	Not more than 10% bare ground	Attribute and target based on O'Neill et al. (2010)

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

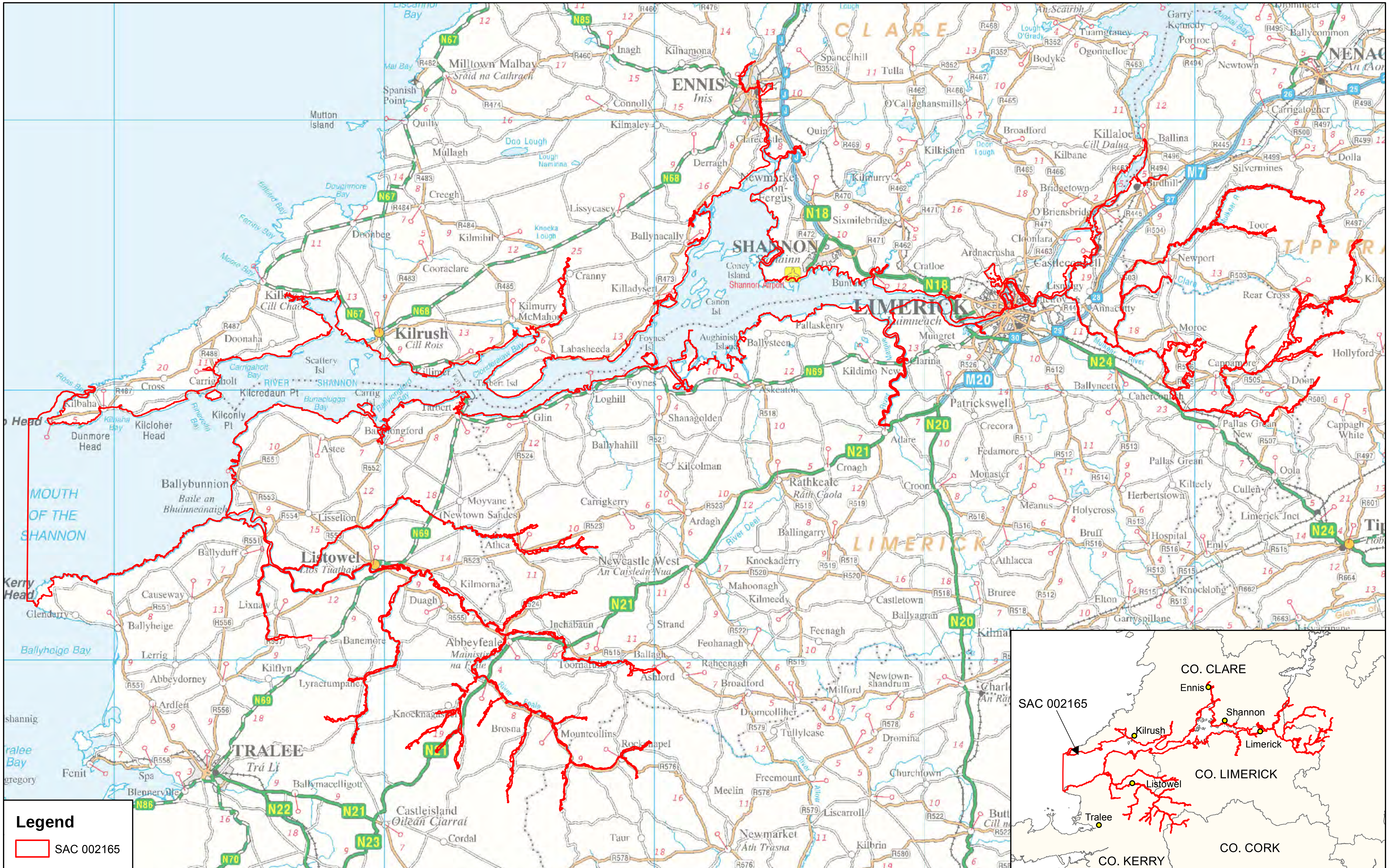
To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed. See map 14	Minimum area, based on 5 sites surveyed by Perrin et al. (2008) - site codes 1286, 1577, 1857, 1861, 1995. See woodland habitats supporting document for further details. NB further areas are likely to be present within the SAC
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 14	Distribution based on Perrin et al. (2008). NB further areas are likely to be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring ‘deep’ woodland conditions (Peterken, 2002). Topographical and land-ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder and oak regenerate poorly. Ash often regenerates in large numbers although few seedlings reach pole size
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river floodplains
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem

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

To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-data and other rare or localised species. Perrin and Daly (2010) list four sites as containing potential ancient/long established woodland. See woodland habitats supporting document for further details
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*)	Species reported in Perrin et al. (2008). See woodland habitats supporting document for further details
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: Himalayan balsam (*Impatiens glandulifera*), giant hogweed (*Heracleum mantegazzianum*), sycamore (*Acer pseudoplatanus*)



MAP 1:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

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SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 20 km

N

Map Version 1
Date: June 2012

SPA 004119

SAC 002165

SPA 004189

SPA 004077

SPA 004161

SAC 000930

SPA 004165

Legend

- 002165 Lower River Shannon SAC
- 000930 Clare Glen SAC
- 004077 River Shannon and River Fergus Estuaries SPA
- 004119 Loop Head SPA
- 004161 Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA
- 004165 Slievefelim to Silvermines Mountains SPA
- 004189 Kerry Head SPA
- OSi Discovery Series County Boundaries

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MAP 2:
LOWER RIVER SHANNON SAC CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002165 CO. CLARE; v1.2, CO. CORK; v1.01, CO. KERRY; v1.11, CO. LIMERICK; v1.11, CO. TIPPERARY; v1.05/SAC 000930 CO LIMERICK; v1, CO. TIPPERARY; v1
SPA 004077 CO CLARE; v 1.03, CO KERRY; v1.02, CO LIMERICK; v1.03/SPA 004119 CO CLARE; v1.02
SPA 004161 CO CORK; v2.12, CO KERRY; v2.17, CO LIMERICK; v2.14
SPA 004165 CO LIMERICK; v2.05, CO TIPPERARY; v2.09/SPA 004189 CO KERRY; v2.01

0 5 10 15 20 km

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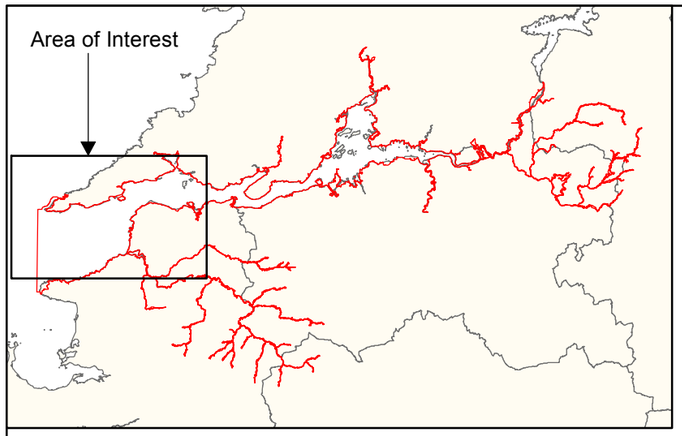
Map Version 1
Date: June 2012



Legend

- SAC 002165
- 1110 Sandbanks which are slightly covered by sea water all the time
- OSi Discovery Series County Boundaries

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MAP 3:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
SANDBANKS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- 1130 Estuaries
- OSi Discovery Series County Boundaries

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Arts, Heritage and the Gaeltacht

MAP 4:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
ESTUARIES

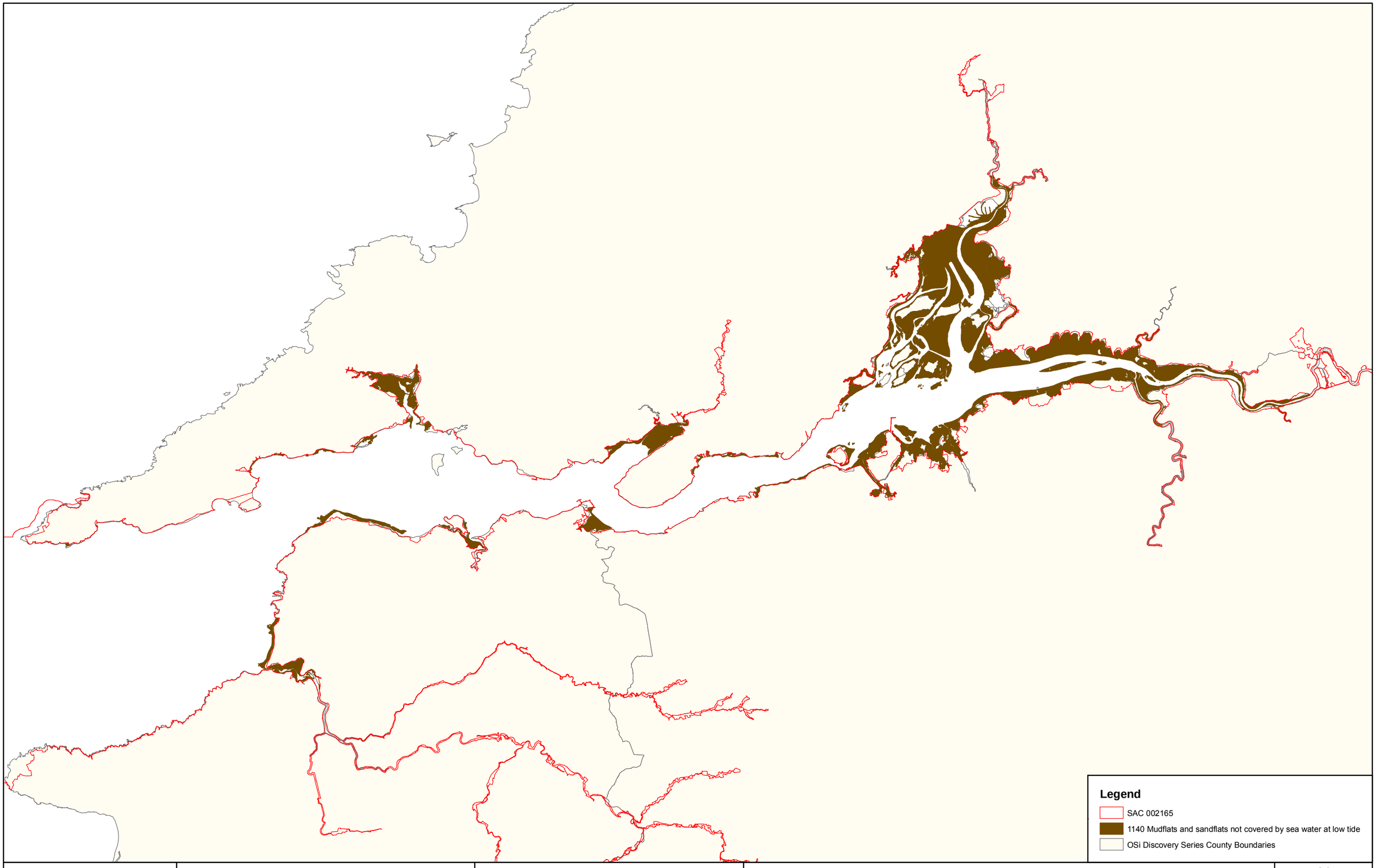
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11,
CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 2 4 6 8 10 km

N

Map Version 1
Date: June 2012



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Department of Arts, Heritage and the Gaeltacht

MAP 5:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

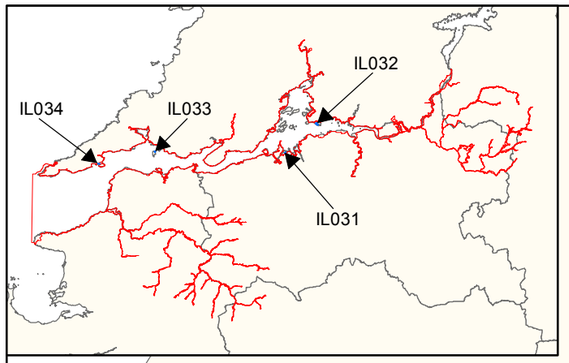
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012



Quayfield and Poulaweala Loughs
IL031

Shannon Airport Lagoon
IL032

Scattery Lagoon
IL033

Cloonconeen Pool
IL034

Legend

- SAC 002165
- 1150 Coastal lagoons
- OSi Discovery Series County Boundaries

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Department of Arts, Heritage and the Gaeltacht

MAP 6:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
COASTAL LAGOONS

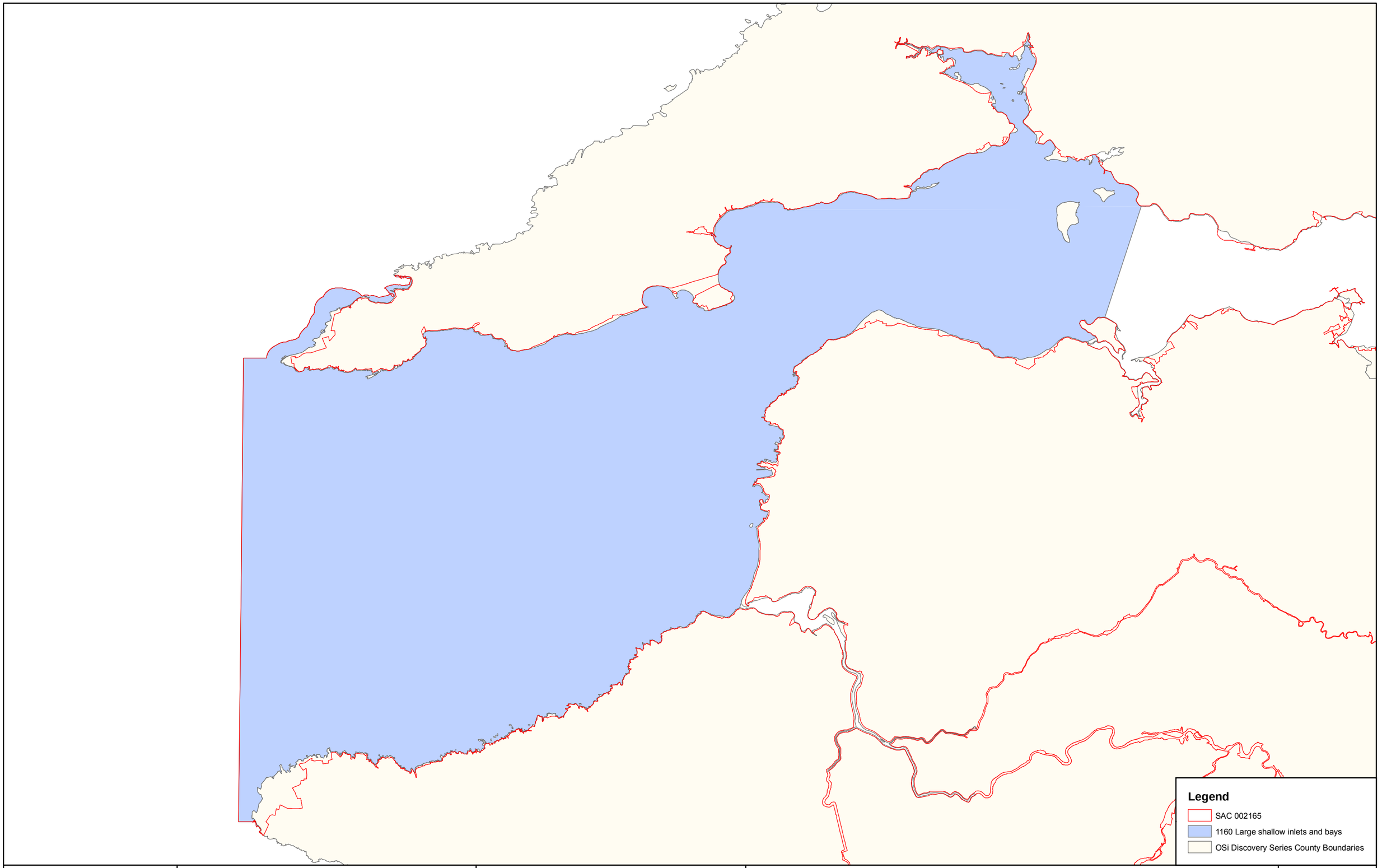
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 100 200 300 400 500 m

N

Map Version 1
Date: June 2012



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MAP 7:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- 1170 Reefs
- OSi Discovery Series County Boundaries

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MAP 8:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
REEFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012

Legend

- SAC 002165
- OSi Discovery Series County Boundaries

Marine Community Types

- Anemone-dominated subtidal reef community
- Estuarine subtidal muddy sand to mixed sediment with gammarids community complex
- Faunal turf-dominated subtidal reef community
- Fucoid-dominated intertidal reef community complex
- Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex
- Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community
- *Laminaria*-dominated community complex
- Mixed subtidal reef community complex
- River
- Subtidal sand to mixed sediment with *Nephtys* spp. community complex
- Subtidal sand to mixed sediment with *Nucula nucleus* community complex

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MAP 9:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012

Carrigaholy Bay

Ballymacrinan Bay

Ross Bay

Kilbaha Bay

Cloonconeen Lough and Rinevella Bay

Bunaclugga Bay

Corcas and Sandhills

Bromore

Ballybunion

Area of Interest

Legend

- SAC 002165
- 1220 Perennial vegetation of stony banks
- OSi Discovery Series County Boundaries

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Department of Arts, Heritage and the Gaeltacht

MAP 10:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
PERENNIAL VEGETATION OF STONY BANKS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

N

Map Version 1
Date: June 2012

Loop Head
Site Id: 01006

Kilclogher
Site Id: 01007

Kilbaha

Moyarta

Lisheencrony

Ladder Rock

Burrane

Ballybunion
Site Id: 06001

Kerry Head
Site Id: 06002

Legend

- SAC 002165
- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- Undocumented 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- OSi Discovery Series County Boundaries

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MAP 11:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
VEGETATED SEA CLIFFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11,
CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

N

Map Version 1
Date: June 2012

SMP 0083

SMP 0082

SMP 0081

SMP 0084

SMP 0086

SMP 0085

SMP 0080

SMP 0079

SMP 0087

SMP 0078

Legend

SAC 002165

OSi Discovery Series County Boundaries

SMP 0078 Saltmarsh Monitoring Project Site Codes

Saltmarsh Habitats

Qualifying Interests

1310 *Salicornia* and other annuals colonising mud and sand

1310 / 1330 *Salicornia* and other annuals colonising mud and sand / Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)

1410 Mediterranean salt meadows (Juncetalia maritimi)

Potential 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

Potential 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)

Potential 1410 Mediterranean salt meadows (Juncetalia maritimi)

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MAP 12:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
SALTMARSH HABITATS

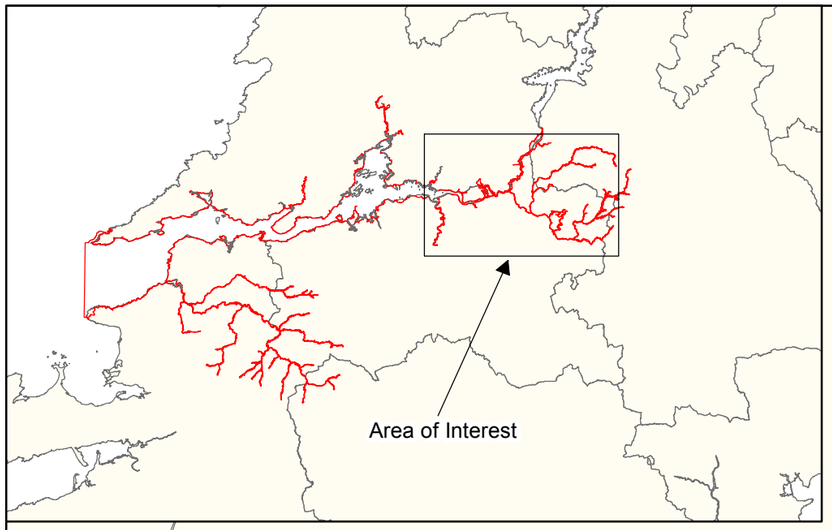
Map to be read in conjunction with the NPWS Conservation Objectives Document.

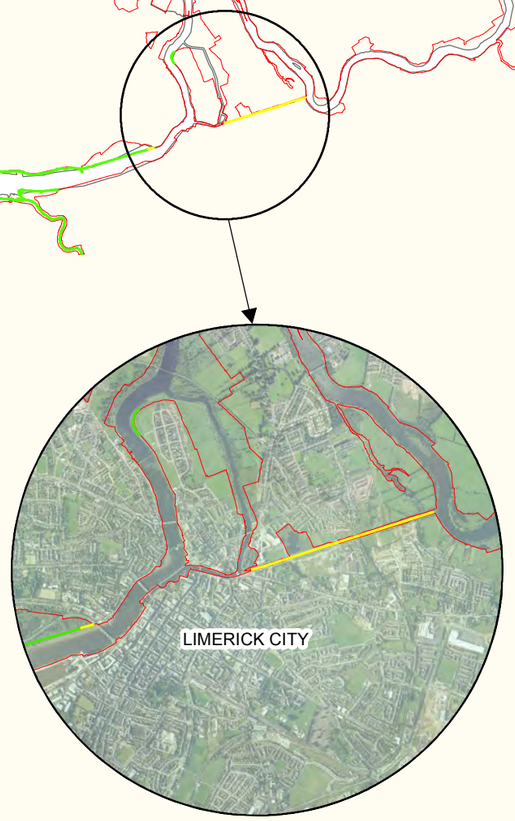
SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 2 4 6 8 10 km

N

Map Version 1
Date: June 2012





Legend

- SAC 002165
- OSi Discovery Series County Boundaries

3260 Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

- *Groenlandia densa*
- *Schoenoplectus triqueter*
- Bryophyte-rich streams and rivers sub-type

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MAP 13:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
FLOATING RIVER VEGETATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

N

Map Version 1
Date: June 2012

Area of Interest

NSNW: 1577

NSNW: 1857

NSNW: 1286

NSNW: 1861

NSNW: 1995

Legend

SAC 002165

OSi Discovery Series County Boundaries

NSNW: 1857 National Survey of Native Woodland Site Codes

Woodland Habitats

91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) Qualifying Interest

91A0 / 91E0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles / *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) Qualifying Interest

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

WN2 Oak-ash-hazel woodland

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MAP 14:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

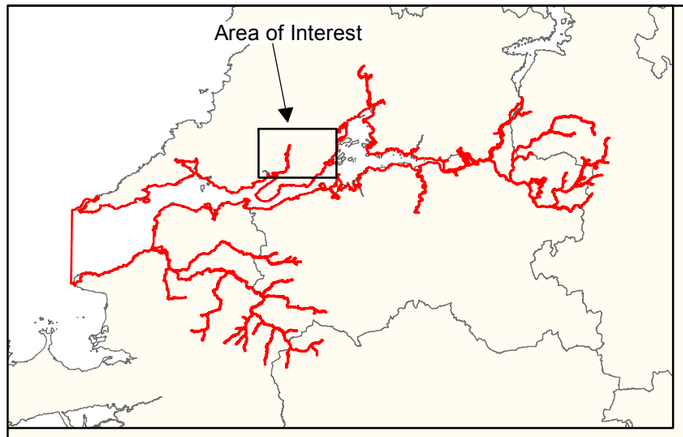
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 2 4 6 8 10 km

N

Map Version 1
Date: June 2012



Legend

- SAC 002165
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Suitable Habitat
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Distribution
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Catchment
- OSi Discovery Series County Boundaries

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Department of Arts, Heritage and the Gaeltacht

MAP 15:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL

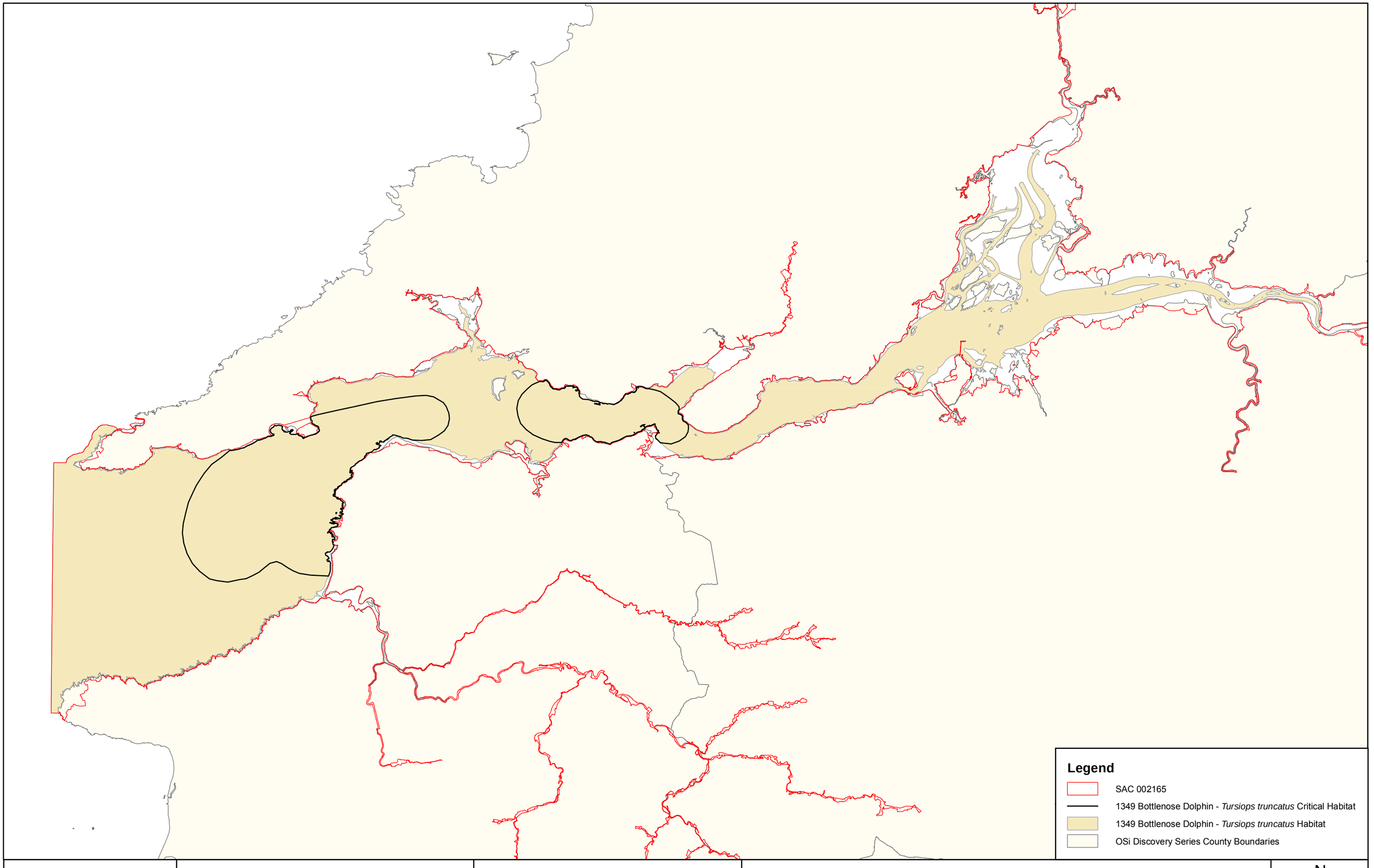
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 0.5 1 1.5 2 km

N

Map Version 1
Date: June 2012



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MAP 16:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
BOTTLENOSE DOLPHIN

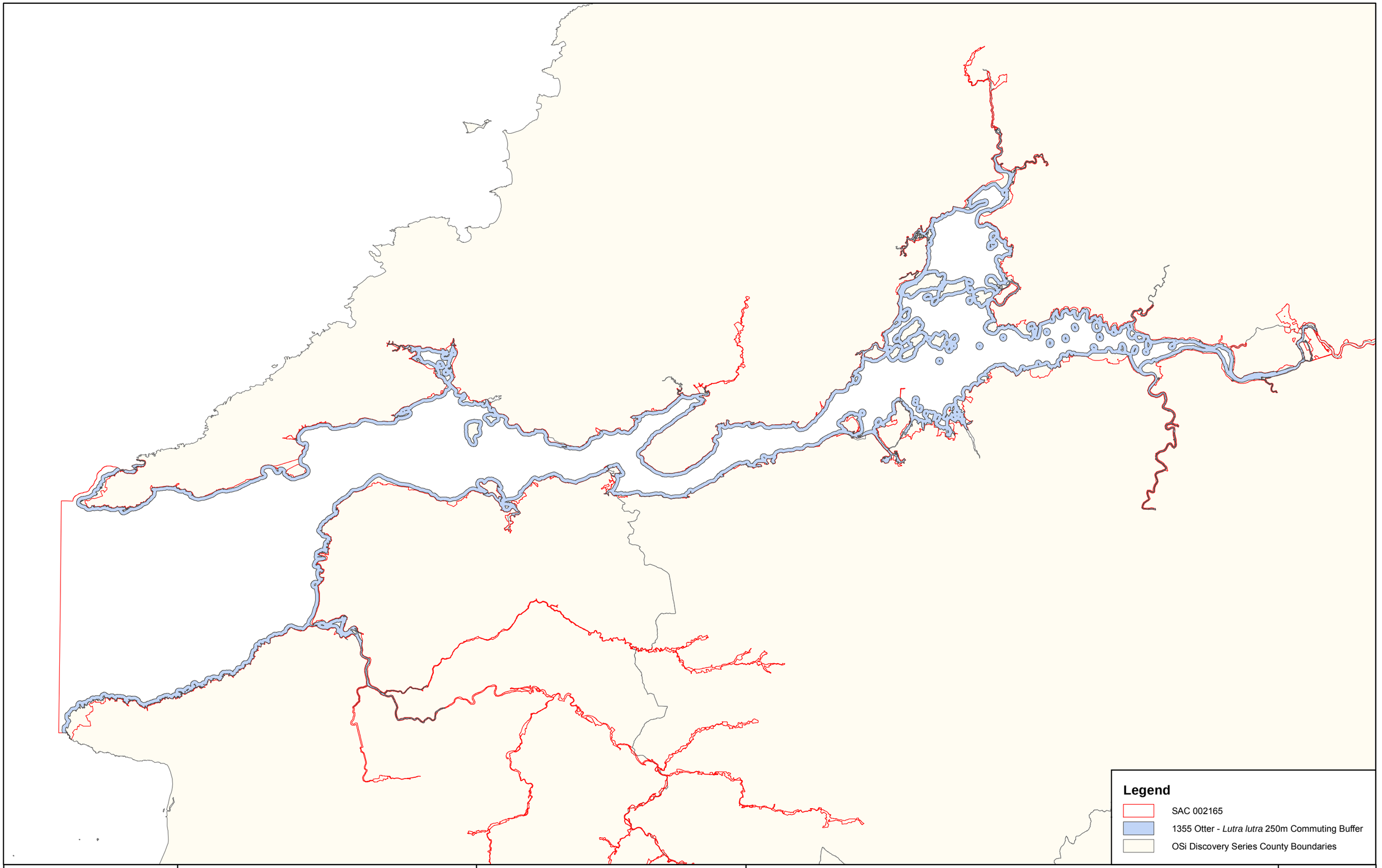
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012



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Department of Arts, Heritage and the Gaeltacht

MAP 17:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
OTTER COMMUTING

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

N

Map Version 1
Date: June 2012

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

River Shannon and River Fergus Estuaries SPA 004077

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:
NPWS (2012) Conservation Objectives: River Shannon and River Fergus Estuaries SPA 004077. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

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.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

004077 River Shannon and River Fergus Estuaries SPA

A017	Cormorant *Phalacrocorax carbo*	breeding + wintering
A038	Whooper Swan *Cygnus cygnus*	wintering
A046	Light-bellied Brent Goose *Branta bernicla hrota*	wintering
A048	Shelduck *Tadorna tadorna*	wintering
A050	Wigeon *Anas penelope*	wintering
A052	Teal *Anas crecca*	wintering
A054	Pintail *Anas acuta*	wintering
A056	Shoveler *Anas clypeata*	wintering
A062	Scaup *Aythya marila*	wintering
A137	Ringed Plover *Charadrius hiaticula*	wintering
A140	Golden Plover *Pluvialis apricaria*	wintering
A141	Grey Plover *Pluvialis squatarola*	wintering
A142	Lapwing *Vanellus vanellus*	wintering
A143	Knot *Calidris canutus*	wintering
A149	Dunlin *Calidris alpina*	wintering
A156	Black-tailed Godwit *Limosa limosa*	wintering
A157	Bar-tailed Godwit *Limosa lapponica*	wintering
A160	Curlew *Numenius arquata*	wintering
A162	Redshank *Tringa totanus*	wintering
A164	Greenshank *Tringa nebularia*	wintering
A179	Black-headed Gull *Chroicocephalus ridibundus*	wintering
A999	Wetlands	

Please note that this SPA overlaps with Lower River Shannon SAC (002165). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title:	BirdLife International Seabird Ecology and Foraging Range Database
Year:	2012
Author:	BirdLife International
Series:	http://seabird.wikispaces.com

Title:	Seabird Monitoring Programme (SMP) Database
Year:	2012
Author:	JNCC
Series:	http://jncc.defra.gov.uk/smp/Default.aspx

Title:	River Shannon and River Fergus Estuaries SPA (004077). Conservation objectives supporting document. [Version 1]
Year:	2012
Author:	NPWS
Series:	Unpublished Report to NPWS

Title:	Seabird Populations of Britain and Ireland
Year:	2004
Author:	Mitchell, P.I.; Newton, S.F.; Ratcliffe, N.; Dunn, T.E.
Series:	Poyser, London

Title:	Seabird monitoring handbook for Britain and Ireland: a compilation of methods for survey and monitoring of breeding seabirds.
Year:	1995
Author:	Walsh, P.; Halley, D.J.; Harris, M.P.; del Nevo, A.; Sim, I.M.W.; Tasker, M.L.
Series:	JNCC, Peterborough

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). Mitchell et al. (2004) provides summary population information. The Seabird Monitoring Programme (SMP) online database (JNCC, 2012) provides population data for this species
Productivity rate	Mean number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). The Seabird Monitoring Programme (SMP) online database (JNCC, 2012) provides population data for this species
Distribution: breeding colonies	Number; location; area (hectares)	No significant decline	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs but they can also nest in trees (Walsh et al., 1995)
Prey biomass available	Kilogrammes	No significant decline	This attribute applies to breeding cormorant. Key prey items: fish (mostly benthic), some crustaceans. Key habitats: populations use sandy areas, rocky and vegetated substrate. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database (Birdlife International, 2012))
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	This attribute applies to breeding cormorant. Seabird species can make extensive use of the marine waters adjacent to their breeding colonies. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database (Birdlife International, 2012))
Disturbance at the breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding cormorant population	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs but they can also nest in trees (Walsh et al., 1995)
Population trend	Percentage change	Long term population trend stable or increasing	This attribute applies to non-breeding cormorant. Waterbird population trends are presented in part four of the conservation objectives supporting document

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by cormorant other than that occurring from natural patterns of variation	This attribute applies to non-breeding cormorant. As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A038 Whooper Swan *Cygnus cygnus*

To maintain the favourable conservation condition of Whooper Swan in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by whooper swan other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by light-bellied brent goose other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A048 Shelduck *Tadorna tadorna*

To maintain the favourable conservation condition of Shelduck in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shelduck other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A050 Wigeon *Anas penelope*

To maintain the favourable conservation condition of Wigeon in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by wigeon other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A052 Teal *Anas crecca*

To maintain the favourable conservation condition of Teal in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by teal other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A054 Pintail *Anas acuta*

To maintain the favourable conservation condition of Pintail in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by pintail other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A056 Shoveler *Anas clypeata*

To maintain the favourable conservation condition of Shoveler in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shoveler other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A062 Scaup *Aythya marila*

To maintain the favourable conservation condition of Scaup in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by scaup other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A137 Ringed Plover *Charadrius hiaticula*

To maintain the favourable conservation condition of Ringed Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by ringed plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A140 Golden Plover *Pluvialis apricaria*

To maintain the favourable conservation condition of Golden Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by golden plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A141 Grey Plover *Pluvialis squatarola*

To maintain the favourable conservation condition of Grey Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by grey plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A142 Lapwing *Vanellus vanellus*

To maintain the favourable conservation condition of Lapwing in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by lapwing other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A143 Knot *Calidris canutus*

To maintain the favourable conservation condition of Knot in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by knot other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A149 Dunlin *Calidris alpina*

To maintain the favourable conservation condition of Dunlin in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by dunlin other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A156 Black-tailed Godwit *Limosa limosa*

To maintain the favourable conservation condition of Black-tailed Godwit in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by black-tailed godwit other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by bar-tailed godwit other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A160 Curlew *Numenius arquata*

To maintain the favourable conservation condition of Curlew in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by curlew other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by redshank other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A164 Greenshank *Tringa nebularia*

To maintain the favourable conservation condition of Greenshank in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by greenshank other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A179 Black-headed Gull *Chroicocephalus ridibundus*

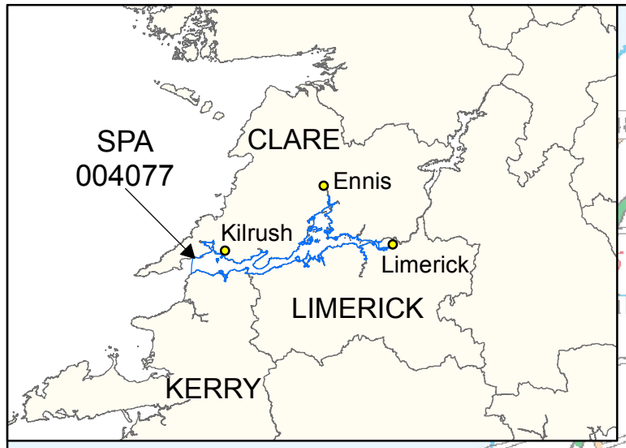
To maintain the favourable conservation condition of Black-headed Gull in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by black-headed gull other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in the River Shannon and River Fergus Estuaries SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Wetland habitat area	hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261ha, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 32,261ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document



CLARE

ENNIS
Inis

SHANNON
Sionainn

LIMERICK
Luimneach

Kilrush
Cill Rois

Milltown Malbay
Sráid na Cathrach

Newmarket-on-Fergus

Kilkee
Cill Chaoi

Doonbeg

Creegh

Cooraclare

Kilmihil

Lissycasey

Ballynacally

Inagh

Kilnamona

Connolly

Kilmaley

Derragh

Mullagh

Doo Lough

Lough Naminna

Knocka Lough

Cranny

Killadysert

Labasheeda

Foynes

Foynes Isl

Aughinish Island

Tarbert Isd

Tarbert

Loghill

Glin

Shanagolden

Ballyhahill

Kilcolman

Ardagh

Carrigkerry

Moyvane
(Newtown Sandes)

Lisselton

Astee

Ballylongford

Barrylongford

Kilcredaun Pt

Carrig Isl

Scattery Isl

Killimer

Ferry

Doonaha

Quin

Clarecastle

Spancelhill

Tulla

O'Callaghansmills

Kilkishen

Broadford

Kilmurry

Sixmilebridge

Cratloe

Ardnacrusha

Coney Island

Shannon Airport

Bunratty

Pallaskenry

Ballysteen

Mungret

Clarina

Kildimo New

Askeaton

Patrickswell

Crecora

Adare

Croagh

Rathkeale
Ráth Caola

Ballingarry

Fedamore

Monaster

Croom

Carrigaholt Bay

Bunaclugga Bay

Ballylongford Bay

Clonderalaw Bay

Doughmore Bay

Ballard Bay

Farrihy Bay

Moore Bay

River Maigue

River Deel

N67 N68 N69 N18 N20 N21 M20

R460 R474 R483 R484 R485 R487 R551 R552 R553 R554 R524 R521 R523 R473 R472 R470 R471 R462 R352 R467 R466 R465 R468 R469 R518 R519 R526 R511

J7 J8 J9 J10 J11 J12 J13 J14

30

Legend

SPA 004077

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

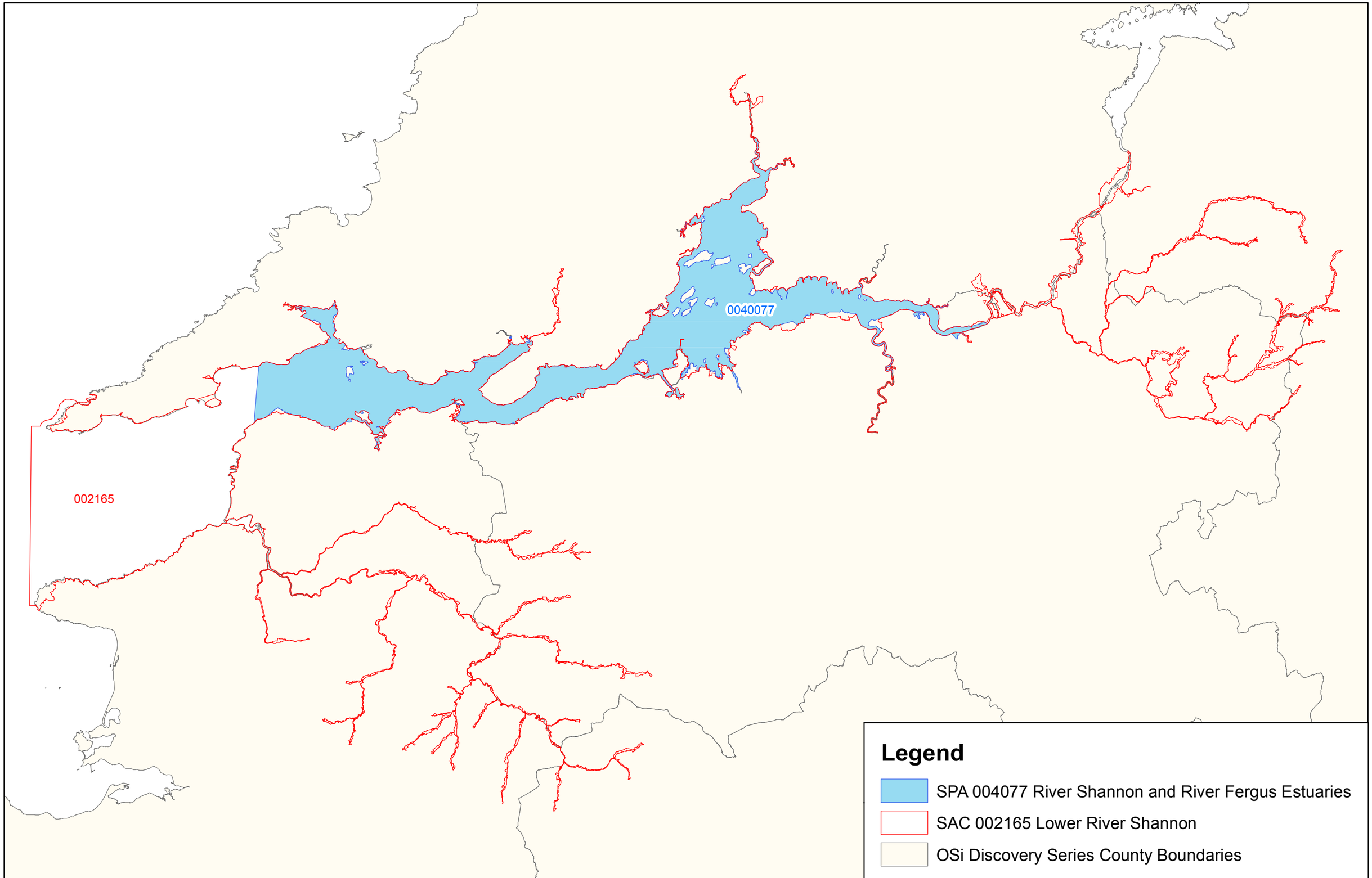
MAP 1:
RIVER SHANNON AND RIVER FERGUS ESTUARIES
CONSERVATION OBJECTIVES
SPA DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

0 2 4 6 8 10 km

N

Site Code
SPA 004077
Version: CL 1.03 / LI 1.03 / KE 1.02
Map Version 1
Date: May 2012



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
RIVER SHANNON AND RIVER FERGUS ESTUARIES
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING
DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives SPA Document.

0 5 10 15 20 km

N

Site Code
SPA 004077
Version: CL 1.03 / LI 1.03 / KE 1.02
Map Version 1
Date: May 2012