

Natura Impact Statement

Shannon Estuary North & Mal Bay

Natura Impact Statement

For

River Basin (27/28) Shannon Estuary North & Mal Bay Flood Risk Management Plan

Areas for Further Assessment included in the Plan:

<i>Cuinche</i>	<i>Quin</i>
<i>Cill Chaoi</i>	<i>Kilkee</i>
<i>Bun Raite</i>	<i>Bunratty</i>
<i>Inis</i>	<i>Ennis</i>
<i>Droichead Abhann Ó gCearnaigh</i>	<i>Sixmilebridge</i>
<i>Cill Rois</i>	<i>Kilrush</i>
<i>Sionainn</i>	<i>Shannon</i>
<i>Aerfort na Sionainne</i>	<i>Shannon Airport</i>

Flood Risk Management Plans prepared by the Office of Public Works 2018

In accordance with

European Communities (Assessment and Management of Flood Risks) Regulations 2010 and 2015

Purpose of this Report

As part of the National Catchment-based Flood Risk Assessment & Management (CFRAM) programme, the Commissioners of Public Works have commissioned expert consultants to prepare Strategic Environmental Assessments, Appropriate Assessment Screening Reports and, where deemed necessary by the Commissioners of Public Works, Natura Impacts Assessments, associated with the national suite of Flood Risk Management Plans.

This is necessary to meet the requirements of both S.I. No. 435 of 2004 European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (as amended by S.I. No. 200/2011), and S.I. No. 477/2011 European Communities (Birds and Natural Habitats) Regulations 2011.

Expert Consultants have prepared these Reports on behalf of the Commissioners of Public Works to inform the Commissioners' determination as to whether the Plans are likely to have significant effects on the environment and whether an Appropriate Assessment of a plan or project is required and, if required, whether or not the plans shall adversely affect the integrity of any European site.

The Report contained in this document is specific to the Flood Risk Management Plan as indicated on the front cover.

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The OPW also acknowledges the participation of members of the public, representative organisations and other groups throughout each stage of consultation.

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Glossary and Acronyms

Term	Definition
Annual Exceedance Probability (AEP)	The probability, typically expressed as a percentage, of a flood event of a given magnitude being equalled or exceeded in any given year. For example, a 1% AEP flood event has a 1%, or 1 in a 100, chance of occurring or being exceeded in any given year.
Appropriate Assessment (AA)	An assessment of Likely Significant Effects (LSEs) identified during Screening for AA, to determine if these may adversely affect the integrity of any European sites, either alone or in combination with other plans or projects.
Appropriate Assessment Screening Statement (AASS)	Term for the non-statutory report produced to inform the screening for Appropriate Assessment by the Competent Authority.
Area for Further Assessment (AFA)	Areas where, based on the Preliminary Flood Risk Assessment, the risks associated with flooding are considered to be potentially significant. For these areas further, more detailed assessment is required to determine the degree of flood risk, and develop measures to manage and reduce the flood risk. The AFAs are the focus of the CFRAM Studies.
Arterial Drainage Scheme	Works undertaken under the Arterial Drainage Act (1945) to improve the drainage of land. Such works were undertaken, and are maintained on an ongoing basis, by the OPW.
Candidate Special Area of Conservation (cSAC)	European site designated for non-avian habitats and species, under the European Union Habitats Directive 92/43/EEC as transposed by the European Communities (Bird and Natural Habitats) Regulations 2011-2015, and primarily S.I. 477 of 2011.
Catchment	The area of land draining to a particular point on a river or drainage system, such as an Area for Further Assessment (AFA) or the outfall of a river to the sea.
Catchment Flood Risk Assessment and Management Study (CFRAM Study)	A study to assess and map the flood hazard and risk (both existing and potential future) from fluvial and coastal waters; to define objectives for the management of the identified risks; and to prepare a FRMP setting out a prioritised set of measures aimed at meeting the defined objectives.
Competent Authority	Public body provided for in the relevant legislation, who makes statutory determinations (e.g. in relation to Appropriate Assessment).
European site	Any candidate Special Areas of Conservation or Special Protection Areas. Also referred to as Natura 2000 sites.
Flood	The temporary covering by water of land that is not normally covered by water.

Term	Definition
'Floods' Directive	The EU 'Floods' Directive [2007/60/EC] is the Directive that came into force in November 2007 requiring Member States to undertake a preliminary flood risk assessment to identify Areas for Further Assessment (AFAs), and then to prepare flood maps and FRMPs for these areas.
Flood Extent	The extent of land that has been, or might be, flooded. Flood extent is often represented on a flood map.
Flood Hazard Map	A map indicating areas of land that may be prone to flooding, referred to as a flood extent map, or a map indicating the depth, velocity or other aspect of flooding or flood waters for a given flood event. Flood hazard maps are typically prepared for either a past event or for (a) potential future flood event(s) of a given probability.
Flood Risk Management Measure	A set of works, structural and / or non-structural, aimed at reducing or managing flood risk. A flood risk management option ('option') consists of one or more flood risk management measures.
Flood Risk Management Option	See Flood Risk Management Measure.
Flood Risk Management Plan (FRMP)	A Plan setting out a prioritised set of measures within a long-term sustainable strategy aimed at achieving defined flood risk management objectives. The FRMP is developed at a catchment or Unit of Management scale, but is focused on managing risk within the AFAs.
Floodplain	The area of land adjacent to a river or coastal reach that is prone to periodic flooding from that river or the sea.
Fluvial	Riverine, often used in the context of fluvial flooding, i.e., flooding from rivers, streams, etc.
Freshwater pearl mussel (FWPM)	The freshwater pearl mussel <i>Margaritifera margaritifera</i> (FWPM) is a type of mollusc with a body enclosed between a pair of shells. The species is a Qualifying Interest of a number of candidate Special Areas of Conservation within the Shannon River Basin District.
Hazard	Something that can cause harm or detrimental consequences. In this context, the hazard referred to is flooding.
Hydraulics	The science of the behaviour of fluids, often used in this context in relation to estimating the conveyance of flood water in river channels or structures (such as culverts) or overland to determine flood levels or extents.
Hydrology	The science of the natural water cycle, often used in this context in relation to estimating the rate and volume of rainfall flowing off the land and of flood flows in rivers.
Hydrometric Area	Hydrological divisions of land, generally large catchments or a conglomeration of small catchments, and associated coastal areas. There are 40 Hydrometric Areas in the island of Ireland.
Indicative	This term is typically used to refer to the flood maps developed under the PFRA. The maps developed are approximate, rather than highly detailed, with some local anomalies.

Term	Definition
Individual Risk Receptor (IRR)	A single receptor (see below) that has been determined to represent a potentially significant flood risk (as opposed to a community or other area at potentially significant flood risk AFA).
Inland Fisheries Ireland (IFI)	National inland fisheries organisation within the Department of Communications, Energy and Natural Resources (DCENR).
Likely Significant Effects (LSEs)	Term adapted from Article 6 (3) of the European Union Habitats Directive (“likely to have a significant effect”), describing the type of effects which, if identified as potentially arising as a result of a project or plan, trigger an Appropriate Assessment, which must be conducted by the Competent Authority.
Measure	See Flood Risk Management Measure.
National CFRAM Programme	The programme developed by the OPW to implement key aspects of the EU ‘Floods’ Directive in Ireland, which includes the CFRAM Studies, and builds on the findings of the PFRA.
National Parks & Wildlife Service (NPWS)	Government body within the Irish Department of Arts, Heritage and the Gaeltacht with responsibility for wildlife conservation, whose Minister has a statutory role, in the context of Appropriate Assessment of FRMPs.
Natura 2000 site (together forming the Natura 2000 network)	Any candidate Special Areas of Conservation or Special Protection Areas. Also referred to as European sites.
Natura Impact Statement (NIS)	Term for the statutory report produced to inform the Appropriate Assessment by the Competent Authority.
Non-structural flood risk management measure	Any of a number of flood risk management measures not requiring physical interventions (or requiring minimal physical intervention). These typically refer to strategic flood risk measures without a spatially defined built element (e.g. commitments relating to Building Regulations, or Strategic Development Management). Some minor works are included however, namely works for individual Property Resistance and Property Resilience, gauge installation under Additional Monitoring, or the Flood Forecasting/Warning/Response measure including local responses (e.g. sandbag deployment and other temporary flood responses).
Office of Public Works (OPW)	Government body with responsibility for Flood Risk Management, and Competent Authority for the adoption of the CFRAM Study
Qualifying Interest (QI)	One of the features (habitat or species) that are the reasons for designation of a European site, named in the Conservation Objectives for that site. The term QI also includes birds - The term Special Conservation Interest used by the NPWS to refer specifically to reasons for designation of Special Protection Areas (i.e. bird species) is not used in this report.
Receptor (in the context of flooding)	Something that might suffer harm or damage as a result of a flood, such as a house, office, monument, hospital, agricultural land or environmentally designated sites.
Relevant European site	A European site on which Likely Significant Effects could not be excluded following Screening for AA in the Appropriate Assessment Screening Statement.

Term	Definition
Relevant Qualifying Interest	The particular designated features within a European site (species or habitats) on which Likely Significant Effects could not be excluded following Screening for AA in the Appropriate Assessment Screening Statement.
Riparian	River bank. Often used to describe the area on or near a river bank that supports certain vegetation suited to that environment (Riparian Zone).
Risk (in relation to flooding)	The combination of the probability of flooding, and the consequences of a flood.
River Basin District (RBD)	A hydrological division of land defined for the purposes of the Water Framework Directive. There are eight RBDs in the island of Ireland
Runoff	The flow of water over or through the land to a waterbody (e.g., stream, river or lake) resulting from rainfall events. This may be overland, or through the soil where water infiltrates into the ground.
Sedimentation	The accumulation of particles (of soil, sand, clay, peat, etc.) in the river channel
Special Protection Area (SPA)	European site designated for birds and their habitats, under the European Union Habitats Directive 92/43/EEC and EU Birds Directive 2009/147/EC, as transposed by the European Communities (Bird and Natural Habitats) Regulations 2011-2015, and primarily S.I. 477 of 2011
Strategic Environmental Assessment (SEA)	An SEA is an environmental assessment of plans (such as the FRMPs) and programmes to ensure a high level consideration of environmental issues in the plan preparation and adoption, and is a requirement provided for under the SEA directive [2001/42/EC]
Structural flood risk management measure	Any of a number of flood risk management measures requiring physical interventions, and construction works.
Surface Water	Water on the surface of the land. Often used to refer to ponding of rainfall unable to drain away or infiltrate into the soil.
Tidal	Related to the tides of the sea / oceans, often used in the context of tidal flooding, i.e., flooding caused from high sea or estuarine levels.
Transitional Water	The estuarine or inter-tidal reach of a river, where the water is influenced by both freshwater river flow and saltwater from the sea.

1 Introduction

1.1 Planning and Legal Context for the Proposed Plan

The European Union (EU) Directive on the assessment and management of flood risks 2007/60/EC is transposed in Ireland by the European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. 122/2010). Under these Regulations, the Office of Public Works (OPW) must coordinate Flood Risk Management Plans (FRMPs) at River Basin District (RBD) or 'Unit of Management' level (UoM). This report assesses the draft FRMP for Unit of Management 27_28 (**hereafter 'the draft FRMP for UoM 27_28_28'**). There are six UoMs within the Shannon RBD, which are being reported in four UoM groupings. UoM 27 is one of these four UoM groupings.

The obligation to undertake Appropriate Assessment (AA) of plans including FRMPs derives from the Habitats Directive 92/43/EEC. The European Communities (Birds and Habitats) Regulations 2011-2015¹, and primarily S.I. 477 of 2011 (together '**The Regulations**'), transpose the Habitats Directive in Ireland in relation to AA of certain land-use plans including FRMPs. FRMPs fall outside the regulatory remit of the Irish planning legislation.

Under the Regulations, the Office of Public Works (OPW) is the proponent and Competent Authority for the Screening for AA of the draft FRMP for UoM 27_28. An Appropriate Assessment Screening Statement (AASS) of the draft FRMP for UoM 27_28 was produced by Jacobs Engineering and provided to the OPW in February 2016. Informed by this AASS, the OPW determined that it could not be excluded, on the basis of objective scientific information, alone or in-combination with other plans or projects that the draft FRMP for UoM 27_28 could have likely significant effects (LSEs) on a large number of European sites. This triggered the requirement for an AA of the draft FRMP for UoM 27_28 to be undertaken by the OPW, as informed by this Natura Impact Statement (NIS).

1.1.1 Role of the Competent Authority in the AA

Regulation 42 (9) of the Regulations states:

"(9) Where a public authority is required to conduct an Appropriate Assessment...in relation to a plan or project that it proposes to undertake or adopt, it shall—

- (a) Prepare a Natura Impact Statement;*
- (b) Compile any other evidence including, but not limited to, scientific evidence that is required for the purposes of the Appropriate Assessment;*
- (c) Submit a Natura Impact Statement together with evidence compiled under subparagraph (b) to the Minister [for Arts, Heritage and the Gaeltacht] not later than six weeks before it proposes to adopt or undertake the plan or project to which the Natura Impact Statement and evidence relates".*

This NIS is being provided to the OPW to inform their AA determination as Competent Authority.

¹ S.I. No. 477 of 2011; S.I. No. 499 of 2013; S.I. No. 355 of 2015.

In accordance with Regulation 42 (10), as Competent Authority for the AA, the OPW “shall also take account of any submissions made to it by the Minister”.

1.2 Introduction to UoM 27

The ‘Shannon Estuary North Mal Bay’ UoM (or UoM 27) is shown in Figure 1 and is located almost entirely within County Clare, with only a very small part of the UoM within counties Limerick and Galway. UoM 27 is bounded to the east by the Lower Shannon Hydrometric Area (part of UoM 25_26), and to the north by the Western RBD. The UoM is characterised in greater detail in Section 5.

1.3 Background to the CFRAM Study

Flood risk in Ireland has historically been addressed through the use of engineered arterial drainage schemes and/or site-specific flood relief schemes. In line with internationally changing perspectives, the Government has adopted policy² related to new flood risk assessment and management that has shifted the emphasis in addressing flood risk towards:

- A catchment-based context for managing risk;
- Pro-active flood hazard and risk assessment and flood hazard management; and
- Increased use of ‘non-structural’ measures (refer to glossary) and flood impact mitigation measures.

For the purposes of the EU Water Framework Directive (WFD), Ireland was divided into eight RBDs, reflecting natural drainage boundaries and comprising multiple catchments. The boundaries for the CFRAM Studies reflect those of the RBDs. Each CFRAM Study is focused on areas known to have experienced fluvial (river) and/or coastal flooding in the past or which are considered to be at potentially significant risk. The flood hazard maps produced for the Shannon CFRAM study have been used to assess the level of economic, social, environmental and cultural flood risk in the Shannon RBD, and together inform the four draft FRMPs within the Shannon CFRAM Study boundary.

The AA process is an intrinsic part of the CFRAM Study methodology, because flood risk management options (hereafter ‘options’; refer to definition in glossary) likely to affect the integrity of European sites were considered not viable through heavily negative scoring in Multi Criteria Analysis (MCA). MCA is described in detail later in this NIS.

1.4 Overview of Programme

AA Screening Statements for the draft FRMP’s of all Units of Management were completed in tandem with the ongoing Options Appraisal Process in late 2015 and early 2016.

For all four draft FRMPs, the OPW determined, following review of the AASS’s, that AA was required. NIS’s for UoMs 23, 24, and 25_26 were produced in tandem with this NIS for the draft FRMP for UoM 27_28.

² To meet the requirements of the EU Flood Directive (Directive 2007/60/EC) and the 2004 Flood Policy Review Report.

2 Methodology

2.1 Screening for AA

This report does not include the methodology for Screening for AA which is described in the AASS for the draft FRMP for UoM 27_28, produced by Jacobs on behalf of the OPW in February 2016.

2.2 Appropriate Assessment

In accordance with Article 6 (3) of the Habitats Directive which – in relation to the AA of FRMPs – is transposed in Ireland by the Regulations:

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.

'Likely significant effects' (LSEs) of the draft FRMP for UoM 27_28 on European sites were identified in the AASS, to determine the requirement for AA as per the wording of Article 6 (3) above. The AASS listed the particular European sites, and particular Qualifying Interests (QIs) of those sites, for which LSEs could not be excluded. This list of European sites and QIs affected was reviewed in the course of completing the NIS in light of new information available since the AASS, particularly the draft Plan for UoM 27, and the emerging draft Strategic Environmental Assessment (SEA) Environmental Report.

Where potential adverse effects on integrity are identified in the AA process, mitigation measures are proposed to avoid effects, or reduce them below the threshold where they would affect integrity. In light of the mitigation proposed, conclusions are made on whether there is reasonable scientific doubt regarding the absence of adverse effects on integrity. This is all documented within the NIS, which informs the AA determination of the Competent Authority.

2.2.1 Steps in AA

Irish governmental guidance from the Department of the Environment, Heritage, and Local Government (DoEHLG, 2010) follows the approach of the European Commission (EC, 2001) to a significant degree, in the EC's *Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. The following steps for the AA are adopted by the EC and DoEHLG and are used as the basis for this NIS:

- Step 1 – Information Required (including 'scoping');

- Step 2 – Conservation Objectives;
- Step 3 – Prediction of Effects (including Article 10 considerations);
- Step 4 – Mitigation Measures; and
- Conclusion.

DoEHLG guidance (2010) specifically identifies ‘scoping’, as a distinct part of the AA of plans, and this has been incorporated into Step 1 above. According to DoEHLG guidance, scoping:

- Follows a Screening decision that AA is required;
- Extends the Screening process to identify more precisely what AA must cover, including the data, information and level of detail required in the NIS;
- Should be revisited throughout the AA to address any new emerging issues; and
- Should take account of any recommendations from various statutory bodies.

2.2.2 Outcomes of the AA Process

Graphic 1 summarises the potential scenarios following the completion of the NIS, and how NIS outcomes influence the AA determination of the Competent Authority.

Graphic 1 Schematic showing how NIS informs AA Determination of Competent Authority.

NIS Finding - Scenario 1:

If, following full implementation of proposed mitigation:

- The draft FRMP for UoM 27_28 would have no adverse effects on integrity of European sites, either alone or in combination with other plans or projects and;
- The NIS contains complete, precise, and definitive findings and conclusions, without lacunae or gaps and;
- No reasonable doubt remains regarding the absence of adverse effects on integrity.

Then the OPW either:

1a Agrees ⇨ NIS and AA Conclusion Statement published on OPW website

1b Disagrees → OPW requests review of NIS

NIS Finding – Scenario 2:

If, following full implementation of proposed mitigation,

- The draft Plan for UoM 27 would have adverse effects on integrity of European sites; or
- Reasonable doubt remains regarding the absence of potential effects;

Then the OPW either:

2a Agrees \Rightarrow Proceed to Assessment of Alternatives/'IROPI' (refer to text)
2b Disagrees \Rightarrow Requests review of NIS

In accordance with the DoEHLG guidance, the Competent Authority is required to produce a clear and discrete 'AA Conclusion Statement', which should include the reasons for their determination. NIS consultation requirements have been described in Section 1.1.1.

If the OPW still wished to propose the Plan despite adverse effects on integrity remaining after AA, a rigorous 'Assessment of Alternatives' would be carried out under scenario 2a.

In the unlikely event where an Assessment of Alternatives was required following AA, and only if this failed to identify any alternatives which would not adversely affect European sites, Imperative Reasons of Over-Riding Public Interest (IROPI) would need to be demonstrated and compensatory measures implemented to maintain the coherence of the Natura 2000 network in the face of adverse effects on site integrity. If a plan or project is to be authorised on the basis of IROPI, an application and 'statement of case' is required to serve as the basis for an IROPI decision. Referral to the relevant Minister is also required, in advance of informing or obtaining the opinion of the European Commission (DoEHLG, 2010).

2.2.3 Further Aspects of AA Methodology

The following additional aspects of the AA/NIS methodology are included in Appendix 1.

- The Interaction of the NIS and SEA of the Plan;
- The incorporation of Article 10 of the Habitats Directive into this NIS; and
- The Role of the Precautionary Principle.

2.3 Key Guidance

The following key information sources underpinned the NIS:

- *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities* (DoEHLG, 2010);
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites - Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (EC, 2001);
- *Findings from the International Workshops on Appropriate Assessment* in Oxford, England (Levett-Therivel, 2009) and Mikulov, Czech Republic (Chvojková et al., 2013); and
- Unpublished recommendations of the National Parks and Wildlife Service, and the Cork County Heritage Officer at the Advanced Appropriate Assessment Workshop hosted by the Chartered Institute of Ecology and Environmental Management, Dublin Port Centre, 17th April 2015.

2.4 Key Desktop Data

Digital mapping of ecological data was a critical part of determining the potential for adverse effects on site integrity. Key sources included:

- Mapping of existing flood extents and proposed measures from the CFRAM study design team;
- Mapping of Water Framework Directive (WFD) Waterbodies, including salmonid waterbodies;
- Mapping of European site boundaries and QIs in Conservation Objective mapping obtained in digital format online from the NPWS in 2015 and 2016;
- Data from NPWS Research Branch including:
 - Freshwater pearl mussel (FWPM) 'Habitat' and 'Population' GIS Data;
 - FWPM Catchment boundaries in GIS format;
 - Special Protection Area (SPA) Wetland bird roost locations in GIS format;
 - Favourable Reference Ranges and tabulated threats and pressures for QI species/habitats in the NPWS' latest national conservation status assessments (NPWS, 2013 a and b);
- Data from the online portal of the National Biodiversity data centre on species records, and the Landscape Conservation for Bats mapping (Lundy et al., 2011);
- Ordnance Survey Ireland mapping and aerial photography available from www.osi.ie;
- Conservation status of relevant species and habitats from NPWS conservation status assessments (NPWS, 2013a; 2013b);
- Ground Water Dependent Terrestrial Ecosystem mapping (GWDTE) obtained digitally from the Environment Protection Agency (EPA); and
- Area plan status and zoning information available online from the myplan.ie portal hosted by the Department of Environment, Community and Local Government (DoECLG).

Key resources used to understand the characteristics of the River Shannon RBD and the existing regime of flood risk measures included:

- Outputs of the optioneering and SEA of the Shannon CFRAM Study;
- Shannon River Basin Management Plan (RBMP) 2009 – 2015;
- The Strategic Integrated Framework Plan (SIFP) for the Shannon Estuary, including Natura Impact Report (RPS, 2013);
- The Habitats Directive Assessment Arterial Drainage Maintenance and High Risk Channel Designation Programme 2011 – 2015 (OPW, 2011);
- The Natura impact Statement for the OPW's previous Arterial Drainage Maintenance and High Risk Channel Designation Programme 2011 – 2015 (OPW, 2011); and
- The Natura impact Statements for the OPW's Arterial Drainage Scheme for the period 2014-20.

3 AA Screening and NIS Scoping

3.1 Preliminary List of European Sites Identified in the AASS

Applying the precautionary principle given the uncertainty over the location and characteristics of measures at that time, the AASS for the draft FRMP for UoM 27_28 concluded that LSEs on a large number of European sites could not be excluded, either from the Plan alone or in-combination with other plans or projects, (Table 1).

Table 1: Original AASS Findings: Preliminary and Precautionary List of European Sites on which LSEs could not be excluded at that time

European site		
Name		Code
Candidate Special Areas of Conservation	Ballyallia Lake	14
	Ballycullinan Lake	16
	Ballyogan Lough	19
	Black Head-Poulsallagh Complex	20
	Danes Hole, Poulnalecka SAC	30
	Dromore Woods And Loughs	32
	East Burren Complex	1926
	Kilkee Reefs	2264
	Knockanira House	2318
	Lough Gash Turlough	51
	Lower River Shannon	2165
	Moneen Mountain	54
	Moyree River System	57
	Newhall And Edenvale Complex	2091
	Old Domestic Buildings (Keevagh)	2010
	Pouladatig Cave	37
	Poulnagordon Cave (Quin)	64
	Ratty River Cave	2316
	Slieve Bernagh Bog	2312
	Toonagh Estate	2247
	Tullaheer Lough And Bog	2243
Special Protection Area	Ballyallia Lough SPA	4041
	Coole-Garryland SPA	4107
	Corofin Wetlands SPA	4220
	Inner Galway Bay	4031
	Loop Head SPA	4119
	Mid-Clare Coast SPA	4182

	River Shannon and River Fergus Estuaries SPA	4077
	Slieve Aughty Mountains SPA	4161

This preliminary list of sites identified in the AASS, was precautionary and based on the limited information available at that time, in advance of the draft FRMP which would contain details on preferred options. This list was reviewed during production of the NIS, specifically with a view to:

- Reviewing which *flood measures* at each spatial scale could be scoped out from the NIS due to the absence of LSEs, given the new information on the characteristics of the measures presented in the draft FRMP;
- Reviewing which *types of effects* from different flood measures could be scoped out from the NIS due to the absence of LSEs, given the new information on the characteristics of the measures presented in the draft FRMP;
- Reviewing if any additional European sites on which LSEs could be excluded in the AASS, should be '*scoped in*' to the NIS due to the potential for LSEs, based on the new information in the draft FRMP, including the final preferred options;
- Reviewing if any European sites for which LSEs could not be excluded in the AASS should be '*scoped out*' from the NIS due to the absence of LSE, based on the new information in the draft FRMP; and
- Conducting a more *in-depth review of zones of influence* specified in the AASS, with reference to scientific publications and expert opinion.

An NIS 'scoping' exercise as per DoEHLG guidance facilitated the above review of the original AASS findings.

3.2 NIS Scoping of Measures

The technical terms relating to flood risk used in this NIS were explained in the AASS. Readers not familiar with the AASS should read this Section on scoping in conjunction with the glossary preceding the NIS. The four spatial scales at which flood risk management measures are potentially proposed (UoM, Sub-catchment, Area for Further Assessment, and Individual Risk Receptor) are defined in the Glossary and described further in Section 4.2.

3.2.1 NIS Scoping of UoM and Sub-Catchment-Scale Measures

The Shannon CFRAM Study area comprises a RBD (as defined under the WFD), and is divided into UoMs. Each UoM, such as UoM 27, constitutes one or more major catchments or river basins (typically greater than 1,000 km²) and their associated coastal areas, or conglomerations of smaller river basins and their associated coastal areas. For the purposes of delineating appropriate areas within which flood measures are applied under the CFRAM Study, a total of three 'Sub-catchments' were identified for UoM 27. UoM and Sub-catchment spatial scales are discussed in detail in Section 4.2.

Applying the precautionary principle, in the absence of specifics on measures at that time, the AASS concluded that 'Additional Monitoring', 'Land-use management', 'Planning and Development Control', and 'Strategic Development Management'

flood risk management measures at UoM or sub-catchment scales could have LSEs on European sites.

These measures have now been characterised in the draft FRMP. With the exception of 'Additional Monitoring', the draft FRMP specifies no spatially defined 'on-the-ground' flood defences for any UoM or sub-catchment scale measures, nor any specific policies for measures at these scales. Table 2 identifies Additional Monitoring as the only measure at UoM or Sub-catchment scale with the potential for LSEs on European sites. This is the only measure at these spatial scales scoped into the AA.

Table 2: NIS Scoping: UoM and Sub-catchment-scale Measures for which LSEs can't be excluded

UoM/Sub-catchment Measure	Description	Policy(s) specified under measure?	Spatially defined flood measure?	Potential for LSE?
Additional Monitoring	Installation of additional gauging stations along watercourses with historical evidence of flooding or where properties are 'at risk' in the 1% fluvial / 0.5% tidal AEP event	No	Yes	Yes- scoped into NIS
Sustainable urban drainage systems	Alleviation of fluvial flood risk (e.g. detention basins and ponds)	No	No	No – scoped out of NIS
Public Awareness	Public campaigns via meetings, workshops and information leaflets for communities at risk	No	No	No – scoped out of NIS
Building Regulations	Regulations relating to floor levels, flood-proofing, flood resilience, sustainable drainage systems, prevention of reconstruction or redevelopment in flood-risk areas, etc.	No	No	No – scoped out of NIS
Land-use management	Potential management practices within the catchment to attenuate existing runoff, such as creation of wetlands and riparian buffer zones	No	No	No – scoped out of NIS
Planning and Development Control	Zoning of land for flood risk appropriate development, prevention of inappropriate incremental development, review of existing Local Authority policies	No	No	No – scoped out of NIS
Strategic Development Management	Proactive integration of structural measures into development designs and zoning, regulation on developer-funded communal retention, drainage and / or protection systems, etc.	No	No	No – scoped out of NIS

The option in the 'Shannon Town and Airport Sub-catchment and Coastal Area' was unique amongst sub-catchment options as including structural measures. This option was assessed alongside AFA options in the NIS (i.e. effectively considered an option at AFA-scale), for ease of assessment.

3.2.1 NIS Scoping of AFA-Scale Measures

Areas for Further Assessment (AFA) are areas of land such as cities, towns and villages where a degree of existing or potential flood risks exists (refer to Section 4.2). Most measures at this scale had the potential for LSEs in European sites and were scoped into the AA.

The AASS identified three non-structural measures considered in preferred options at AFA scale, which had no potential for LSEs based on the information available at that time. These were: Public Awareness, Planning and Development Control Measures, and Building Regulations. The key characteristics of these measures (i.e. they have no spatially defined or specific policy elements) remain unchanged in the draft FRMP, and these measures remain scoped out from the NIS.

‘Existing Regime’ measures on the CFRAM Study project comprised either existing flood defences, existing reactive activities under the OPW’s Arterial Drainage Schemes (including dredging), or other measures such as flood storage, level control, or flow diversion. Existing flood defences have potential for LSEs on European sites within the scope of this assessment, due to the associated maintenance requirements which could include localised construction or repair works.

The OPW’s Arterial Drainage Scheme is subject to AA under a separate statutory regime. The Arterial Drainage Scheme will operate in the absence of the CFRAM Study, and is not part of the study. None of the existing measures of the Existing Regime including the OPW’s Arterial Drainage Scheme can be either ceased or altered as part of the CFRAM Study. The potential for effects on European sites from Existing Regime including the Arterial Drainage Scheme will be considered in the in-combination assessment only.

Table 3 summarises the results of NIS scoping of measures with potential for LSEs at AFA-scale.

Table 3: NIS Scoping: AFA-scale Measures for which LSEs can't be excluded (*Pink colour indicates Measure is Scoped into NIS*)

AFA Measure	Description	Project stage AA?	Spatially defined?	Potential LSE?	Comments
Existing Regime	Existing channel maintenance under OPW Arterial Drainage schemes	Yes	Yes	Yes	Arterial Drainage schemes are/will be subject to their own AA but are assessed here as components of CFRAM Study options.
Flood Forecasting/Warning/Response	Flood forecasting/warning system, Flood Forecasting/Warning/Response including sandbag deployment.	No	No	Yes	Sandbag deployment poses siltation risk to aquatic species in absence of mitigation, and would not be subject to project-level AA
Storage	Single or multiple, online or offline flood water storage sites, flood retardation, etc.	No	Yes	Yes	Locations will not be specified in the plan
Sustainable Urban Drainage Systems	Includes detention basins and ponds	Yes	No	No	Scoped out.
Flow Diversion	Increase conveyance or avoid area at risk.	No	Yes	Yes	Location-specific options requiring construction have been proposed.
Increase Conveyance	In-channel works to remove material/widen, floodplain earthworks, removal of constraints / constrictions, increasing culvert/bridge openings,	No	Yes	Yes	Location-specific options requiring construction have been proposed
Flood Defences	New walls/embankments, raising existing walls/embankments, improving existing defences, or demountable defences	No	Yes	Yes	Location-specific options requiring construction have been proposed
Relocation of Properties	Relocation outside area at risk from the 1% AEP Fluvial and 0.5% Tidal flooding	No	Yes	Yes	Property locations not specified in plan
Individual Property Resistance	Prevent flood waters entering existing properties by retrofitting flood barriers, building skirts, non-return valves	No	Yes	Yes	Location-specific options requiring construction have been proposed but may not be subject to project-level assessment (e.g. due to planning exemptions). Potential for LSEs from pollution to highly sensitive aquatic features presumed, on a precautionary basis.
Individual Property Resilience	Wet-proofing properties (i.e. flood waters may enter) by changing materials use, relocating vulnerable building services	No	Yes	Yes	Location-specific options requiring construction have been proposed, but may not be subject to project-level assessment (e.g. due to planning exemptions). Potential for LSEs from pollution to highly sensitive aquatic features presumed, on a precautionary basis.
Public Awareness	Public campaigns for communities at risk(meetings, workshops information leaflets)	No	No	No	Scoped out.

3.3 NIS Scoping of Effects using New Information in the draft FRMP

Measures requiring construction, with the likely exception of works to implement Property Resistance and Resilience (which are likely to qualify for planning exemptions), would be subject to further AA at project stage in so-called 'down-the-line' or 'project-level' assessments.

Down-the-line assessments of projects would – as a minimum – impose mitigation to address potential adverse effects, and so it can be reasonably assumed at Plan level that certain effects would be effectively mitigated. Where projects would not be subject to a planning regime, no further assessment of mitigation may be undertaken; therefore the Plan level assessment cannot reasonably assume such mitigation would be implemented.

However applying the precautionary principle, some effects, for instance in-combination effects on highly pollution-sensitive species, could also result in adverse effects on European site integrity, after implementation of mitigation implemented at project-level, if plan-level mitigation does not inform project-level survey and assessment methods.

Therefore, in this NIS, as a precautionary measure, supplementary plan-level mitigation will be proposed to inform the requirements of some project-level assessments.

3.3.1 Scoping of Pollution Effects

Pollution control mitigation on regulated construction sites (e.g. bunded fuel storage areas, and restrictions on discharge of concrete washings into watercourses) would be implemented at project stage for options triggering further down-the-line assessments. These measures would protect most habitats and species from pollution effects.

However, adopting a precautionary approach, exacting pollution mitigation will be proposed in this NIS, to protect highly sensitive aquatic species in-combination pollution effects.

These highly sensitive aquatic features are Freshwater pearl mussel *Margaritifera margaritifera* (FWPM), and juvenile and spawning habitats of both Atlantic salmon *Salmo salar*, and lamprey populations (three species). Potential pollution effects on QIs which are not highly sensitive to water pollution, were scoped out of the NIS.

There is no mapping of spawning habitats for any of these species in the CO mapping for the site. The Environmental Protection Agency has compiled a map of WFD Designated Salmonid Waters under S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988. Published studies by the Inland Fisheries can be applied to determine potential presence of spawning Atlantic salmon presence based on water quality (minimum Q4 or 'Good' water quality), and channel width (minimum 3 m) (O'Grady, 2006).

The River Fergus is the only river designated a Salmonid Water under these regulations within the area of the draft FRMP for UoM 27_28. The portion of the Feale designated a Salmonid Water flows through the Ennis AFA. However no options are proposed for the Ennis AFA within the plan due to the

existing Arterial Drainage Scheme, and the AFA is effectively scoped out from the NIS (albeit the Arterial Drainage Scheme is assessed under in-combination effects in Section 10).

There are numerous watercourses with known or potential salmonids within the area of the draft FRMP for UoM 27_28, in a Register of Protected Areas maintained by the EPA entitled WFD RPA “salmonid lines of interest”. These watercourses, including all tributaries of the Fergus, are within the catchment of designated salmonid watercourses under the Regulations and all discharge into the Lower River Shannon cSAC, which has Atlantic salmon as a QI. However, spawning Atlantic salmon and lamprey, and FWPM beds occur only in freshwater reaches, where spawning gravels and juveniles are highly susceptible to small changes in dissolved oxygen, water quality, or water chemistry.

There are no options upstream of freshwater reaches of the Lower River Shannon cSAC which contain QI lamprey species or Atlantic salmon, and following the rationale on FWPM in the note below.

Potential pollution effects to spawning populations of Atlantic salmon and lamprey species in freshwater catchments (and FWPM as per the note below) were scoped out of the NIS.

Note on Freshwater Pearl Mussel

This species is a QI of one cSAC within the area of the draft FRMP for UoM 27_28 for UoM 27 (Lower River Shannon cSAC), and deserves special attention, due to its extreme sensitivity to water quality including turbidity.

There is one river sub-catchment within the area of the draft FRMP for UoM 27_28 for UoM 27 known to contain QI freshwater pearl mussel populations, associated with the Lower River Shannon cSAC. This is the River Shannon-Cloon sub-catchment within the South Clare/Shannon Estuary Water Management Unit. The NPWS hold detailed records of the location of mussel beds in this catchment (most recently from 2007), as well as mapped lines reflecting FWPM habitat.

In the AASS, LSEs could not be excluded, given the uncertainty regarding option locations. However, following new information in the draft FRMP, it has been confirmed that there are no AFAs within this catchment, no gauges or emergency measures (involving sandbag deployment) within this catchment, and therefore no potential for LSEs from the Plan to QI FWPM populations. **QI FWPM of the Lower River Shannon cSAC is therefore scoped out from the NIS.**

3.3.2 Scoping of Habitat Loss Effects

Direct habitat loss could result from habitat overlap with flood risk management options, or associated ‘ancillary’ works.

More subtle indirect habitat loss could also arise; for instance, flood defences may alter hydrological regime or flood plain extent resulting in deterioration or loss of surface-water dependent habitats such as alluvial woodlands.

Direct habitat loss effects would be readily mitigatable at project-level through simple avoidance measures. Certain indirect habitat loss may not be readily mitigatable at project-level.

In its judgement on the ‘Galway By-Pass’ ruling, the European Court of Justice concluded that, where a plan or project “*will lead to the lasting and irreparable loss of the whole or part of a priority natural habitat type whose conservation was the objective that justified the designation of the site concerned as an SCI, the view should be taken that such a plan or project will adversely affect the integrity of that site*”³.

It is clear from this ruling that any lasting loss of priority QI habitat would not be permitted in project-level assessments, without proceeding beyond AA to Article 6 (4). However there is some uncertainty when assessing loss of non-priority QI habitats. On this basis therefore, this NIS adopts the following approach to scoping habitat loss effects:

- The NIS reasonably assumes that project-level assessments will impose mitigation to avoid direct lasting loss of priority QI habitat (e.g. within the footprint of developments and ancillary works) and such effects are scoped out from this NIS;
- Due to the uncertainty regarding *non-priority* QI habitat loss, precautionary Plan-level mitigation will, in all instances, specify no net loss of such habitats at project-level assessments not progressing beyond AA as per article 6(3) (i.e. habitat loss would be potentially acceptable if progressing through Article 6 (4)); and
- Precautionary Plan-level mitigation will also inform the requirements of certain project-level surveys (e.g. in the case of identifying obscure vegetation communities of ‘water courses of plain to montane levels’ habitats), or subtle indirect effect pathways (e.g. from hydrological changes) and relevant QIs are scoped into this NIS in these instances on a case-by-case basis.

3.3.3 Scoping of Invasive Species Effects

In the AASS, invasive species were considered as a potential effect pathway from any measure requiring construction or land-use change.

Implementation of structural measures at AFA-scale would trigger project-level assessments. The regulatory regime applicable to these assessments would impose mitigation to ensure invasive species treatment and/or removal, as is practice on regulated construction sites. The effect pathway was therefore scoped out for all options triggering project-level assessments.

It has been clarified in the draft FRMP, that non-structural Property Resilience measures (Bunratty AFA only) would not be coupled with structural measures during implementation. However, invasive species effects from Property Resistance and Resilience measures are scoped out because works to implement these measures (e.g. retrofitting flood barriers, building skirts and non-return valves; wet-proofing properties by changing materials use, and

³ Judgment Of The European Court (Third Chamber) on 11 April 2013 in Case C 258/11 (REQUEST for a preliminary ruling under Article 267 TFEU from the Supreme Court (Ireland)) in relation to Peter Sweetman, Ireland, Attorney General, Minister for the Environment, Heritage and Local Government v An Bord Pleanála, para 46.

relocating vulnerable building services) would be highly localised to the building interior and immediate exterior, away from vegetated areas.

In contrast to most AFA-scale options, further assessment at project-level is unlikely to be required for Additional Monitoring at UoM/Sub-catchment scale. Works to install gauges under this measure could disturb and disperse aquatic and terrestrial invasive flora and fauna species, due to the nature of bankside works. Invasive species effects were therefore only scoped into the NIS for the Additional Monitoring measure at UoM/Sub-catchment scale (As has already been noted, effects from the 'Shannon Town and Airport Sub-catchment and Coastal Area' were effectively considered an option at AFA-scale, for ease of analysis).

3.3.4 Scoping of Barrier Effects to Atlantic Salmon and Lamprey Migration

There are no flapped outfalls or instream flood gates, or any other measures with the potential to pose a migratory barrier to upstream fish migration proposed in options for the draft FRMP for UoM 27_28. In the event where instream working is required, potentially requiring use of coffer dams and/or temporary over-pumping, any such work would be subject to project-level assessments, at which point fish passage would be addressed as part of the detailed design and mitigation development. The effect pathway is scoped out and not considered further.

3.3.5 Scoping of Potential Effects to QI Lesser Horseshoe Bat

Originally a cave-dwelling species, Irish lesser horseshoe bats *Rhinolophus hipposideros* now choose buildings for its summer or nursery roosts, while hibernating in underground sites such as caves or artificial structures such as cellars or ice-houses.

The species is a QI for a total of 18 cSACs within this UoM, equating to nearly half of all Irish cSACs for the species. This indicates the high importance of the area to the conservation of the species, both nationally and internationally. As a highly mobile species, there is potential for the species to forage at significant distance from its breeding sites and between its wintering sites. Habitat loss severing feeding areas from roosting sites could significantly affect the conservation of the species, and occur at significant distance from the designated site boundary.

Two AFAs in UoM 27 overlap cSACs for the species, namely the Ennis AFA (Pouladatig Cave cSAC and Newhall and Edenvale Complex cSAC), and the Quin AFA (Poulnagordon Cave (Quin) cSAC). However, as stated in the AASS, no options were developed for the Quin and Ennis AFAs because there was no flood risk to any properties for the 1% Annual Exceedance Probability (AEP) event design standard given the existing Arterial Drainage Scheme.

In the AASS, a precautionary range of 6 km was used to assess effects from options of ex-situ habitat loss from options on distant cSACs designated for the species, based on guidance published by Bat Conservation Ireland on considering the species in AA (BCI, 2012).

Accounting for such ex-situ effects, LSEs could not be excluded on a total of seven cSACs designated for lesser horseshoe bat, at the time of the AASS.

However, based on new information in the draft FRMP, and further analysis of scientifically-supported foraging/ranging distances in the Irish context (see 'Note on Lesser Horseshoe Bat Ranging Distances below), LSEs were excluded on all QI lesser horseshoe populations in the revised screening (see Section 3.5.2 and Appendix 3 Revised AA Screening Tables for AFA-Scale)

Note on Lesser Horseshoe Bat Ranging Distances

Although maximum foraging ranges for the species have approached 6 km in Ireland (e.g. 5.2 km in Galway; Rush and Billington, 2014), and Wales (4.2 km; Bontadina et al., 2002) no studies have found core foraging ranges in excess of 4 km (Schofield, 1996; Bontadina et al., 2002; Rush and Billington, 2014). Accordingly the 6 km distance used in the original AASS was revised down to 4 km in the revised screening.

3.4 Summary of NIS Scoping Results

Table 8 summarises the results of the NIS scoping. Table 8 identifies the measures at each spatial scale scoped into the NIS based on the characteristics of the measure, and whether it included a specific policy or spatially defined element. The likelihood of the measure being subject to a further project-level assessment, and any uncertainties associated with that assessment were also important criteria in considering whether a measure required scoping into NIS, and imposition of plan-level mitigation.

Table 4: NIS Scoping: Summary Table (Pink colour indicates Measure is scoped into NIS)

Spatial Scale	Type of Measures	Measure	Potential Effects	Potential for LSE?	Project-level Assessment Likely?	Scoped into NIS: Plan-level Mitigation Required?
UoM/Sub catchment	Non-structural	Additional Monitoring	Various	Yes	No	Yes – This is the only spatially defined measure at UoM/Sub-catchment scale, and the only measure at these scales requiring construction
UoM/Sub catchment	Non-structural	All except Additional Monitoring	Various	No	No	No – All measures other than Additional Monitoring have been scoped out from the NIS as all other measures have no specific policy or spatially defined characteristics
	Structural	None in plan	N/A	N/A	N/A	N/A
AFA	Structural measures.	All Structural.	Pollution to <i>highly pollution-sensitive features</i>	Yes	Yes	Yes – Populations of these species are highly pollution-sensitive, several are at unfavourable conservation status, and there are significant potential in-combination pollution effects
	Non-structural measures	Property resistance, Property resilience, Flood Forecasting / Warning / Response				
	Structural measures	All	<i>Non-priority</i> QI habitat loss	Yes	Yes	Yes – On precautionary basis, due to uncertainty over whether loss of <i>non-priority</i> habitat constitutes an adverse effect to integrity.
AFA	Structural measures	All	<i>Priority</i> QI habitat loss	Yes	Yes	No – Loss of priority QI habitat would constitute an adverse effect to European site integrity (see Section 3.3.2).
			Pollution to features <i>not highly sensitive to pollution</i>	Yes	Yes	No – Populations of these species/habitats are <i>not</i> highly pollution-sensitive and would not be at risk from in-combination pollution effects.
			Invasive species effects	Yes	Yes	No – No plan-level mitigation identified to inform project-level assessments (see Section 3.3.3).
AFA	Non-structural measures	Property resistance, Property resilience, Flood Forecasting/Warning/Response	All other effects not scoped in above including invasive species and habitat loss	No	No	No – Mitigation imposed at project-level sufficient to avoid adverse effects on integrity

3.5 Revised AA Screening of European Sites using Scoping Results

3.5.1 Revised AA Screening – UoM/Sub-catchment -scale Measures

‘Additional Monitoring’ involving installation of river level gauges, was the only measure at UoM or Sub-catchment scales for which potential LSEs on European sites could not be excluded. As has already been noted, effects from the ‘Shannon Town and Airport Sub-catchment and Coastal Area’ – which was unique in including structural measures at sub-catchment scale – were assessed at AFA-scale, for ease of analysis.

The AASS was drafted in advance of the draft FRMP, when greater uncertainty remained regarding the potential locations for gauges. Applying the Precautionary Principle, LSEs could not be excluded at Screening stage for any European sites within the UoM. Although locations remain indicative in the draft FRMP, the design team has confirmed the particular reaches of rivers along which gauges would be positioned, and potential effects were predicted on the basis that gauges could be located anywhere within the indicative extents.

Installation of gauges would involve localised in stream disturbance to anchor the gauge into the river substrate (by hand), in addition to a physical footprint on the riverbank associated with installation of a kiosk to receive the digital river level data. There is also potential for a weir to be installed downstream of the water level recorder, to provide data (and correct projections for) flow data (Graphic 2).

Graphic 2: Indicative example of type of water level recorder gauge potentially installed under ‘Additional Monitoring’ measure, which in this instance also includes a downstream weir.



The proposed installations may be subject to planning exemptions such that there is uncertainty as to whether project-level assessments may be conducted.

In accordance with the zones of influence for bird species in Appendix 2, LSEs on Special Protection Areas (SPAs) could not be excluded if:

- SPAs were designated for breeding species whose nests could be within the relevant zone of influence of disturbance (Appendix 2); or
- SPAs were designated for QI 'wetland' habitat and this could occur within the footprint of gauge installations.

In accordance with the zones of influence in Appendix 2, LSEs on cSACs could not be excluded if:

- QI habitats could occur within the footprint of gauge locations; or
- QI ground-water-dependent habitats could occur within 250 m of potential gauge locations; or
- cSACs designated for otter were within 10 km of gauge locations and within the same catchment as the potential gauge locations.

Table 5 and Table 6 summarise the results of the revised AA Screening of potential effects from the Additional Monitoring measure on European sites. The precautionary list of European sites on which LSEs could not be excluded at the time of the AASS formed the starting point for the revised AA screening. Of a total of ten gauges, Table 5 and Table 6 show there were LSEs predicted on European sites, from all ten gauges (GS01-GS10).

Table 5: Revised AA Screening Results. cSACs on which LSEs not excluded from Additional Monitoring (UoM/Sub-Catchment)

Name	Code	Does site overlap river along which gauge (s) proposed?	If otter is a QI, is the site within 10 km of gauges, and within the same catchment?	Potential ground-water dependent QIs within 250 m of gauge locations?	Proposed Gauge Reference(s)	Potential for LSEs?
Ballyallia Lake cSAC	14	No	N/A	No	N/A	No
Ballycullinan Lake cSAC	16	No	N/A	No	N/A	No
Ballyogan Lough cSAC	19	No	N/A	No	N/A	No
Black Head-Poulsallagh Complex cSAC	20	No	N/A	No	N/A	No
Danes Hole, Poulnalecka cSAC	30	No	N/A	No	N/A	No
Dromore Woods And Loughs cSAC	32	No	N/A	No	N/A	No
East Burren Complex cSAC	1926	No	N/A	No	N/A	No
Kilkee Reefs cSAC	2264	Yes	N/A	No	GS02-GS04(Kilkee)	No
Knockanira House cSAC	2318	No	N/A	No	N/A	No
Lough Gash Turlough cSAC	51	No	N/A	No	N/A	No
Lower River Shannon cSAC	2165	Yes	N/A	N/A	GS01 (in Kilrush AFA) GS02-04 (in Kilkee AFA) GS05 (south of Quin AFA) GS06-10 (within Shannon Town and Airport Sub-catchment ⁴)	Yes – potential disturbance of otter (all gauges)
Moneen Mountain cSAC	54	No	N/A	No	N/A	No
Moyree River System cSAC	57	No	N/A	No	N/A	No
Newhall And Edenvale Complex cSAC	2091	No	N/A	No	N/A	No
Old Domestic Buildings (Keevagh) cSAC	2010	No	N/A	No	N/A	No
Pouladatig Cave cSAC	37	No	N/A	No	N/A	No
Ratty River Cave cSAC	64	No	N/A	No	N/A	No
Slieve Bernagh Bog cSAC	2316	No	N/A	No	N/A	No

Name	Code	Does site overlap river along which gauge (s) proposed?	If otter is a QI, is the site within 10 km of gauges, and within the same catchment?	Potential ground-water dependent QIs within 250 m of gauge locations?	Proposed Gauge Reference(s)	Potential for LSEs?
Toonagh Estate cSAC	2312	No	N/A	No	N/A	No
Tullaheer Lough And Bog cSAC	2247	No	N/A	No	N/A	No

Table 6: Revised AA Screening Results. SPAs on which LSEs not excluded from Additional Monitoring (UoM/Sub-Catchment)

Name	Code	Does site overlap river along which gauge (s) proposed?	Could QI wetland be within the footprint of gauges?	Could nests of QI birds be within the zone of influence of disturbance from gauges?	Proposed Gauge Reference (s)	Potential for LSEs?
Ballyallia Lough SPA	4041	No	No	No	N/A	No
Coole-Garryland SPA	4107	No	No	No	N/A	No
Corofin Wetlands SPA	4220	No	No	No	N/A	No
Inner Galway Bay SPA	4031	No	No	No	N/A	No
Loop Head SPA	4119	No	No	No	N/A	No
Mid-Clare Coast SPA	4182	No	No	No	N/A	No
River Shannon and River Fergus Estuaries SPA	4077	Yes	No	No	GS06-GS10 (in Shannon & Shannon Airport Sub-Catchment and Coastal area)	No

Name	Code	Does site overlap river along which gauge (s) proposed?	Could QI wetland be within the footprint of gauges?	Could nests of QI birds be within the zone of influence of disturbance from gauges?	Proposed Gauge Reference (s)	Potential for LSEs?
Slieve Aughty Mountains SPA	4168	No	No	No	N/A	No

3.5.2 Revised Screening of European Sites from AFA-scale Options

The revised tables comprising the Screening of AFA-scale options are included in Appendix 3, which includes a summary of each preferred option. Table 7 summarises the contents of Appendix 3, and presents the European sites and QIs for which LSEs could not be excluded for each AFA. The 'Shannon Town and Airport Sub-catchment and Coastal Area' is assessed alongside AFA options in Table 7, because it (uniquely) includes structural options.

Table 7: Summary of Revised Screening Results (AFA-scale Options)

European site	Relevant Qualifying Interests ⁵ (*Priority for cSACs)	Bunratty AFA	Kilkee AFA	Kilrush AFA	Shannon Town AFA	Shannon Town and Airport Sub-catchment and Coastal Area
Lower River Shannon cSAC	Atlantic salt meadow	-	-	-	-	-
	Coastal lagoons*	-	-	-	-	✓
	Estuaries	✓	-	-	-	✓
	Large shallow inlets and bays	✓	-	-	-	✓
	<i>Lutra lutra</i>	✓	✓	✓	✓	✓
	Mediterranean salt meadows	-	-	-	-	-
	Molinia meadows	-	-	-	-	-
	Mudflats	✓	-	-	-	✓
	Sandbanks	✓	-	-	-	-
	Water courses of plain to montane level	✓	-	-	-	-
River Shannon and River Fergus Estuaries (All QI Populations effected are non-breeding) No effects predicted to breeding <i>P.carbo</i>)	<i>Anas acuta</i>	-	-	-	✓	✓
	<i>Anas clypeata</i>	-	-	-	✓	✓
	<i>Anas crecca</i>	✓	-	-	✓	✓
	<i>Anas penelope</i>	-	-	-	✓	✓
	<i>Aythya marila</i>	-	-	-	✓	✓
	<i>Branta bernicla hrota</i>	-	✓	✓	✓	✓
	<i>Calidris alpina</i>	-	-	-	✓	✓
	<i>Calidris canutus</i>	-	-	-	✓	✓
	<i>Charadrius hiaticula</i>	-	-	-	✓	✓
	<i>Chroicocephalus ridibundus</i>	✓	-	-	✓	✓
	<i>Cygnus cygnus</i>	-	✓	✓	✓	✓
	<i>Limosa lapponica</i>	✓	-	-	✓	✓
	<i>Limosa limosa</i>	✓	-	-	✓	✓
	<i>Numenius arquata</i>	✓	-	-	✓	✓
	<i>Phalacrocorax carbo</i> (non-breeding)	✓	-	-	✓	✓
	<i>Pluvialis apricaria</i>	-	-	-	✓	✓
	<i>Pluvialis squatarola</i>	-	-	-	✓	✓
	<i>Tadorna tadorna</i>	-	-	-	✓	✓
	<i>Tringa nebularia</i>	✓	-	-	✓	✓
	<i>Tringa totanus</i>	✓	-	-	✓	✓
	<i>Vanellus vanellus</i>	-	-	-	✓	✓
	Wetlands	-	-	-	-	✓
Illaunonearaun SPA	<i>Branta leucopsis</i>	-	✓	✓	-	-

⁵ Accurate at time of writing

3.6 New Information on Zones of Influence

Wintering Birds

In the AASS, a foraging range of 20 km was applied to all wintering bird species on a precautionary basis; based on the 20 km distance identified by Scottish Natural Heritage (SNH) for certain far-flying wintering geese species (SNH, 2013).

The evidence supporting this precautionary approach was reviewed following the AASS. The review included scientific literature and consultation with ornithological experts in Birdwatch Ireland, the British Trust for Ornithology, and SNH. The review indicated that shorter foraging distances were reliably supported by the scientific literature for a number of goose and swan species. For instance, core foraging ranges were reduced to 15 km for light-bellied goose *Branta bernicla hrota*, and 5 km for whooper swan *Cygnus cygnus*. The full list of species-specific distances used, and the supporting scientific rationale are provided in Appendix 2.

Geese and swans are herbivorous and do not feed on invertebrates in wetland habitats. The herbivorous diet reduces the dependence of many species on their core designated wetlands, as suggested by the NPWS' ranking of site fidelity for all designated geese and swan species as moderate in the Conservation Objective supporting documents for all SPAs scoped into the NIS for the draft FRMP for UoM 27_28. Geese and swans can exploit feeding grounds on sometimes distant pasture and cropland, relying on their designated areas more for roosting (NPWS, 2012a).

In contrast, waders and ducks are highly faithful to particular feeding and roosting areas, albeit these areas can be extensive. The dependence of these birds on invertebrate prey in soft wet substrates and/or aquatic vegetation typically increases their reliance on their designated wetland sites, whether inland or coastal. Accordingly, in their Conservation Objective supporting documents for SPAs, the NPWS have ranked all designated wader populations as either "reliant" or "totally reliant" on wetland habitats, and either of moderate or high fidelity to designated sites.

An area of 1-2 km beyond the boundary of designated wetland sites may encompass the necessary feeding and roosting resources required to maintain the distribution and long-term population trends for designated wader and duck populations. However there is little published evidence on ranging of wintering waders and ducks within around their designated areas. There have been occasional resightings of colour-ringed oystercatcher in inland suburban areas of south Dublin up to 4 km from their designated wetlands. In the absence of further data, a precautionary distance of 5 km has been considered the maximum potential foraging range for wader species such as oystercatcher utilising inland feeding areas.

3.7 Revised List of European sites with potential for LSEs

Following the revised Screening and NIS scoping using the new information in the draft FRMP, and new information on zones of influence, it was determined

that LSEs could not be excluded for the QIs of European sites listed in Table 8. The list of sites was generated with reference to the in-combination assessment in Section 10.

Table 8: Revised list of European sites, and Relevant QIs, for which LSEs could not be excluded following the Revised Screening and NIS Scoping.

Name	Code	Qualifying Interests ⁶ (*Priority)	Bird Population
Lower River Shannon cSAC	2165	Atlantic salt meadows	N/A
		Estuaries	N/A
		Large shallow inlets and bays	N/A
		<i>Lutra lutra</i>	N/A
		Mediterranean salt meadows	N/A
		Molinia meadows	N/A
		Mudflats	N/A
		Sandbanks	N/A
		Water courses of plain to montane level	N/A
River Shannon and River Fergus Estuaries SPA	4077	<i>Anas acuta</i>	Non-breeding
		<i>Anas clypeata</i>	Non-breeding
		<i>Anas crecca</i>	Non-breeding
		<i>Anas penelope</i>	Non-breeding
		<i>Aythya marila</i>	Non-breeding
		<i>Branta bernicla hrota</i>	Non-breeding
		<i>Calidris alpina</i>	Non-breeding
		<i>Calidris canutus</i>	Non-breeding
		<i>Charadrius hiaticula</i>	Non-breeding
		<i>Chroicocephalus ridibundus</i>	Non-breeding
		<i>Cygnus cygnus</i>	Non-breeding
		<i>Limosa lapponica</i>	Non-breeding
		<i>Limosa limosa</i>	Non-breeding
		<i>Numenius arquata</i>	Non-breeding
		<i>Phalacrocorax carbo</i>	Non-breeding
		<i>Pluvialis apricaria</i>	Non-breeding
		<i>Pluvialis squatarola</i>	Non-breeding
		<i>Tadorna tadorna</i>	Non-breeding
		<i>Tringa nebularia</i>	Non-breeding
		<i>Tringa totanus</i>	Non-breeding
		<i>Vanellus vanellus</i>	Non-breeding
Illaunonearaun SPA	4114	Wetlands	N/A
		<i>Branta leucopsis</i>	Non-breeding

⁶ Accurate as of January 2016

4 Description of the draft FRMP for UoM 27_28

4.1 Flood Risk Management Plans

The draft FRMP for UoM 27_28 outlines the flood risk assessment and analysis undertaken and the specific flood risk management policies, strategies, actions and options to be implemented by the OPW, local authorities and other relevant bodies.

4.2 Spatial Scales for Flood Risk Management Measures

Potential flood risk management measures and options for draft FRMPs in the Shannon CFRAM Study are considered at four different spatial scales (see Table 9 below).

Table 9: Spatial Scales for the draft FRMP for UoM 27_28

Spatial Scale	Number of Sites at each Scale	Name(s) of site
Unit of Management (UoM)	1	Shannon Estuary North
Sub-catchment or coastal area within the UoM	5	-Kilrush sub-catchment and coastal area -Fergus sub-catchment and coastal area -Owenogarney sub-catchment and coastal area -Moore Bay sub-catchment and coastal area -Shannon and Shannon Airport Sub-catchment and Coastal Area (but considered at AFA scale for ease of analysis)
Areas for Further Assessment (AFAs)	7	Kilrush, Quin, Ennis, Shannon Town, Bunratty, Kilkee, Sixmilebridge <i>Note, No options were developed for Quin, Ennis, and Sixmilebridge as per section 4.2.4</i>
Individual Risk Receptors (IRRs)	1	Shannon Airport <i>Note: No options were developed for the Shannon Airport IRR as per section 4.2.4</i>

These spatial scales are defined below.

4.2.1 Unit of Management

As the Shannon CFRAM Study area comprises a RBD (as defined under the WFD), it is divided into UoMs. Each UoM constitutes major catchments or river basins (typically greater than 1,000 km²) and their associated coastal areas or conglomerations of smaller river basins and their associated coastal areas.

4.2.2 Sub-catchment

In the context of the WFD, a sub-catchment corresponds to a Water Management Unit (WMU) boundary. WMU boundaries are mapped in the Shannon RBMP 2009 – 2015. There are two WMUs within UoM 27 (South Clare/Shannon WMU and Fergus WMU).

For the purposes of delineating appropriate areas within which flood measures are applied under the CFRAM Study, a total of five sub-catchments were identified for UoM 27. As well as the Fergus sub-catchment which is a WMU under the Shannon RBMP, four additional 'sub-catchments' were defined within WMUs for the purposes of the Shannon CFRAM Study. These are the coastal areas comprising the Kilrush and Moore Bay sub-catchments (both within the South Clare/Shannon WMU), and the 'Shannon and Shannon Airport Sub-catchment and Coastal Area' and Owengarney sub-catchments (both within the Fergus WMU).

4.2.3 Areas of Further Assessment

An Area of Further Assessment (AFA) is an area of land where a degree of existing or potential flood risks exists. AFAs include cities, towns and villages; there are seven AFAs in UoM 27, and these are mapped in Figure 1.

4.2.4 Individual Risk Receptors

An Individual Risk Receptor (IRR) is an individual property or infrastructure asset (e.g. a utility service) outside of AFAs that, if flooded, would give rise to significant detrimental impact or damage. There is one IRR in UoM 27 (Shannon Airport).

4.3 Flood Risk Management Measures

Having mapped areas at risk from flooding both now and in the future, a series of flood risk management measures were identified. Measures scoped out from the NIS are not discussed. These measures can be categorised as structural or non-structural, or alternatively under the following headings:

- Flood Prevention Methods which avoid or eliminate flood risk (e.g. 'Relocation of Properties' outside flood plains);
- Flood Protection Methods aimed at reducing likelihood and/or severity of flood events, and which typically require physical works (e.g. 'Construction of Flood Defences'; 'Increasing Conveyance' through in-channel dredging or widening, alteration of structures such as bridges or clearing debris; or 'Storage' involving flood storage wetlands);
- Flood Preparedness (Resilience) Methods applicable when it may not be possible to reduce the likelihood or severity of flooding to an area at risk. but, actions can be taken to reduce the consequences of flooding (e.g. Flood Forecasting/Warning/Response); or
- Existing Regime/Do-Nothing measures are applicable where the existing programme of works may be sufficient to effectively manage the existing flood risk (e.g. OPW's Arterial Drainage Scheme).

Certain measures were only applicable at particular spatial scales, as per Table 10 overleaf.

Table 10 Flood Risk Management Measures in the CFRAM Study

Flood Risk Management Measures in CFRAM Study	Applicable Spatial Scale	Scoped into NIS?
Baseline		
Do Nothing	AFA/IRR	No
Existing Regime	AFA/IRR	Yes (in-combination only)
Structural		
Storage	All	Yes
Flow Diversion	All	Yes
Increase Conveyance (incl. dredging)	All	Yes
Construct Flood Defences	All	Yes
Relocation of Properties	AFA/IRR	Yes
Other Measures	All	Yes
Non-structural		
Flood Forecasting/Warning/Response	AFA for all UoMs except UoM 25_26 in which it is applicable at all scales	Yes
Public Awareness	All	No
Individual property resistance	AFA/IRR	Yes
Individual property resilience	AFA/IRR	Yes
Planning and development control measures	UoM	No
Building regulations	UoM	No
Sustainable urban drainage systems	AFA/IRR	Yes
Land use management	All	Yes
Strategic development management	UoM	No
Additional Monitoring (rain and river level/flow gauges)	UoM	Yes

Detailed descriptions of all flood risk measures are provided in Appendix 4. The preferred options for all AFAs are illustrated in Figure 3.

4.4 Development of Option

4.4.1 'Exclusion' of Measures

Some measures were 'excluded' as they were not viable on technical, economic, social, or environmental grounds. The formal term used in the Options Appraisal process is 'Screening', but this has been replaced with the term 'exclusion' in this NIS, to avoid confusion with Habitats Directive terminology. Excluded measures included measures not socially or environmentally acceptable, excessively expensive or ineffective in managing or reducing flood risk. The outcome of this process was a set of flood risk management measures that might form, alone or in combination, potentially viable options for flood risk management measures.

4.4.2 Outline Design of Options

The options for possible measures were then developed to outline design. This permitted an estimation of the cost of the option, and also an appraisal of the option to determine how well it achieved the flood risk management objectives, what negative impacts it might cause and whether it was economically viable. One flood risk management objective specifically represented the aims of the Habitats Directive and therefore AA, and is discussed further in Section 4.5.1.

The options considered included 'Existing Regime', which means continuing only the current flood risk management activities, and also, in some circumstances, 'Do Nothing', which means ceasing any current flood risk management activities. Option development was informed by the SEA and AA processes.

Three AFAs were excluded from the draft FRMP (Quin AFA, Ennis AFA, and Sixmilebridge AFA), because there was no flood risk to any properties for the 1% Annual Exceedance Probability (AEP) event design standard given the existing Arterial Drainage schemes. The Shannon Airport IRR was additionally excluded because – being hydraulically connected to the Shannon Town AFA for coastal flood events – the flood risk could not be isolated to either site, and the design standard could only be provided to Shannon Airport at a sub-catchment scale. As has been highlighted elsewhere, the 'Shannon Town and Airport Sub-catchment/Coastal Area' was unique amongst sub-catchment options as including structural measures, and was therefore assessed alongside AFA options in the NIS.

4.5 Options Appraisal by Multi-Criteria Analysis

Full details of the Option Appraisal process are contained in the draft FRMP for UoM 27_28. A summary is presented in this Section.

With a range of possible options for measures to manage and reduce flood risk in a given area or location, a method of analysis is needed to determine which might be the most appropriate. This analysis needs to take account of the various flood risk management Objectives, including Objective 4B relating to AA defined in Section 4.5.1. The general importance of each Objective was defined using a 'Global Weighting'. The local importance or relevance of each Objective was defined using a 'Local Weighting'.

The purpose of this stage was threefold:

- Obtain Multi-Criteria Assessment (MCA) and economic scores for each viable option;
- Provide a comparison of the options using MCA and economic scores; and
- Determine the preferred option.

4.5.1 Scoring of Options against CFRAM Study AA Objective

CFRAM Study Objective 4B is to: "Support the objectives of the Habitats Directive" and this integrates AA into the CFRAM Study methodology. The sub-objective is to: "Avoid detrimental effects on, and where possible enhance

the Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones”.

Scoring of options against this Objective within the MCA incorporated AA, as defined in Article 6(3) of the Habitats Directive, into the options appraisal process. Following this approach, options potentially triggering article 6(4) of the Habitats Directive (i.e. adverse effects on integrity remain after mitigation requiring Assessment of Alternatives and if necessary IROPI) were considered not viable and not progressed.

Objective 4B was refined throughout the SEA and AA Screening processes, and through stakeholder consultation, including the National Technical Coordination Group Workshop in September 2013 and public consultation process carried out nationally by the OPW in November 2014.

Professional judgement was used to negatively score options for which it was likely that adverse effects on European site integrity would remain even after imposition of project-level mitigation, and/or where uncertainty remained over such effects. Such options were considered not viable, regardless of positive scores on other environmental, social, technical, or economic criteria, by scoring the option with a -999. Examples of options from the Shannon CFRAM Study which were scored -999 were those:

- Certain to result in permanent loss within cSACs of QI habitat within the footprint of flood defence structures;
- Certain to permanently reduce the extent of QI wetlands within SPAs due to reductions in flood extent; and
- Involving dredging within catchments containing designating populations of Atlantic salmon or FWPM.

4.6 Identification of Preferred Options

The preferred options set out in the draft FRMP were determined based on a range of considerations, namely:

- The MCA score;
- The economic viability score;
- Environmental considerations and assessments, including AA and SEA input to the exclusion of non-viable measures and option development;
- The adaptability to possible future changes, such as the potential impacts of climate change;
- Professional experience and judgement of the OPW, local authorities and Jacobs Engineering; and
- Public and stakeholder input and opinion.

5 Description of Relevant Baseline Environment

5.1 UoM 27 Overview

The Shannon Estuary North UoM or UoM 27, is located almost entirely within co. Claire, with only with only a small part of the unit of management within Limerick and Galway.

The unit of management is dominated by two main river catchments, which are, from east to west, the River Owenogarney (or Ratty) and the River Fergus, both of which discharge into the Shannon Estuary. The largest of these is the River Fergus. Further to the west, the rivers are much smaller, with several rivers draining generally southwards into the Shannon Estuary, such as the Crompaun and the Cloon.

From Loop Head the coastline extends northeast to Kilkee, along which the coastline is exposed to the Atlantic Ocean. UoM 27 is bounded to the east by the Lower Shannon Hydrometric Area (part of UoM 25_26), to the north by the Western RBD and to the west by UoM 28, separated from it by the upland area which creates the catchment divide.

The coastline extends along the Shannon Estuary from Limerick City in the east to where it meets the Atlantic Ocean at Loop Head in the far west of County Clare. The far north of UoM 27 includes the southern part of The Burren, with its characteristic karst limestone features, and the virtual absence of any surface water features. The southern part of UoM 27 is dominated by the tidal influence of the Shannon Estuary. This is reflected in the extensive flood defence assets (typically tidal embankments), located along the low-lying shoreline of much of the eastern part of UoM 27. In the central part of UoM 27, the River Fergus dominates, rising northwest of Corrofin near Lough Fergus, flowing through Corrofin and then through the central part of UoM 27, where it is dominated by numerous groundwater-fed lakes, heavily influenced by the limestone geology. Just north of Ennis it flows through Ballyallia Lough before splitting into two channels in the northern part of Ennis. The main River Fergus channel flows through the northwestern part of the town and the town centre (where the River Claureen or Inch joins the Fergus from the west) while the smaller channel flows southeast through the northern part of the town. The two parts of the Fergus re-join on the eastern side of Ennis. South of Ennis, the river widens and there is a tidal barrage located at Clarecastle approximately 4 km south of the centre of Ennis. 3 km south of Clarecastle, the River Rine (or Ardsolus in its lower reaches) flows into the tidal River Fergus before entering the Shannon Estuary.

Towards the eastern boundary of UoM 27, the River Owenogarney (or Ratty) flows into the Shannon Estuary, draining the eastern part of the catchment, and is separated from the Lower Shannon catchment (part of UoM 25_26) by the Slieve Bearnagh Mountains.

Water Management Units (WMUs) are sub-catchments (or sub-basins) as defined within the Shannon River Basin Management Plan (2009 – 2015). There are two WMUs within UoM 27. These are the South

Clare/Shannon Estuary WMU and the Fergus WMU, which together cover the entire area of UoM 27, and whose boundaries are coincident with those of the UoM.

5.2 Summary of Flooding History

Within UoM 27, significant flooding has occurred throughout the River Fergus and South Clare/Shannon WMUs, with flood records from 1929 to 2009, affecting a number of towns and villages, and most AFAs, with the exception. The major cause of flooding, based on the available records, appears to be fluvial and tidal.

5.3 Water Quality Baseline

The EU WFD 2000/60/EC establishes a framework for the protection of both surface and ground waters and aims to maintain high status of waters where it exists, prevent any deterioration in existing water status and achieve at least 'good' status for all waters by 2015. This is currently being implemented through the RBMPs.

The Shannon RBMP 2009-2015, adopted in June 2009, identifies two WMUs within the area of the draft FRMP for UoM 27_28 for UoM 27, for which Action Plans and a programme of measures have been proposed to facilitate the achievement of the WFD objectives (South Clare/Shannon WMU and Fergus WMU).

The WMU Action Plans highlight the failure of many areas of WMUs within UoM 27 to fully meet the WFD target of "good" WFD status. The following proportion of rivers is achieving "good" WFD status, in each WMU in UoM 27:

- Fergus – 44%; and
- South Clare/Shannon – 14%.

5.4 European Designated Sites

Having regard for Irish governmental guidance on AA (DEHLG, 2010) initially, all European sites within and adjacent to proposed plans were identified as a minimum. There are 28 candidate Special Areas of Conservation (cSACs) and two Special Protection Areas (SPAs) within or bordering the UoM.

These sites and other sites bordering the boundary of UoM 27 are illustrated in Figure 1, and listed below in Table 11.

Table 11: European Sites within/bordering the Boundary of UoM 27

	Name	Code
Candidate Special Areas of Conservation	Ballyallia Lake	14
	Ballycullinan Lake	16
	Ballycullinan, Old Domestic Building	2246
	Ballyogan Lough	19
	Black Head-Poulsallagh Complex	20
	Cregg House Stables, Crusheen	2317
	Danes Hole, Poulmalecka	30
	Dromore Woods And Loughs	32
	East Burren Complex	1926
	Kilkee Reefs	2264
	Kilkishen House	2319
	Knockanira House	2318
	Lough Cutra	299
	Lough Gash Turlough	51
	Lower River Shannon	2165
	Moneen Mountain	54
	Moyree River System	57
	Newgrove House	2157
	Newhall And Edenvale Complex	2091
	Old Farm Buildings, Ballymacrogan	2245
	Pouladatig Cave	37
	Poulnagordon Cave (Quin)	64
	Ratty River Cave	2316
	Slieve Bernagh Bog	2312
	Toonagh Estate	2247
	Tullaheer Lough And Bog	2243
Special Protection Areas	Ballyallia Lough	4041
	Corofin Wetlands	4220
	Loop Head	4119
	River Shannon and River Fergus Estuaries	4077
	Slieve Aughty Mountains	4168
	Illlaunonearaun	4114

5.4.1 Distribution of Qualifying Interests

The GIS data obtained from the NPWS provided distribution data for some QIs within the area of the draft FRMP for UoM 27_28 for UoM 27 and the surrounding areas. However, this data is incomplete, and primarily available for coastal sites for which detailed conservation objectives have been produced (e.g. Lower River Shannon cSAC and River Shannon and River Fergus SPA). Moreover, a precautionary approach is required even where shapefiles are available for QI distribution, since the NPWS have clearly stated that absence of a record in a particular area does not necessarily equate to absence of the feature.

Certain QIs, expanded upon below, deserve particular attention due to their high sensitivity, or restricted range.

5.4.2 Noteworthy QIs of Particular Sensitivity

Freshwater Pearl Mussel

Although there are QI populations of FWPM within the area of the draft FRMP for UoM 27_28 for UoM 27 within the Cloon sub-catchment (Figure 2), there are no AFAs within this catchment, no gauges proposed within this catchment

and therefore no potential for LSEs from the Plan to the FWPM populations. FWPM are scoped out (see Section 3.3.1).

Lesser Horseshoe Bat

Although a total of 18 cSACs within UoM 27 are designated for QI lesser horseshoe bat, there were no LSEs identified in the revised screening, and the species was scoped out from the NIS (see Section 3.3.5).

Atlantic Salmon and Lamprey species (Brook, River, and Sea)

The Lower River Shannon cSAC is the only European site within the boundary for UoM 27, for which these are designated as QI species. The area of the cSAC overlapping the boundary of the UoM is estuarine in nature. This is one of the primary reasons why potential pollution effects were scoped out from the NIS as per Section 3.3.1.

Alluvial Woodland

This habitat, which is a QI of the Lower River Shannon cSAC and East Burren Complex cSAC within UoM 27 is of particular sensitivity as a priority habitat at danger of disappearance under the Habitats Directive, *and* because the structure and function of the habitat is reliant upon the flood regime. There are no known examples of the habitat in NPWS CO mapping within the UoM. Furthermore, the habitat is not found along watercourses subject to tidal influence. All AFAs for which options are proposed (and the specific options therein) are in coastal or estuarine environments. No LSEs were predicted on any QI alluvial woodlands as per the revised screening assessment in Section 3.7.

Coastal lagoons

This habitat is also of particular sensitivity as a priority habitat at danger of disappearance under the Habitats Directive, and because the structure and function of the habitat is reliant upon the saline influence of coastal flooding, both from seasonal winter floods, and storm events. The potential changes in flood extent with measures in place define the zone of influence of potentially significant effects on this habitat.

Within UoM 27, the habitat is a QI of the Lower River Shannon cSAC only. Detailed conservation objectives, including mapping of QI lagoon locations are available from the NPWS for this site. There are two known QI coastal lagoons within the Lower River Shannon cSAC within the area of the draft FRMP for UoM 27_28. The Shannon Airport lagoon is within the Shannon Town AFA, and the 'Shannon Town and Airport Sub-Catchment and Coastal Area'. The Clonconeen lagoon is more than 10 km from the nearest AFA or gauge location. Finally, the Scatterry lagoon is located in the Shannon estuary, 1.5 km 'offshore' of the Kilrush AFA and UoM boundary.

Other Priority Habitats

There are a number of other habitats are of heightened sensitivity as priority habitats at danger of disappearance under the Habitats Directive. However, as per Section 3.7, there are no LSEs predicted to any other priority habitats, and such habitats are not relevant to the NIS.

6 Consultation

6.1 Statutory Consultees

A large volume of data related to European sites was obtained from the NPWS research branch (see Section 2.4). Inland Fisheries Ireland (IFI) provided comments in June 2011: Feedback under the headings of 'Biodiversity' and 'Fisheries', was gathered during a pre-scoping SEA workshop in July 2011, attended by stakeholders including NPWS and IFI.

Key comments relevant to the NIS are presented in Table 12.

Table 12: Consultation responses relevant to the NIS, and Actions taken

Comment	Stakeholder	Action Taken in NIS
Potential for flood storage in cutaway bog	NPWS	Considered by design team in assessment of flood risk and option design in draft FRMP.
Importance of winter flooding for some waterfowl.	NPWS	Any reduction in winter flooding extent of Special Protection Areas considered an unmitigatable adverse effect to site integrity within the NIS.
Water velocity and bank stability are important for fish ecology.	NPWS/IFI	Considered in design of options in draft FRMP, and plan-level mitigation requirements.
Summer flooding results in greater terrestrial and aquatic ecology impacts than managed winter flooding.	NPWS	Considered in design of options in draft FRMP, and plan-level mitigation requirements.
Wetted areas have a role in nutrient removal.	NPWS/IFI	Considered in prediction of effects and plan-level mitigation requirements for pollution control.
Invasive species considered should include Asian clam <i>Corbicula fluminea</i> and bloody red shrimp <i>Hemimysis anomala</i>	NPWS/IFI	Considered in design of options in plan-level mitigation requirements.
An Atlantic salmon restoration project is underway in the Shannon (Atlantic Aquatic Resource Conservation Project).	IFI	Considered in in-combination assessment..
Fisheries works can positively influence flood management (e.g. deflectors holding back silt).	IFI	Considered in design of options in draft FRMP, and plan-level mitigation requirements.
Importance of silt for juvenile lamprey species and reed beds for habitat connectivity.	IFI	Considered in prediction of effects and plan-level mitigation requirements.
There are no management plans in place between NPWS and sluice operators.	NPWS	Considered in the prediction of effects, particularly in-combination effects on migratory fish.
Abstraction plans need to be assumed for in-combination effects.	NPWS	Considered in the prediction of effects, particularly in-combination effects on ground-water dependent habitats and fisheries.
Role of Waterways Ireland in maintaining water levels for recreation could exacerbate summer flood risk. and	NPWS	Considered in the prediction of effects, particularly in-combination effects on corncrake, where applicable.
Expertise in both aquatic and terrestrial ecology is required for the AA.	NPWS	NIS informed by technical input by aquatic and terrestrial ecologists.
Forestry practices are thought to contribute to flooding in towns such as Listowel [which is in UoM 27].	IFI	Considered in in-combination effects.
Impact of peat harvesting and deposition by individuals and Bord Na Mona will influence conveyance in some watercourses, but is difficult to quantify.	IFI	Considered in in-combination effects.
Catchment-wide Water Framework Directive fisheries studies provide useful data.	IFI	WFD fisheries data, including mapping of WFD Designated Salmonid Waters was used to inform prediction of effects.

Comment	Stakeholder	Action Taken in NIS
NPWS fisheries datasets only represent recorded distribution and absence of records does not confirm absence of species.	IFI	All mapped data from NPWS (CO, ISGS, and NSNW) has been considered as the 'known' extent (as per legend entry on AFA maps). Known data in digital mapping has been used as a guide to potential extent. Although use of 'Favourable Reference Range' mapping allowed some range-restricted features to be determined as absent, the precautionary principle was fundamental to ensuring appropriate assumptions regarding potential occurrence of ecological features.
IFI's jurisdiction extends to 12 miles from the coast but excludes fully marine species. and	IFI	No specific action taken.
There is specialist research being conducted in IFI in Swords.	IFI	Technical input to the NIS was informed by relevant completed and ongoing IFI research from Swords and elsewhere including the <i>Atlas of Freshwater Fish in Irish Lakes</i> , and the Juvenile salmonid fish survey of the River Feale.

The CFRAM Study objective 4B (Habitats Directive) was refined, through stakeholder consultation through the National Technical Coordination Group (NTCG) Workshop carried out in September 2013 and through a public consultation process carried out nationally by the Office of Public Works in November 2014.

Finally, a national AA Workshop for CFRAM Study consultants was co-hosted by the Office of Public Works and the National Parks and Wildlife Service in January 2015, and attended by the CFRAM Study consultants conducting AA in all RBD's. The key findings from this workshop are summarised in Table 13 below.

Table 13: Key Findings from AA Workshop, January 2014

Key Findings (AA Workshop, January 2014)	Stakeholder	Action Taken in NIS
Flood Risk Management Plans (FRMPs) are being carried out under S.I. 122 of 2010 and not the Arterial Drainage Act.	OPW	Incorporated into legislation context (Section 1).
NPWS will not be developing site management plans for all Natura 2000 sites, as they are not needed everywhere, but will focus on reviewing and, if necessary, updating site conservation objectives.	NPWS	Existing conservation management plans were reviewed under in-combination effects. The availability of site-specific 'detailed' Conservation objectives (and supporting documentation) was reviewed on a regular basis throughout NIS production, with reference to the NPWS website.
15 km zone of influence is guidance. It could be greater, it could be less. It is important to investigate the zone of influence measure by measure.	NPWS	A scientific approach was adopted to delineate zones of influence, on a receptor-specific basis, in the context of different potential effects (Appendix 2), and findings were reviewed throughout the Screening and AA processes.
The determination of zones of influence should take account of the vulnerability of different receptors.	NPWS	
Construction management plans are required at project level. However, some consideration of construction issues is appropriate at the Plan-level.	NPWS/OPW	Construction effects have been assessed in the Plan.
The Shannon Integrated Framework Project (SIFP) sets out considerations to be taken into account at project level.	NPWS	The potential effect of SIFP policy objectives are considered in the in-combination assessment. The SIFP mitigation proposed in the 'Detailed AA of Themes related to Strategic Development Locations and Areas of Opportunity' informed the development of plan-level mitigation.
A strong focus on plan level mitigation is recommended.	NPWS	A precautionary approach to mitigation
Scientific evidence is required to support assessments.	NPWS	Applied throughout the NIS, with reference to peer-reviewed and other published studies (refer to References in Section 13)
If there are data gaps, some research or site investigation may be necessary. Some surveys might be done at pre-consent stage of the project (post-CFRAM Study).	NPWS/PW	No specific action necessary.

6.1 Other Consultation

In October 2011, Bat Conservation Ireland (BCI) commented that their organisation was resource-limited and could not comment on all CFRAM studies, but that some BCI comments on the Eastern CFRAM could be applicable in the Shannon. Relevant BCI comments from the eastern CRAM include the potential value of the online National Bat Landscape Plan for Ireland. A number of other individuals and organisations both statutory and non-statutory were contacted, in relation to technical information to inform the AA. These are summarised in Table 14.

Table 14: Additional Consultees contacted for Technical input to NIS

Organisation and Date Consulted	Date	Technical Info Requested	Reason for Consultation	Response
Birdwatch Ireland (Irish Wetland Bird Survey Team)	Feb. 2016	Wetland bird foraging distances, including data from Dublin Port Birds Project	Scientific information on zones of influence	Provided preliminary unpublished resightings data for oystercatcher from January 2013-February 2016
British Trust for Ornithology (Wetland Bird Survey Team)	Feb. 2016	As above	Scientific information on zones of influence	None received at time of writing
Scott Cawley Ecological Consultants	Nov. 2015	Foraging distances for lesser horseshoe bat from Galway City Outer By-Pass environmental surveys	Scientific information on zones of influence	Provided link to publicly available lesser horseshoe radio-tracking survey report (Rush and Billington, 2014)
Scottish Natural Heritage (Ornithology Team)	Feb. 2016	As above	Scientific information on zones of influence	Mean foraging distances apply primarily to 'central place foragers' (i.e. with a defined breeding or roosting location); waders are more mobile, such that distances are more difficult to calculate

7 Step 1 – Information Required

7.1 Introduction

To complete the NIS, detailed information is required on both the draft FRMP for UoM 27_28 and the relevant European sites. The following Sections have had regard for the recommended information checklists in the EC guidance on AA (EC, 2001).

7.2 Information Required on the Plan

The relevant aspects of the Plan to the assessment of potential effects on European sites have been summarised in Section 4, with further detail on the characteristics of flood risk measures provided in Appendix 4.

The understanding of the proposed plan's physical interaction with European sites was further developed by producing landscape-scale maps showing the mapping of AFA boundaries in the context of European site boundaries, the River Shannon estuary and channels, the coastline, and other relevant information at this scale such as WFD Water Management Unit boundaries (Figure 2). All options at AFA scale (including all structural measures) were also mapped, to illustrate finer scale interaction of flood risk measures with the physical environment (Figure 3). The AFA-scale maps include the following relevant environmental data:

- Aerial photography;
- NPWS mapping of *known* QI extents (where available in Conservation Objective mapping and noting that absence of mapping may not equate to absence of QI);
- Other mapping of QIs (or potential QIs applying the precautionary principle), from the NPWS' Irish Semi-natural Grassland Surveys (O'Neill et al., 2010) (hereafter 'ISGS'), and the National Survey of Native Woodlands (Perrin et al., 2008) (hereafter 'NSNW'); and
- Watercourses.

Information on the characteristics of existing or proposed projects or plans with the potential to act in-combination with the proposed Plan is described in Section 10.

7.3 Information Required on European Sites

An overview of the distribution within the area of the draft FRMP for UoM 27_28 of designated priority habitats at danger of disappearance, and other noteworthy QIs of particular sensitivity to effects, for instance due to poor conservation status or vulnerability to pollution have been summarised in Section 5.4. Mapping of European sites, and where available QIs (where available) has been produced as described above.

A brief discursive summary of the importance of each European site for which LSEs could not be excluded has been provided in the pages that follow. This

was sourced from the NPWS' Natura Standard Data Forms, and/or site synopses to place QIs in the particular context of their designated site. The tables following this text then provide the following key information applicable to European sites (and the relevant QIs) 'screened-in' due to the potential for LSEs:

- Site-level conservation status for each relevant QI within its European site, in the form of the simple Natura Standard Data Form descriptor ("Excellent", "Good" or "Average/ Reduced") as supplemented by other sources as relevant;
- Overall national conservation status of each relevant QI from latest conservation assessments (NPWS, 2013a, b; European Topic Centre for Biodiversity, 2015);
- Existing pressures and future threats of medium or high importance for relevant QI habitats and non-bird species in the Irish context (NPWS, 2013a, b), and threats to birds relevant in the Irish context identified by Bird Life International and the BTO Bird Atlas 2007-2011 (Balmer et al., 2013);
- Key environmental conditions supporting relevant QIs derived from NPWS conservation status assessments and other sources, to comprehensively understand the potential interaction of the plan, and other plans or projects with the feature's conservation status; and
- Known distribution data for relevant QIs (if any).

Information has been provided on the one cSAC and two SPAs, on which LSEs could not be excluded following the revised Screening, to inform the assessment of adverse effects to site integrity in the NIS.

7.3.1 Overview of data limitations

The potential limitations associated with the NPWS Conservation Objective data are discussed in the consultation responses in Section 6.

The national Irish Semi-Natural Grasslands Survey (ISGS) took place between May 2007 and September 2012 and resulted in mapping of 1,192 grassland sites across the country. The survey only included 20% of sites within cSACs (O'Neill et al., 2013). The confirmed/potential QI grasslands recorded by the ISGS site are described within each European site in the report Sections that follow.

The National Survey of Native Woodlands (NSNW) was undertaken between 2003 and 2008 with a total of 1,320 sites surveyed across the country. It is not known what percentage of these sites fall within cSACs. As has been described in the baseline Section of this NIS, there are no known examples of QI woodland habitat within the area of the draft FRMP for UoM 27_28, as per the maps in Figure 3.

There is mapped survey data indicating wetland bird foraging and roosting data for most coastal SPAs in Ireland including the River Shannon and River Fergus SPA as per the NPWS' CO supporting documentation (NPWS, 2012a). One limitation of such data is that roosting or feeding habitat outside the SPA is not mapped, even though such areas may be used by significant QI bird populations. Roosting and foraging data is also typically from a small

number of visits and/or seasons, and may not reflect changing patterns of bird usage across the season, and between years.

Bird species distribution records are also available online for most bird species from the NBDC, in addition to the Bird Atlas (Balmer et al., 2013). Two notable limitations of the online bird records are:

- Records may be at a very coarse spatial scale (i.e. correct only within 10 km), and even if at a finer scale, will not indicate usage of particular fields or other areas; and
- Nest locations and/or roost locations are not available.

Although aquatic and terrestrial habitat has been mapped in detailed CO's for coastal sites, there are no records of otter breeding or resting sites provided. The few published accounts of otters holts in Ireland cover only Munster but do not cover the area of the draft FRMP for UoM 27_28 (i.e. O'Sullivan, 1993; Sleeman and Moore, 2005).

7.3.2 Lower River Shannon cSAC

Introduction

The following summary for the site has been compiled from the site synopsis (NPWS, 2013c) and N2K form (NPWS, 2014a):

“A very large, long site approximately 14 km wide and 120 km long, encompassing: the drained river valley which forms the River Shannon estuary; the broader River Fergus estuary, plus a number of smaller estuaries e.g. Poulmasherry Bay; the freshwater lower reaches of the Shannon River, between Killaloe and Limerick, plus the freshwater stretches of much of the Feale and Mulkear catchments; a marine area at the mouth of the Shannon estuary with high rocky cliffs to the north and south; ericaceous heath on Kerry Head and Loop Head; and several lagoons.

Woodland is infrequent within the site, however Cahiracon Wood contains a strip of old oak woodland. There is a small area of actively regenerating cut-away raised bog at Ballyrorheen. Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick.

*Both the Fergus and inner Shannon Estuaries feature vast expanses of intertidal mudflats, often fringed with saltmarsh vegetation. The smaller estuaries also feature mudflats, but have their own unique characteristics, e.g. Poulmasherry Bay is stony and unusually rich in species and biotopes. In the transition zone between mudflats and saltmarsh, specialised colonisers of mud predominate. For example, swards of Common Cord-grass (*Spartina anglica*) frequently occur in the upper parts of the estuaries. Less common are swards of Glasswort (*Salicornia europaea* agg.).Mediterranean salt meadows, characterised by clumps of Sea Rush (*Juncus maritimus*) occur occasionally. Two scarce species are found on saltmarshes in the vicinity of the Fergus estuary: a type of robust saltmarsh-grass (*Puccinellia foucaudii*), sometimes placed within the species Common Saltmarsh-grass (*P. maritima*) and Hard-grass (*Parapholis strigosa*).Saltmarsh vegetation also occurs around a number of lagoons within the site, two of which have been surveyed as part of a National Inventory of Lagoons. Cloonconeen Pool (4-5 ha) is a natural*

sedimentary lagoon impounded by a low cobble barrier. This lagoon represents a type which may be unique to Ireland since the substrate is composed almost entirely of peat. The site supports an excellent example of a large shallow inlet and bay. Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered.

The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore.

Shannon Airport Lagoon (2 ha) is an artificial saline lake with an artificial barrier and sluiced outlet. However, it supports two Red Data Book species of stonewort (*Chara canescens* and *Chara cf. connivens*).

Most of the site west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs.

Other coastal habitats that occur within the site include stony beaches and bedrock shores, shingle beaches, sandbanks which are slightly covered by sea water at all times (e.g. in the area from Kerry Head to Beal Head) and sand dunes (a small area occurs at Beal Point).

Freshwater rivers have been included in the site. Floating river vegetation [or 'water courses of plain to montane levels' habitat] characterised by species of water-crowfoot (*Ranunculus* spp.), pondweeds (*Potamogeton* spp.) and the moss *Fontinalis antipyretica* are present throughout the major river systems within the site. The rivers contain an interesting bryoflora with *Schistidium alpicola* var. *alpicola* recorded from in-stream boulders on the Bilboa, new to Co. Limerick.

The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries. The Fergus is important in its lower reaches for spring salmon. The Feale is important for both types. There are few other river systems in Ireland which contain all three species of lamprey.

The site contains many Annexed habitats, including the most extensive area of estuarine habitat in Ireland. A good range of Annexed species are also present, including the only known resident population of *Tursiops truncatus* in Ireland, all three Irish species of lamprey, and a good population of *Salmo salar*. A Several plant species listed in the Irish Red Data Book are present, perhaps most notably the only known Irish populations of *Scirpus triquetus* [This is included within the Q1 habitat 'water courses of plain to montane levels]."

Data Availability Specifics

There were no confirmed/potential Q1 grasslands recorded by the ISGS within the Lower River Shannon cSAC.

As already noted, the NSNW recorded no confirmed/potential Q1 woodlands within the Lower River Shannon cSAC.

The NPWS CO Supporting document for watercourses (NPWS, 2012b) states: “The area of the *Schoenoplectus triqueter* sub-type is likely to be smaller than the mapped range; however, as both the *Groenlandia densa* and the bryophyte-rich sub-types are presumed to be more widespread than mapped, it is not possible to comment on their areas at this time”. The NPWS also comment in the CO supporting document that: “other high-conservation-value QI sub-types [than those] mapped by NPWS [may be present]”.

There is no comprehensive mapping of lamprey or salmonid habitats within CO mapping or other databases. However, mapping generated by the EPA provides some salmonid habitat mapping as has been described in Section 5.4.1.

Condition of Relevant QIs

The condition of relevant QIs of Lower River Shannon cSAC, for which LSEs could not be excluded, are presented in Table 15, to inform the assessment of adverse effects to site integrity.

Table 15 Lower River Shannon cSAC. Conservation Status, Conditions supporting Integrity, and Key Threats to Relevant QIs

Relevant Qualifying Interests (*Priority)	National Conservation Status	Site-Level Status (NPWS, 2014a)	Key conditions supporting site integrity	Primary threats to key conditions	Mapping for QI in CO (NPWS, 2012d)	Other Mapping
Atlantic salt meadows	Unfavourable (Inadequate)	Good	Frequency of tidal submergence	Grazing, infilling & reclamation, invasive species, erosion & accretion	✓	-
Coastal lagoons*	Unfavourable (Bad)	“Good” according to Natura Standard Data form but “Unfavourable (Inadequate)” according to NPWS (2012e)	Salinity regime, hydrological regime and physiochemical parameters (e.g. chlorophyll)	Pollution to surface waters (limnic, terrestrial, marine & brackish), reclamation of land, erosion, removal of beach materials, sport and leisure, invasive non-native species, abiotic (natural processes) silting up and accumulation of organic material	✓	-
Estuaries	Unfavourable (Inadequate)	Good	Supply of riverine freshwater. Unimpeded tidal flow. Shelter from open coasts. Diversity of invertebrate communities	Aquaculture, recreational fishing, housing development, sewage outflow, industrialisation, autoroutes, port/marina, water pollution, reclamation of land, drainage, dredging, invasive species	✓	-
<i>Lutra lutra</i>	Favourable	Excellent	Prey availability. Water Quality. Riparian vegetation for breeding sites. Unhindered passage along waterways	Water pollution, mortalities/illegal killings, recreation/disturbances, hydroelectric schemes, aquaculture/fisheries, chemical spillages, American mink	✓ (Habitat only – no breeding or resting sites mapped)	-

Relevant Qualifying Interests (*Priority)	National Conservation Status	Site-Level Status (NPWS, 2014a)	Key conditions supporting site integrity	Primary threats to key conditions	Mapping for QI in CO (NPWS, 2012d)	Other Mapping
Mediterranean salt meadows	Unfavourable (Inadequate)	Good	Frequency of tidal submergence	Grazing, Infilling & Reclamation, Invasive Species, Erosion	✓	-
Mudflats	Unfavourable (Inadequate)	Good	Silt deposits in sheltered estuaries	Aquaculture, professional fishing, bait digging, removal of fauna, reclamation of land, coastal protection works, invasive species	✓	-
Sandbanks	Favourable	Good	Local wave action regime, sediment uptake of appropriate size, presence of relevant invertebrate communities	Wind energy production, underground/submerged electricity and phone lines, fishing and harvesting aquatic resources, estuarine and coastal dredging	✓	-
Water courses of plain to montane levels	Unfavourable (Inadequate)	Good	Natural/unmodified rivers which are, fast flowing and with low nutrient input	Pollution (run-off) particularly from agriculture., modification including arterial drainage and channelisation	✓	-

7.3.3 River Shannon and River Fergus SPA

Introduction

The N2K Form (NPWS, 2014b) states:

“The River Shannon and River Fergus Estuaries form the largest estuarine complex in Ireland. The site comprises all of the estuarine habitat west from Limerick City and south from Ennis, extending west as far as Killadysert and Foynes on the north and south shores of the Shannon respectively (a distance of some 25 km from east to west). Also included are several areas in the outer Shannon estuary, notably Clonderalaw Bay and Poulinaherry Bay. The site has vast expanses of intertidal flats. The main macro-invertebrate community is a Macoma-Scrobicularia-Nereis community which provides a rich food resource for the wintering birds. Eelgrass (Zostera spp.) is present in places. The intertidal flats are often fringed with salt marsh vegetation, areas which provide important high tide roost sites for the birds. In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Phragmites australis and Scirpus spp. Spartina anglica is frequent in parts.

This is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl. It has internationally important populations of Calidris alpina, Limosa limosa and Tringa totanus. A further 16 species have populations of national importance. The site is particularly significant for Calidris alpina (11% of national total), Pluvialis squatarola (7.5% of total), Vanellus vanellus (6.5% of total), Tringa totanus (6.1% of total) and Tadorna tadorna (6.0% of total). It has Cygnus cygnus, Pluvialis apricaria and Limosa lapponica in significant numbers. The site was formerly frequented by a population of Anser albifrons flavirostris but these have now abandoned the area. The site provides both feeding and roosting areas for the wintering birds and habitat quality for most of the estuarine habitats is good”.

Data Availability and Limitations

The Conservation supporting document (NPWS, 2012a) states: *“note that data are shown for birds occurring within intertidal and subtidal habitat only. Maps have not been produced for Whooper Swan due to insufficient data”.*

Bird species distribution records for whooper swan were sourced online from the NBDC, in addition to the Bird Atlas (Balmer et al., 2013).

European Site Condition

The condition of relevant QIs of the River Shannon and River Fergus SPA, for which LSEs could not be excluded, are presented in Table 16, to inform the assessment of adverse effects to site integrity

Table 16 River Shannon and River Fergus SPA. Conservation Status, Conditions supporting Integrity, Key Threats to Relevant QIs

Relevant Qualifying Interests ⁷	Population	Conservation Status (and long-term trend)	Site-Level Status (NPWS, 2014b)	Key conditions supporting site integrity	Mapping for QI in CO document (NPWS, 2012c)	Primary Threats to Key Conditions
<i>Anas acuta</i>	Non-breeding	Moderate (Trend unknown)	Excellent	Food availability (intertidal flora and fauna, pasture, cereal). Undisturbed freshwater/coastal roosting sites close to feeding sites	✓	Discharges, urbanisation, industry, fertilisation, habitat loss from reclamation, outdoor recreational activities (including dog-walking), aquaculture, avian influenza
<i>Anas clypeata</i>	Non-breeding	Moderate (Trend unknown)	Excellent	See <i>Anas acuta</i>	✓	See <i>A. acuta</i>
<i>Anas crecca</i>	Non-breeding	Good (Trend unknown)	Good	See <i>Anas acuta</i>	✓	See <i>A. acuta</i>
<i>Anas penelope</i>	Non-breeding	Moderate (Trend decreasing)	Excellent	See <i>Anas acuta</i>	✓	See <i>A. acuta</i>
<i>Aythya marila</i>	Non-breeding	Moderate (Trend unknown)	Excellent	Food availability (intertidal flora and fauna). Undisturbed coastal roosting sites close to feeding sites	None	See <i>A. acuta</i>
<i>Branta bernicla hrota</i>	Non-breeding	Good (Trend increasing)	Excellent	Plant food availability (intertidal/pasture/crops). Undisturbed coastal or freshwater roosting sites close to feeding sites. Grazing of pastures to appropriate sward length	✓	See <i>A. acuta</i> . Also hunting, persecution by farmers, and diseases to eelgrass
<i>Calidris alpina</i>	Non-breeding	Good (Trend decreasing)	Excellent	Invertebrate food availability (intertidal/ pasture). Flooding regime of coastal grasslands. Undisturbed coastal roosting sites close to feeding areas	✓	See <i>A. acuta</i>

⁷ Accurate at time of writing

Relevant Qualifying Interests	Population	Conservation Status (and long-term trend)	Site-Level Status (NPWS, 2014b)	Key conditions supporting site integrity	Mapping for QI in CO document (NPWS, 2012c)	Primary Threats to Key Conditions
<i>Calidris canutus</i>	Non-breeding	Moderate (Trend unknown)	Excellent	See <i>C. alpina</i>	✓	See <i>A. acuta</i>
<i>Charadrius hiaticula</i>	Non-breeding	Moderate (Trend unknown)	Good	See <i>C. alpina</i>	✓	See <i>A. acuta</i>
<i>Chroicocephalus ridibundus</i>	Non-breeding	Moderate (Trend unknown)	Unknown	Food availability (Various aquatic and pasture). Flooding regime of coastal grasslands. Undisturbed coastal roosting sites close to feeding areas	✓	See <i>A. acuta</i> . Also avian botulism
<i>Cygnus cygnus</i>	Non-breeding	Good (Trend increasing)	Average/reduced	See <i>B. bernicla</i>	✓	See <i>A. acuta</i>
<i>Limosa lapponica</i>	Non-breeding	Moderate (Trend declining)	Excellent	See <i>C. alpina</i> .	✓	See <i>A. acuta</i>
<i>Limosa limosa</i>	Non-breeding	Moderate (Trend increasing)	Excellent	See <i>C. alpina</i>	✓	See <i>A. acuta</i>
<i>Numenius arquata</i>	Non-breeding	Good (Trend declining)	Excellent	See <i>C. alpina</i>	✓	See <i>A. acuta</i>
<i>Phalacrocorax carbo</i>	Non-breeding	Moderate (Trend increasing)	Excellent	Food availability (fish, crustaceans, amphibians). Undisturbed coastal roosting sites close to feeding areas (potentially overlapping with colony woodlands)	✓	See <i>A. acuta</i>
<i>Pluvialis apricaria</i>	Non-breeding	Moderate (Trend unknown)	Good	See <i>C. alpina</i>	✓	See <i>A. acuta</i>
<i>Pluvialis squatarola</i>	Non-breeding	Moderate (Trend unknown)	Excellent	See <i>C. alpina</i>	✓	See <i>A. acuta</i>
<i>Tadorna tadorna</i>	Non-breeding	Moderate (Trend stable)	Excellent	See <i>C. alpina</i>	✓	See <i>A. acuta</i>
<i>Tringa nebularia</i>	Non-breeding	Moderate (Trend increasing)	Excellent	Food availability (intertidal fauna, pasture). Undisturbed coastal roosting sites close to feeding areas	✓	See <i>A. acuta</i>
<i>Tringa totanus</i>	Non-breeding	Good (Trend increasing)	Excellent	See <i>C. alpina</i>	✓	See <i>A. acuta</i>
<i>Vanellus vanellus</i>	Non-breeding	Moderate (Trend declining)	Excellent	See <i>C. alpina</i>	✓	See <i>A. acuta</i>
Wetlands	N/A	N/A	Not assessed	Hydrological regime maintaining freshwater and/or saltwater inputs	✓	Discharges, urbanisation, industry, fertilisation, habitat loss from reclamation

7.3.4 Illaunonearaun SPA

Introduction

The N2K Form (NPWS, 2013d) states:

“Illaunonearaun is a small island located approximately 300 m off the west Clare coast. It is a low-lying island surrounded by low cliffs and a rocky shore. Several islets occur off the north-west shore. The sea surrounding the island, to a distance of 200 m, where seabirds forage, bathe and socialise, is included in the site. The island is dominated by a maritime grassland sward.

*The site is of importance as a haunt for the wintering population of Barnacle goose *Branta leucopsis* which frequents the west Clare coastline (Mutton Island being the main site). Numbers vary, though at times exceed the threshold for national importance. This is near the southern limit of the range of *Branta leucopsis* in Ireland.*

Data Availability and Limitations

Distribution records for barnacle goose were obtained from the NPWS, NBDC, and Bird Atlas (Balmer et al., 2013).

European Site Condition.

The condition of the sole QI of Illaunonearaun SPA (i.e. barnacle goose *Branta leucopsis*), for which LSEs could not be excluded are presented in Table 17, in order to inform the assessment of adverse effects to site integrity.

Table 17 Illaunonearaun SPA. Conservation Status, Conditions supporting Integrity, and Key Threats to Relevant QIs

Relevant Qualifying Interests ⁸	Population	Conservation Status (and long-term trend)	Site-Level Status (NPWS, 2013d)	Key environmental conditions supporting site integrity	Mapping for QI in CO document (NPWS, 2015)	Primary Threats to Key Conditions integrity
<i>Branta leucopsis</i> (Non-breeding)		Good (Trend increasing)	Good	Food availability (saltmarsh, intertidal areas, pasture in coastal or inland areas), undisturbed coastal and offshore roosting sites close to feeding areas	No but some distribution data from the NPWS, NBDC, and Bird Atlas 2007-2011 (Balmer et al., 2013)	Pollution is a threat of low importance to the SPA. No other threats are noted by the NPWS (2013d). Disturbance of offshore roosting sites or onshore feeding sites are likely to be threats and/or future pressure

⁸ Accurate at time of writing

8 Step 2 – Conservation Objectives

8.1 Conservation Objective Versions

The version numbers of COs for each site are summarised in Table 18. Where only generic COs were available, attributes were selected from the nearest alternative European site containing the same QI, for which detailed COs were available.

Table 18: CO Version for Relevant European Sites on which LSEs not excluded

Name	Code	Generic (G)/Detailed (D)	Version
Lower River Shannon cSAC	002165	D	1
Illelaunonearaun SPA	004114	G	4.0
River Shannon and River Fergus SPA	004077	D	1

The following Sections present tables of all CO attributes for the relevant QIs within the above sites to inform the assessment of adverse effects to site integrity in the NIS. Shortened descriptions have been provided for CO attributes for ease of presentation.

8.2 Lower River Shannon cSAC

The CO attributes for all QIs for which LSEs could not be excluded are presented in Table 19 to inform the assessment of adverse effects to site integrity in the NIS.

Table 19: CO Attributes of Lower River Shannon cSAC QIs, for which LSEs not excluded

Relevant Qualifying Interests (*Priority)	Site-Level Status (NPWS, 2014a)	Conservation Objective (NPWS, 2012d)	CO Attributes
Atlantic salt meadows	Good	Restore	<ul style="list-style-type: none"> Habitat Area Habitat distribution Physical structure: sediment supply Physical structure: creeks and pans Physical structure: flooding regime Vegetation structure: zonation Vegetation structure: vegetation height Vegetation structure: vegetation cover Vegetation composition: typical species and sub-communities Vegetation structure: negative indicator species (<i>Spartina anglica</i>)

Relevant Qualifying Interests (*Priority)	Site-Level Status (NPWS, 2014a)	Conservation Objective (NPWS, 2012d)	CO Attributes
Coastal lagoons*	Good	Restore	<ul style="list-style-type: none"> Habitat Area Habitat distribution Salinity regime Hydrological regime Barrier: connectivity between lagoon and sea Water quality: chlorophyll a Water quality: Molybdate Reactive Phosphorus (MRP) Water quality: Dissolved Inorganic Nitrogen (DIN) Depth of macrophyte colonisation Typical plant species Typical animal species Negative indicator species
Estuaries	Good	Maintain	<ul style="list-style-type: none"> Habitat Area Community distribution
<i>Lutra lutra</i>	Excellent	Restore	<ul style="list-style-type: none"> Distribution Extent of terrestrial habitat Extent of marine habitat Extent of freshwater (river) habitat Extent of freshwater (lake/lagoon) habitat Couching sites and holts Fish biomass availability Barriers to connectivity
Water courses of plain to montane levels	Good	Maintain	<ul style="list-style-type: none"> Habitat Area Habitat distribution Hydrological regime: river flow Hydrological regime: tidal influence Hydrological regime: freshwater seepages Substratum composition: particle size range
Mediterranean Salt meadows	Good	Restore	<ul style="list-style-type: none"> Habitat Area Habitat distribution Physical structure: sediment supply Physical structure: creeks and pans Physical structure: flooding regime Vegetation structure: zonation Vegetation structure: vegetation height Vegetation structure: vegetation cover Vegetation composition: typical species and sub-communities Vegetation structure: negative indicator species (<i>Spartina anglica</i>)
Mudflats	Good	Maintain	<ul style="list-style-type: none"> Habitat Area Community Distribution
Sandbanks	Good	Maintain	<ul style="list-style-type: none"> Habitat Area Community Distribution

8.3 River Shannon and River Fergus SPA

The CO attributes for all QIs for which LSEs could not be excluded are presented in Table 19 to inform the assessment of adverse effects to site integrity in the NIS.

Table 20: CO Attributes of River Shannon and River Fergus SPA QIs for which LSEs not excluded

Relevant Qualifying Interests	Site-Level Status (NPWS, 2014b)	Conservation Objective	CO Attributes Affected (NPWS, 2012c)
<i>Anas acuta</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Anas clypeata</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Anas crecca</i> (non-breeding)	Good	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Anas penelope</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Aythya marila</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Branta bernicla hrota</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Calidris alpina</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Calidris canutus</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Charadrius hiaticula</i> (non-breeding)	Good	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Chroicocephalus ridibundus</i> (non-breeding)	Unknown	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Cygnus cygnus</i> (non-breeding)	Average/reduced	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Limosa lapponica</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Limosa limosa</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Numenius arquata</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Phalacrocorax carbo</i> (non-breeding)	Excellent (non-breeding)	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Pluvialis apricaria</i> (non-breeding)	Good	Maintain	<ul style="list-style-type: none"> Population trend Distribution

Relevant Qualifying Interests	Site-Level Status (NPWS, 2014b)	Conservation Objective	CO Attributes Affected (NPWS, 2012c)
<i>Pluvialis squatarola</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Tadorna tadorna</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Tringa nebularia</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Tringa nebularia</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
<i>Vanellus vanellus</i> (non-breeding)	Excellent	Maintain	<ul style="list-style-type: none"> Population trend Distribution
Wetlands	Not assessed	Maintain	<ul style="list-style-type: none"> Wetland habitat area

8.4 Illaunonearaun SPA

The CO attributes for all QIs for which LSEs could not be excluded are presented in Table 21 to inform the assessment of adverse effects to site integrity in the NIS.

Table 21: CO Attributes of Illaunonearaun SPA QI, for which LSEs not excluded

Relevant Qualifying Interests	Site-Level Status (NPWS, 2013)	Conservation Objective (NPWS, 2015)	CO Attributes Affected
<i>Branta leucopsis</i> (Non-breeding)	Good	Generic (Maintain or Restore)	Generic: Attributes substituted for Trawbreaga Bay SPA (4034) (NPWS, 2014c): <ul style="list-style-type: none"> • Population Distribution • Population Trend

9 Step 3 – Prediction of Effects

9.1 Summary of European sites for which LSEs not excluded

Table 22 summarises the relevant European sites and QIs therein, which could be subject to LSEs from options at each spatial scale of the Plan.

Table 22: Summary of European sites, and Relevant QIs, for which LSEs could not be excluded

Name	Code	Relevant Qualifying Interests ⁹ (*Priority)	LSEs from UoM/Sub-catchment Scale Option*	LSEs from AFA Scale Options**
Lower River Shannon cSAC	002165	Atlantic Salt Meadows	-	✓
		Coastal Lagoons*	-	✓
		Estuaries	-	✓
		Large shallow inlets and bays	-	✓
		<i>Lutra Lutra</i>	✓	✓
		Mediterranean Salt Meadows	-	✓
		Mudflats and Sandflats	-	✓
		Sandbanks	-	✓
		Water courses of plain to montane levels	-	✓
River Shannon and River Fergus Estuaries SPA	004077	<i>Anas acuta</i>	-	✓
		<i>Anas clypeata</i>	-	✓
		<i>Anas crecca</i>	-	✓
		<i>Anas penelope</i>	-	✓
		<i>Aythya marila</i>	-	✓
		<i>Branta bernicla hrota</i>	-	✓
		<i>Calidris alpina</i>	-	✓
		<i>Calidris canutus</i>	-	✓
		<i>Charadrius hiaticula</i>	-	✓
		<i>Chroicocephalus ridibundus</i>	-	✓
		<i>Cygnus cygnus</i>	-	✓
		<i>Limosa lapponica</i>	-	✓
		<i>Limosa limosa</i>	-	✓
		<i>Numenius arquata</i>	-	✓
		<i>Phalacrocorax carbo</i>	-	✓
		<i>Pluvialis apricaria</i>	-	✓
		<i>Pluvialis squatarola</i>	-	✓
		<i>Tadorna tadorna</i>	-	✓
		<i>Tringa nebularia</i>	-	✓
		<i>Vanellus vanellus</i>	-	✓
		Wetlands	-	✓
Illelaunonearaun SPA	004114	<i>Branta leucopsis</i>	-	✓
Table Legend * Includes the 'Shannon Town and Airport Sub-Catchment and Coastal Area' which includes structural measures unlike any other option at sub-catchment scale **Includes the 'Shannon Town and Airport Sub-Catchment and Coastal Area' which includes structural measures unlike any other option at sub-catchment scale				

⁹ Accurate at time of writing-

9.2 In-combination Assessment

The following prediction of effects has taken into account effects from existing and proposed plans and projects as per the in-combination assessment in Section 10.1.

9.3 Predicted Effects from UoM/Sub-Catchment Scale Options

Table 23 details predicted effects on the Lower River Shannon cSAC for options including the 'Additional Monitoring' measure. This cSAC was the only European site for which LSEs could not be excluded. The 'Additional Monitoring' measure, requiring the installation of gauges on riverbanks, was the only measure from options at these scales for which LSEs could not be excluded. All other measures with potential for LSEs would be implemented at AFA-scale, including all structural measures, and certain non-structural measures (e.g. Flood Forecasting/Warning/Response, and Property Resilience).

Table 23 excludes assessment of the 'Shannon Town and Airport Sub-catchment and Coastal Area' which has been assessed alongside options at AFA-scale, because it contains structural measures.

Table 23: Predicted Effects on Lower River Shannon cSAC from Additional Monitoring Options (UoM Scale)

Indicative Gauge Reference	Existing Regime: Only Assessed In-Combination;	QIs for Which LSEs not excluded (*Priority habitat)	Pathways Affecting QIs and relevant CO Attributes	Predicted Effects on Integrity (Construction)	Predicted Effects on Integrity (Operation)
<p>-GS05 (Downstream of Quin AFA for which no options were developed)</p> <p>-GS06- GS010 (All near Shannon Town and Airport)</p> <p><i>Note: LSEs excluded for gauges GS01-GS04 as per Section 3.5.1.</i></p>	<p>-Existing regime upstream at Quin AFA</p> <p>-Existing coastal defences at Shannon/Shannon Airport</p>	<ul style="list-style-type: none"> • <i>Lutra lutra</i> (hereafter Otter) 	<p>Otter Direct loss/disturbance to breeding/resting sites</p> <p><i>Otter CO attributes affected:</i></p> <ul style="list-style-type: none"> • Distribution • No. couching sites and holts 	<p>Otter <i>-Project-level assessments may not be conducted for 'Additional Monitoring'. The proposed installations could collapse nearby breeding/resting sites and interfere with the objective to restore Favourable Conservation Status (FCS) for otter</i></p> <p>Adverse effects on integrity of Lower River Shannon cSAC in combination with other projects/plans, including existing Arterial Drainage Programmes. Detailed plan-level mitigation required given there may be no project-level assessment</p>	<p><i>No in stream or bankside works required during operation</i></p> <p>No adverse effects on integrity of Lower River Shannon cSAC in combination with other projects/plans, including existing Arterial Drainage Programmes</p>

9.4 Predicted Effects from AFA-scale Options

Table 24, Table 25 and Table 26 detail the predicted effects to integrity by European site (i.e. one table per European site affected) for AFA-scale options.

9.4.1 Lower River Shannon cSAC

Table 24 details the predicted effects on the Lower River Shannon cSAC, by AFA. In summary, there were adverse effects on integrity predicted from options in four AFAs, during implementation of options during both construction and operation.

Table 24: Predicted Effects to Lower River Shannon cSAC from AFA-scale Options

Preferred Option	Existing Regime: Only Assessed In-Combination	QIs for Which LSE not Excluded (*Priority habitat)	Pathways Affecting QIs and relevant CO Attributes	Predicted Effects to Integrity (Construction)	Predicted Effects to Integrity (Operation)
Bunratty (BUY_01) <ul style="list-style-type: none"> Construct new flood defence walls on the right bank side of the Owenagarney River, upstream and downstream of Bunratty Bridge Individual Property Resilience and Public Awareness will apply to one commercial property Maintenance of proposed defences 	<ul style="list-style-type: none"> Existing flood defences 	<ul style="list-style-type: none"> Estuaries Mudflats and sandflats Large shallow inlets and bays Sandbanks Water courses of plain to montane levels Otter 	<p><u>Estuaries, Mudflats Sandbanks, Habitat Loss</u></p> <p><i>Habitat CO attributes affected:</i></p> <ul style="list-style-type: none"> Estuaries (Habitat area and distribution of <i>Nephtys</i> spp. community) Mudflats (Habitat area and condition of intertidal sand community) Large shallow inlets (Habitat area and distribution of <i>Nephtys</i> spp. community) Sandbanks (Habitat area and distribution, and condition of <i>Nephtys</i> spp. community) <p><u>Water courses of plain to montane levels</u> Habitat loss or Hydrological changes</p> <p><i>CO attributes affected:</i></p> <ul style="list-style-type: none"> Habitat Area/distribution Hydrological regime Substratum composition: particle size range <p><u>Otter</u> Loss/disturbance to breeding/resting sites and reduction in fish prey from pollution</p> <p><i>Otter CO attributes affected:</i></p> <ul style="list-style-type: none"> Distribution Couching sites and holts 	<p><u>Estuaries, Mudflats Sandbanks,</u></p> <p><i>-The current footprint of proposed flood defences could result in permanent habitat loss of these QIs and/or affect the <i>Nephtys</i> community (whose condition must be maintained regardless of habitat presence in accordance with the CO targets for all four habitats)</i></p> <p><i>- <u>Non-priority</u> QI habitat loss given QI proximity to proposed flood defences; and the rationale regarding the ECJ's 'Galway By-Pass Ruling' in Section 3.3.2.</i></p> <p><i>(Note: In contrast to QI estuaries and QI mudflats, sandbanks and 'large shallow inlets and bays' do not occur within the footprint. However the <i>Nephtys</i> spp. Community does occur within the footprint, and maintaining the condition of this community is a CO target for both habitats, even though they themselves do not occur)</i></p> <p><u>Water courses of plain to montane levels</u></p> <p><i>-The extent of this habitat is not fully known and there is uncertainty over which communities could qualify as QI habitat, given the NPWS' comment in the CO supporting document that : "other high-conservation-value QI sub-types [than those] mapped by NPWS [may be present]"</i></p> <p><i>-As-yet unidentified QI communities could be lost if specialist bryophyte surveys do not inform project-level surveys</i></p> <p><i>-Habitat loss or hydrological changes would interfere with the objective to restore FCS for this habitat</i></p> <p><u>Otter</u></p> <p><i>-Earthworks could collapse nearby breeding/resting sites and interfere with the objective to restore FCS for otter</i></p> <p>-Adverse effects on integrity of Lower River Shannon cSAC in combination with other projects/plans, including the existing Arterial Drainage Scheme</p> <p>-Precautionary plan-level mitigation will inform project-level otter surveys</p>	<p><u>Estuaries, Mudflats Sandbanks,</u></p> <p>-No adverse effects on integrity of Lower River Shannon cSAC either alone or in combination with other projects/plans</p> <p><u>Water courses of plain to montane</u></p> <p><i>-Once constructed, proposed flood defences could alter local hydrological conditions resulting in loss or change in this habitat. if it occurs within the zone of influence of hydraulic changes caused by proposed flood defences, and this cannot be determined without specialist bryophyte surveys combined with hydraulic modelling</i></p> <p><i>-Habitat loss or hydrological changes would interfere with the objective to restore FCS for this habitat</i></p> <p><u>Otter</u></p> <p><i>-, Physical works to repair proposed embankments could collapse nearby breeding/resting sites and interfere with conservation objectives as described under construction.</i></p> <p>-Adverse effects on integrity of Lower River Shannon cSAC and in combination with other projects/plans</p> <p>-Precautionary plan-level mitigation will inform project-level otter surveys and associated mitigation as part of operational maintenance programme</p>
Kilrush (KIL_01) <ul style="list-style-type: none"> Construct new flood defence embankments and wall Maintain proposed defences Maintenance of proposed defences 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Otter 	<p><u>Otter</u> Loss/disturbance to breeding/resting sites</p> <p><i>Otter CO attributes affected:</i></p> <ul style="list-style-type: none"> Distribution Couching sites and holts 	<p><u>Otter</u></p> <p><i>- Earthworks could collapse nearby breeding/resting sites and interfere with the objective to restore FCS for otter</i></p> <p>-Adverse effects on integrity of Lower River Shannon cSAC in combination with other projects/plans.</p> <p>-Precautionary plan-level mitigation will inform project-level otter surveys</p>	<p><u>Otter</u></p> <p><i>- Physical works to repair proposed embankments could collapse nearby breeding/resting sites and interfere with conservation objectives as described under construction.</i></p> <p>-Adverse effects on integrity of Lower River Shannon cSAC and in combination with other projects/plans.</p> <p>-Precautionary plan-level mitigation will inform project-level otter surveys and associated mitigation as part of operational maintenance programme</p>
Kilkee (KIE_02) <ul style="list-style-type: none"> Construct new flood defence wall along bank of the Kilkee Lower (River) watercourse. Construct new flood defence walls along the left and right bank of the Kilkee Upper (River) watercourse Any existing embankments along the left bank of the 	<ul style="list-style-type: none"> Flood defences 	<ul style="list-style-type: none"> Otter 	<p><u>Otter</u> Loss/disturbance to breeding/resting sites and reduction in fish prey from pollution</p> <p><i>Otter CO attributes affected:</i></p> <ul style="list-style-type: none"> Distribution Couching sites and holts 	<p><u>Otter</u></p> <p><i>- Earthworks could collapse nearby breeding/resting sites and interfere with the objective to restore FCS for otter</i></p> <p>-Adverse effects to integrity of Lower River Shannon cSAC in combination with other projects/plans.</p> <p>-Precautionary plan-level mitigation will inform project-level otter surveys</p>	<p><u>Otter</u></p> <p><i>-Even though there is a lower risk of otter establishing breeding or resting sites in walls, relative to embankments, there is precedence for major breeding holts in estuarine bridge structures in Ireland (see Sleeman & Moore, 2005) Physical works to repair proposed defences could collapse nearby breeding/resting sites and interfere with conservation objectives as described under construction.</i></p>

Preferred Option	Existing Regime: Only Assessed In-Combination	QIs for Which LSE not Excluded (*Priority habitat)	Pathways Affecting QIs and relevant CO Attributes	Predicted Effects to Integrity (Construction)	Predicted Effects to Integrity (Operation)
<p>Kilkee Upper (Stream) watercourse will need to be assessed and raised in some places by 0.3 m</p> <ul style="list-style-type: none"> Downstream of the existing embankment, the existing wall will need to be assessed and will need to provide a flood defence function up to a level a 5.8 m Construct new flood defence wall parallel to the Kilkee East watercourse Construct new flood defence walls and parapets along the left and right bank of the Kilkee East watercourse Maintain proposed measures 					<p>-Adverse effects on integrity of Lower River Shannon cSAC and in combination with other projects/plans.</p> <p>-Precautionary plan-level mitigation will inform project-level otter surveys and associated mitigation as part of operational maintenance programme</p>
<p>Shannon Town and Shannon Airport Sub-Catchment and Coastal Area (SUBSHN_01; assessed at AFA-scale for ease of analysis)</p> <p>Note on Design Standard: This option will exceed the typical design standard in providing for the 0.1% AEP coastal event (i.e. 1:1000 year flood event), rather than the 0.5% AEP coastal event (i.e. the 1:200 year flood event)</p> <ul style="list-style-type: none"> Construct new flood defence walls and embankments potentially including replacement of existing coastal defences Diversion of flow, from unnamed river to natural storage (two culverts required) Natural storage areas, balancing pond and flood plain Replace existing 90 m culvert Replace existing 35 m culvert Construct new coastal defences Maintain proposed measures 	<ul style="list-style-type: none"> Existing flood defences 	<ul style="list-style-type: none"> Atlantic saltmarsh Coastal lagoons* Estuaries Mediterranean saltmarsh Mudflats and sandflats Large shallow inlets and bays Sandbanks Otter 	<p><u>Atlantic Saltmarsh, Mediterranean Saltmarsh, Estuaries, Mudflats Sandbanks, Habitat Loss</u></p> <p><i>Saltmarsh habitat CO attributes affected:</i></p> <ul style="list-style-type: none"> Habitat Area Habitat distribution Physical structure: sediment supply,,: creeks and pans, flooding regime Vegetation structure: zonation, vegetation height, vegetation cover, negative indicator species (<i>Spartina anglica</i>) Vegetation composition: typical species and sub-communities <p><i>Mudflat, estuary and large shallow bay CO attributes affected:</i></p> <ul style="list-style-type: none"> Estuaries (Habitat area and distribution of <i>Nephtys</i> spp. community) Large shallow inlets (Habitat area and distribution of <i>Nephtys</i> spp. community) Mudflats (Habitat area and condition of intertidal sand community) Sandbanks (Habitat area and distribution, and condition of <i>Nephtys</i> spp. community) <p><u>Coastal Lagoon*</u></p> <p><i>Habitat deterioration due to altered hydrological and/or salinity regime</i></p> <p><i>CO attributes affected:</i></p> <ul style="list-style-type: none"> Salinity regime Hydrological regime Barrier: connectivity between lagoon and sea Typical plant and plant species <p><u>Otter</u></p> <p>Loss/disturbance to breeding/resting sites</p> <p><i>Otter CO attributes affected:</i></p> <ul style="list-style-type: none"> <i>Distribution</i> <i>Couching sites and holts</i> 	<p><u>Atlantic Saltmarsh, Mediterranean Saltmarsh, Estuaries, Mudflats Sandbanks,</u></p> <p><i>-The current footprint of proposed flood defences could result in permanent habitat loss of these QIs and/or affect the <i>Nephtys</i> community (whose condition must be maintained regardless of habitat presence)</i></p> <p><i>- As <u>non-priority</u> QI habitats, loss could arise given QI proximity to proposed flood defences; and the rationale regarding the ECJ's 'Galway By-Pass Ruling' in section 3.3.2.</i></p> <p><i>(Note: In contrast to QI estuaries and QI mudflats, sandbanks and 'large shallow inlets and bays' do not occur within the footprint. However the <i>Nephtys</i> spp. Community does occur within the footprint, and maintaining the condition of this community is a CO target for both habitats, even though they themselves do not occur)</i></p> <p><u>Coastal Lagoon*</u></p> <p>No adverse effects on integrity of Lower River Shannon cSAC either alone or in combination with other projects/plans</p> <p><u>Otter</u></p> <p><i>- Earthworks could collapse nearby breeding/resting sites and interfere with the objective to restore FCS for otter</i></p> <p>-Adverse effects to integrity of Lower River Shannon cSAC in combination with other projects/plans.</p> <p>-Precautionary plan-level mitigation will inform project-level otter surveys</p>	<p><u>Atlantic Saltmarsh, Mediterranean Saltmarsh, Estuaries, Mudflats, Sandbanks,</u></p> <p>No adverse effects on integrity of Lower River Shannon cSAC either alone or in combination with other projects/plans</p> <p><u>Coastal Lagoon*</u></p> <p><i>- Altered salinity/ connectivity between lagoon and sea. Proposed flood defences may permanently alter the temporal variation in salinity regime or water level fluctuations</i></p> <p><i>-Loss or changes to communities of lagoonal specialist invertebrates or plants with high dependency on these parameters could result, and interfere with the objective to restore FCS for coastal lagoons*</i></p> <p><u>Otter</u></p> <p><i>- Physical works to repair proposed embankments could collapse nearby breeding/resting sites and interfere with conservation objectives as described under construction.</i></p> <p>-Adverse effects on integrity of Lower River Shannon cSAC and in combination with other projects/plans.</p> <p>-Precautionary plan-level will inform project-level otter surveys and associated mitigation as part of operational maintenance programme</p>

Preferred Option	Existing Regime: Only Assessed In-Combination	QIs for Which LSE not Excluded (*Priority habitat)	Pathways Affecting QIs and relevant CO Attributes	Predicted Effects to Integrity (Construction)	Predicted Effects to Integrity (Operation)
<p>Shannon Town (SHN_02)</p> <p>Note, in contrast to SUBSHN_01, this option will meet the design standard for coastal events (i.e. 0.5% AEP; 1:200 year event), but will not exceed it.</p> <p>The other key differences with SUBSHN_091 are that SHN_02 excludes structural measures at Shannon Airport, and excludes replacement of the existing coastal defences</p> <ul style="list-style-type: none"> Construct new flood defence walls and embankments, excluding replacement of the existing coastal defences Natural online storage areas, balancing pond and natural flood plain areas to be located Replace existing 90m culvert Replace existing 1500m culvert Replace existing 35m culvert Maintain existing coastal defences. 	<ul style="list-style-type: none"> Existing flood defences 	<ul style="list-style-type: none"> Otter only (In contrast to SUBSHN_01, there are no structural measures proposed adjacent to intertidal habitats or the Shannon Airport lagoon) 	<p><u>Otter</u> Loss/disturbance to breeding/resting sites</p> <p><i>Otter CO attributes affected:</i></p> <ul style="list-style-type: none"> <i>Distribution</i> <i>No. couching sites and holts</i> 	<p><u>Otter</u> <i>- Earthworks could collapse nearby breeding/resting sites and interfere with the objective to restore FCS for otter</i></p> <p>-Adverse effects to integrity of Lower River Shannon cSAC in combination with other projects/plans. -Precautionary plan-level mitigation will inform project-level otter surveys</p>	<p><u>Otter</u> <i>- Physical works to repair proposed embankments could collapse nearby breeding/resting sites and interfere with conservation objectives as described under construction.</i></p> <p>-Adverse effects on integrity of Lower River Shannon cSAC and in combination with other projects/plans. -Precautionary plan-level will inform project-level otter surveys and associated mitigation as part of operational maintenance programme</p>

9.4.2 River Shannon and River Fergus Estuaries SPA

Table 25 details the predicted effects on the River Shannon and River Fergus Estuaries SPA. In summary, there were adverse effects on integrity predicted from options in four AFAs, during implementation of options during construction only.

Table 25: Predicted Effects to River Shannon and River Fergus Estuaries SPA from AFA-scale Options

Preferred Option	Existing Regime: Only Assessed In- Combination	QIs for Which LSE not Excluded	Pathways Affecting QIs and relevant CO Attributes	Predicted Effects to Integrity (Construction)	Predicted Effects to Integrity (Operation)
Bunratty (BUY_01) <ul style="list-style-type: none"> Construct new flood defence walls on the right bank side of the Owenagarney River, upstream and downstream of Bunratty Bridge Individual Property Resilience and Public Awareness will apply to one commercial property Maintenance of proposed defences 	<ul style="list-style-type: none"> Existing flood defences 	<p><u>Non-breeding waders, waterfowl)</u></p> <p>The following non-breeding populations feed and/or roost in upstream (narrow) estuarine reaches</p> <ul style="list-style-type: none"> <i>P.carbo</i> <i>Anas crecca</i> <i>Chroicocephalus ridibundus</i> <i>Limosa lapponica</i> <i>Limosa limosa</i> <i>Numenius arquata</i> <i>Tringa nebularia</i> <i>Tringa totanus</i> <p>Other QI populations were excluded, as they are found only in open estuarine, or true coastal habitats</p>	<p><u>Non-breeding waders, waterfowl)</u> Disturbance to roosting or feeding birds</p> <p>Non-breeding QI CO attributes affected:</p> <ul style="list-style-type: none"> Population trend Distribution 	<p><u>Non-breeding waders, waterfowl)</u></p> <p>-Roosting and/or feeding populations of certain non-breeding QI populations could be within the zone of influence of disturbance effects associated with option construction</p> <p>-Construction could reduce long-term population size or alter distribution and interfere with the objective to maintain FCS for all wintering QIs</p> <p>-</p> <p>-Adverse effects on integrity of SPA in combination with other projects/plans</p> <p>-Precautionary plan-level mitigation will inform project-level assessments and survey specification</p>	<p><u>Non-breeding waders, waterfowl)</u></p> <p>-Birds would be habituated to the type, duration, and location of disturbance, because it would – in contrast to construction disturbance – be similar in scale to the existing regime of disturbance associated with the existing urban centre of Bunratty.</p> <p>-No adverse effects on integrity of River Shannon and River Fergus SPA either alone or in combination with other projects/plans</p>
Kilrush (KIL_01) <ul style="list-style-type: none"> Construct new flood defence embankments and wall Maintain proposed defences Maintenance of proposed defences 	<ul style="list-style-type: none"> None 	<p>The following non-breeding goose and swan populations could feed and/or roost in in coastal pasture adjacent to the proposed option :</p> <ul style="list-style-type: none"> <i>Branta bernicla hrota</i> <i>Cygnus cygnus</i> 	<p><u>Non-breeding goose and swans</u> Disturbance to roosting or feeding birds</p> <p>Non-breeding QI CO attributes affected:</p> <ul style="list-style-type: none"> Population trend Distribution 	<p><u>Non-breeding waders, waterfowl)</u></p> <p>-Roosting and/or feeding populations of QI goose or swan populations could be within the zone of influence of disturbance effects associated with option construction</p> <p>-Construction could reduce long-term population size or alter distribution and interfere with the objective to maintain FCS for these populations</p> <p>-</p> <p>-Adverse effects to integrity of River Shannon and River Fergus SPA in combination with other projects/plans</p> <p>-Precautionary plan-level mitigation will identify survey specification to inform project-level assessments</p>	<p><u>Non-breeding waders, waterfowl)</u></p> <p>-Birds would be habituated to the type, duration, and location of disturbance, because it would – in contrast to construction disturbance – be similar in scale to the existing regime of disturbance associated with the existing urban centre of Kilrush.</p> <p>-No adverse effects on integrity of River Shannon and River Fergus SPA either alone or in combination with other projects/plans</p>
Kilkee (KIE_02) <ul style="list-style-type: none"> Construct new flood defence wall along bank of the Kilkee Lower (River) watercourse. Construct new flood defence walls along the left and right bank of the Kilkee Upper (River) watercourse Any existing embankments along the left bank of the Kilkee Upper (Stream) watercourse will need to be assessed and raised in some places by 0.3 m Downstream of the existing embankment, the existing wall will need to be assessed and will need to provide a flood defence function up to a level a 5.8 m Construct new flood defence wall parallel to the Kilkee East watercourse Construct new flood defence walls and parapets along the left and right bank of the Kilkee East watercourse Maintain proposed measures 	<ul style="list-style-type: none"> Existing flood defences 	<p>The following non-breeding goose and swan populations could feed and/or roost in in coastal pasture adjacent to the proposed option :</p> <ul style="list-style-type: none"> <i>Branta bernicla hrota</i> <i>Cygnus cygnus</i> 	<p><u>Non-breeding goose and swans</u> Disturbance to roosting or feeding birds</p> <p>Non-breeding QI CO attributes affected:</p> <ul style="list-style-type: none"> Population trend Distribution 	<p><u>Non-breeding waders, waterfowl)</u></p> <p>Prediction of effects identical to Kilrush above</p> <p>Adverse effects to integrity of River Shannon and River Fergus SPA in combination with other projects/plans</p> <p>-Precautionary plan-level mitigation will identify survey specification to inform project-level assessments</p>	<p><u>Non-breeding waders, waterfowl)</u></p> <p>-Birds would be habituated to the type, duration, and location of disturbance, because it would – in contrast to construction disturbance – be similar in scale to the existing regime of disturbance associated with the existing urban centre of Kilkee.</p> <p>-No adverse effects on integrity of River Shannon and River Fergus SPA either alone or in combination with other projects/plans</p>

Preferred Option	Existing Regime: Only Assessed In- Combination	QIs for Which LSE not Excluded	Pathways Affecting QIs and relevant CO Attributes	Predicted Effects to Integrity (Construction)	Predicted Effects to Integrity (Operation)
<p>Shannon and Shannon Airport (SUBSHN_01)</p> <p>This option will exceed the typical design standard in providing for the 0.1% AEP coastal event (i.e. 1:1000 year flood event</p> <ul style="list-style-type: none"> Construct new flood defence walls and embankments Diversion of flow, from unnamed river to natural storage (two culverts required) Natural storage areas, balancing pond and flood plain Replace existing 90 m culvert Replace existing 35 m culvert Construct new coastal defences Maintain proposed measures 	<ul style="list-style-type: none"> Existing flood defences 	<p>Non-breeding QIs:</p> <ul style="list-style-type: none"> <i>Anas acuta</i> <i>Anas clypeata</i> <i>Anas crecca</i> <i>Anas penelope</i> <i>Aythya marila</i> <i>Branta bernicla hrota</i> <i>Calidris alpina</i> <i>Calidris canutus</i> <i>Charadrius hiaticula</i> <i>Chroicocephalus ridibundus</i> <i>Cygnus cygnus</i> <i>Limosa lapponica</i> <i>Limosa limosa</i> <i>Numenius arquata</i> <i>Phalacrocorax carbo</i> <i>Pluvialis apricaria</i> <i>Pluvialis squatarola</i> <i>Tadorna tadorna</i> <i>Tringa nebularia</i> <i>Tringa totanus</i> <i>Vanellus vanellus</i> <p>Habitats</p> <ul style="list-style-type: none"> Wetlands 	<p>Non-breeding waders, waterfowl)</p> <p>Disturbance to roosting or feeding birds</p> <p>Non-breeding QI CO attributes affected:</p> <ul style="list-style-type: none"> Population trend Distribution <p>Wetlands</p> <p>Habitat loss</p> <p>Wetland QI CO attributes affected:</p> <ul style="list-style-type: none"> Habitat area 	<p>Non-breeding birds</p> <p>-Roosting and/or feeding populations of wintering QI species are within the zone of influence of disturbance effects associated with option construction</p> <p>-Populations of wintering QI species could depend on the coastal pasture proposed to be used as flood storage for feeding or roosting at high tide.</p> <p>-Flooding of these fields could reduce long-term population size or alter distribution and interfere with the objective to maintain FCS for all wintering QIs</p> <p>-Construction could reduce long-term population size or alter distribution and interfere with the objective to maintain FCS for all wintering QIs</p> <p>Wetlands</p> <p>-NPWS CO mapping indicates QI wetland habitat is immediately adjacent/within the footprint of the proposed flood defences</p> <p>- As <i>non-priority</i> QI habitat, loss could arise given QI proximity to proposed flood defences; and the rationale regarding the ECJ's 'Galway By-Pass Ruling' in Section 3.3.2</p> <p>-Any decrease in habitat area would interfere with the objective to maintain FCS for wetland habitat.</p> <p>Adverse effects on integrity of River Shannon and River Fergus Estuaries SPA in combination with other projects/plans</p> <p>-Precautionary plan-level mitigation will inform project-level assessments</p>	<p>Non-breeding waders, waterfowl</p> <p>-Birds would be habituated to the type, duration, and location of disturbance, because it would – in contrast to construction disturbance – be similar in scale to the existing regime of disturbance associated with the existing urban centre of Shannon Town and Shannon Airport.</p> <p>-No adverse effects on integrity of River Shannon and River Fergus SPA either alone or in combination with other projects/plans</p>
<p>Shannon Town (SHN_02)</p> <p>Note, in contrast to SUBSHN_01, this option will meet the design standard for coastal events (i.e. 0.5% AEP; 1:200 year event), but will not exceed it.</p> <p>The other key differences with SUBSHN_091 are that SHN_02 excludes structural measures at Shannon Airport, and excludes replacement of the existing coastal defences</p> <ul style="list-style-type: none"> Construct new flood defence walls and embankments, excluding replacement of the existing coastal defences Natural online storage areas, balancing pond and natural flood plain areas to be located Replace existing 90m culvert Replace existing 1500m culvert Replace existing 35m culvert <p>Maintain existing coastal defences.</p>	<ul style="list-style-type: none"> Existing flood defences 	<p>Non-breeding QIs:</p> <ul style="list-style-type: none"> <i>Anas acuta</i> <i>Anas clypeata</i> <i>Anas crecca</i> <i>Anas penelope</i> <i>Aythya marila</i> <i>Branta bernicla hrota</i> <i>Calidris alpina</i> <i>Calidris canutus</i> <i>Charadrius hiaticula</i> <i>Chroicocephalus ridibundus</i> <i>Cygnus cygnus</i> <i>Limosa lapponica</i> <i>Limosa limosa</i> <i>Numenius arquata</i> <i>Phalacrocorax carbo</i> <i>Pluvialis apricaria</i> <i>Pluvialis squatarola</i> <i>Tadorna tadorna</i> <i>Tringa nebularia</i> <i>Tringa totanus</i> <i>Vanellus vanellus</i> 	<p>Non-breeding waders, waterfowl)</p> <p>Disturbance to roosting or feeding birds</p> <p>Non-breeding QI CO attributes affected:</p> <ul style="list-style-type: none"> Population trend Distribution 	<p>Non-breeding waders, waterfowl)</p> <p><i>In contrast to the proposed coastal walls and embankments under SUBSHN_01, all proposed structures are within the urban fabric of Shannon Town.</i></p> <p>-There are no habitats with significant potential value to QI populations within the likely zone of influence of disturbance from construction works for structural measures.</p> <p>-No adverse effects on integrity of River Shannon and River Fergus SPA either alone or in combination with other projects/plans</p>	<p>Non-breeding birds</p> <p>-Populations of wintering QI species could depend on the coastal pasture proposed to be used as flood storage for feeding or roosting at high tide.</p> <p>-Flooding of these fields could reduce long-term population size or alter distribution and interfere with the objective to maintain FCS for all wintering QIs</p> <p>Adverse effects on integrity of River Shannon and River Fergus Estuaries SPA in combination with other projects/plans</p> <p>-Precautionary plan-level mitigation will inform project-level assessments</p>

9.4.3 Illaunonearaun SPA

Table 26 details the predicted effects on the Illaunonearaun SPA from AFA-scale Options. In summary, there were adverse effects on integrity predicted from options in two AFAs, only during construction of options.

Table 26: Predicted Effects to Illaunonearaun SPA from AFA-scale Options

Preferred Option	Existing Regime: Only Assessed In-Combination	QIs for Which LSE not Excluded	Pathways Affecting QIs and relevant CO Attributes	Predicted Effects to Integrity (Construction)	Predicted Effects to Integrity (Operation)
Kilrush (KIL_01) <ul style="list-style-type: none"> Construct new flood defence embankments and wall 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> <i>Branta leucopsis</i> 	Disturbance to roosting or feeding birds Non-breeding QI CO attributes affected: <ul style="list-style-type: none"> Population trend Distribution 	<u>Branta leucopsis:</u> - If geese are present within the zone of influence of construction – there could be a long-term reduction in population size or significant change in distribution -Construction could therefore interfere with the objective to maintain or restore FCS for the species -Adverse effects on integrity of Illaunonearaun SPA in combination with other projects/plans -Precautionary plan-level mitigation will inform project-level assessments	<u>Branta leucopsis:</u> -Birds would be habituated to the type, duration, and location of disturbance, because it would – in contrast to construction disturbance – be similar in scale to the existing regime of disturbance associated with the existing urban centre of Kilrush -No adverse effects on integrity of Illaunonearaun SPA either alone or in combination with other projects/plans
Kilkee (KIE_02) <ul style="list-style-type: none"> Construct new flood defence wall along bank of the Kilkee Lower (River) watercourse. Construct new flood defence walls along the left and right bank of the Kilkee Upper (River) watercourse. Any existing embankments along the left bank of the Kilkee Upper (Stream) watercourse will need to be assessed and raised in some places by 0.3 m. Downstream of the existing embankment, the existing 	<ul style="list-style-type: none"> Existing flood defences 	<ul style="list-style-type: none"> <i>Branta leucopsis</i> 	Disturbance to roosting or feeding birds Non-breeding QI CO attributes affected: <ul style="list-style-type: none"> Population trend Distribution 	<u>Branta leucopsis:</u> -Prediction of effects identical to Kilrush above	<u>Branta leucopsis:</u> -Birds would be habituated to the type, duration, and location of disturbance, because it would – in contrast to construction disturbance – be similar in scale to the existing regime of disturbance associated with the existing urban centre of Kilrush -No adverse effects on integrity of Illaunonearaun SPA either alone or in combination with other projects/plans

Preferred Option	Existing Regime: Only Assessed In-Combination	QIs for Which LSE not Excluded	Pathways Affecting QIs and relevant CO Attributes	Predicted Effects to Integrity (Construction)	Predicted Effects to Integrity (Operation)
<ul style="list-style-type: none"> • wall will need to be assessed and will need to provide a flood defence • function up to a level a 5.8 m • Construct new flood defence wall parallel to the Kilkee East watercourse. • Construct new flood defence walls and parapets along the left and right bank of the Kilkee East watercourse. 					

9.5 Summary of Predicted Effects by Spatial Scale Units

The relevant European sites and relevant QIs on which adverse effects on integrity were predicted are summarised in Table 27, for all options at all spatial scales.

Table 27: Relevant European sites and Relevant QIs therein for which Adverse Effects to Integrity Predicted (AFA-Scale Options)

European site	Relevant Qualifying Interests ¹⁰ (*Priority)	Bunratty AFA	Kilkee	Kilrush	Shannon and Shannon Airport Sub-Catchment and Coastal Area (Assessed at AFA-scale)	Shannon Town AFA
Lower River Shannon cSAC	Atlantic salt meadow	-	-	-	-	-
	Coastal lagoons*	-	-	-	✓	-
	Estuaries	✓	-	-	✓	-
	Large shallow inlets and bays	✓	-	-	✓	-
	<i>Lutra lutra</i>	✓	✓	✓	✓	✓
	Mediterranean salt meadows	-	-	-	-	-
	Molinia meadows	-	-	-	-	-
	Mudflats	✓	-	-	✓	-
	Sandbanks	✓	-	-	-	-
	Water courses of plain to montane level	✓	-	-	-	-
River Shannon and River Fergus Estuaries SPA	<i>Phalacrocorax carbo</i> (Non-breeding)	✓	-	-	✓	✓
	<i>Anas acuta</i>	-	-	-	✓	✓
	<i>Anas clypeata</i>	-	-	-	✓	✓
	<i>Anas crecca</i>	✓	-	-	✓	✓
	<i>Anas penelope</i>	-	-	-	✓	✓
	<i>Aythya marila</i>	-	-	-	✓	✓
	<i>Branta bernicla hrota</i>	-	✓	✓	✓	✓
	<i>Calidris alpina</i>	-	-	-	✓	✓
	<i>Calidris canutus</i>	-	-	-	✓	✓
	<i>Charadrius hiaticula</i>	-	-	-	✓	✓
	<i>Chroicocephalus ridibundus</i>	✓	-	-	✓	✓
	<i>Cygnus cygnus</i>	-	✓	✓	✓	✓
	<i>Limosa lapponica</i>	✓	-	-	✓	✓
	<i>Limosa limosa</i>	✓	-	-	✓	✓
	<i>Numenius arquata</i>	✓	-	-	✓	✓
	<i>Pluvialis apricaria</i>	-	-	-	✓	✓
	<i>Pluvialis squatarola</i>	-	-	-	✓	✓
	<i>Tadorna tadorna</i>	-	-	-	✓	✓
	<i>Tringa nebularia</i>	✓	-	-	✓	✓
	<i>Tringa totanus</i>	-	-	-	✓	✓
	<i>Vanellus vanellus</i>	-	-	-	✓	✓
	Wetlands	-	-	-	✓	-
Illelaunonearaun SPA	<i>Branta leucopsis</i>	-	✓	✓	-	-

¹⁰ Accurate at time of writing

10 In-combination Assessment

10.1 Approach

The in-combination assessment should include completed, approved but uncompleted, or proposed (but not yet approved) plans and projects (DoEHG, 2010) and consider both natural and anthropogenic factors (Levett-Therivel, 2009). The potential for “synergistic” effects should also be considered (i.e. when the combined effect of two projects is greater than the sum of the individual effects).

Potential for in-combination effects (especially synergistic ones) could be greatest, when considering ‘within-plan’ interactions of different options within the draft FRMP, and the draft FRMP in-combination with other flood risk management activities, such as the OPW’s Arterial Drainage Schemes. The potential for within-plan interactions, and any overlap of the draft FRMP with relevant schemes was assessed.

Information on land-use plans at County and Local scales was sourced from the Department of the Environment, Community and Local Government available online (www.myplan.ie).

Some sectoral plans were additionally of particular relevance to the draft FRMP due to their objectives for the development and increased exploitation of the Shannon Estuary, and relevant river catchments. The Shannon Strategic Integrated Framework Plan 2013-2020 is an inter-jurisdictional land and marine based framework plan to guide the future development and management of the Shannon Estuary, of particular relevance in the context of in-combination effects.

For all Arterial Drainage Schemes and land-use plans identified, the outcome of the AAs of these plans was assessed to interpret the potential for in-combination effects with the draft FRMP.

However the starting point was to place the assessment in the context of the relevant European sites for which LSEs could not be excluded from the draft FRMP, by examining known threats to these sites. To achieve this, the primary sources of negative (and positive) effects at European site level were obtained from the relevant Natura Standard Data Forms produced by the NPWS.

10.2 Known Threats to Relevant European Sites

In Natura Standard Data forms for European sites (all updated in 2014), the NPWS combine ‘threats’ (i.e. likely future effects) with ‘pressures’ (i.e. existing effects), and the former term is used for ease of reference here. The importance of each threat in influencing the European site is ranked as either ‘High’, ‘Medium’, or ‘Low’.

Only those threats of Medium or High importance were included in this in-combination assessment, with the exception of threats from flood risk management (i.e. ‘Flooding modifications’, ‘Modification of Hydrographic

functioning', and 'Dykes/embankments') which were identified even when considered a threat of Low importance by the NPWS. The results are summarised in Table 28. Positive impacts were also identified.

Table 28: Known pressures/threats from European sites for which LSEs could not be excluded for the draft FRMP for UoM 27_28

Relevant European site	Known Threats/Pressures from NPWS Natura Standard Data Forms											
	Agriculture	Forestry	Energy Production and mining	Transportation and service corridors	Urbanisation	Biological Resource other than agriculture and forestry (e.g. fishing, hunting)	Human disturbance	Pollution	Invasives	Human Changes to Natural Systems (e.g. Flood management, Dredging, reclamation)	Flood-Management-Specific Threats Identified	Positive Threats of Medium or High Importance
Lower River Shannon cSAC	-ve	-	-	-	-ve	-ve	-	-ve	-	-ve	Coastal protection works is identified as a threat of "Low" Importance	None
River Shannon and River Fergus SPA	-ve	-	-	-ve	-ve	-ve	-ve	-ve	-	-ve	None	None

The following observations/trends are apparent from Table 28:

- Human disturbance from existing projects/plans is an important threat to the River Shannon and River Fergus SPA (and is likely to be a pressure from proposed projects/plans), but not to Illaunonearaun SPA;
- Existing agriculture is an important threat to most SPAs and cSACs (and agriculture is likely to be an important pressure from proposed projects/plans);
- Although flood risk management including Arterial Drainage Schemes were considered to have potential for the greatest in-combination effects, existing flood management works are identified by the NPWS as a threat of low importance to the Lower River Shannon cSAC only;
- Despite the poor quality of many river systems identified in the baseline Section of this NIS, pollution from existing projects/plans is an important threat to the Lower River Shannon cSAC only; and
- Abstraction (included within 'Human-induced changes to natural systems'), which was identified as a potential threat during the consultation process, was not identified as a threat to any of the relevant sites.

10.3 Within Plan Interaction Effects

Different options have been identified as affecting the QI of the same site in a number of these instances. These are summarised in Table 29.

Table 29: Within-Plan In-combination effects

European site	Relevant Qualifying Interests ¹¹ (*Priority)	Potential Within-Plan In-combination effects	Potential Between-Plan In-combination effects
Lower River Shannon cSAC	Estuaries	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
	Large shallow inlets and bays	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
	<i>Lutra lutra</i>	UoM/Sub-catchment measures and all AFAs	UoM, 23, UoM 24, UoM 25_26
	Mudflats	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
River Shannon and River Fergus Estuaries SPA	<i>Phalacrocorax carbo</i> (Non-breeding)	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
	<i>Anas crecca</i>	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
	<i>Branta bernicla hrota</i>	Kilkee , Kilrush, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
	<i>Chroicocephalus ridibundus</i>	Bunratty and Shannon and Shannon Airport AFAs	UoM 24, UoM 25_26
	<i>Cygnus cygnus</i>	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
	<i>Limosa lapponica</i>	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26

¹¹ Accurate at time of writing

		Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	
	<i>Limosa limosa</i>	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
	<i>Numenius arquata</i>	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
	<i>Tringa nebularia</i>	Bunratty AFA, Shannon Town AFA, and Shannon and 'Shannon Airport Sub-Catchment and Coastal Area'	UoM 24, UoM 25_26
Ilklaunoneeraun SPA	<i>Branta leucopsis</i>	Kilkee AFA and Kilrush AFA	N/A

10.4 Other Land-use Plans

10.4.1 Area Plans

Table 30 presents all area plans which overlap the draft FRMP for UoM 27_28. The AA reporting on these plans identified LSEs on European sites from one of the two county development plans, but only one of the six Local Area/Town Plans. The relevant AA reporting concluded that none of the plans would have adverse effects upon the integrity of any European sites, following implementation of mitigation.

Table 30: Summary of Outcomes of AA process for area plans within the area of the draft FRMP for UoM 27_28

Scale	Plan or Programme	Screened for AA?	Was an AA Conducted?
Regional	River Basin Management Plan	✓	✓
County	Clare County Development Plan (2011- 2017)	✓	✓
County	Draft Clare County Development Plan (2017- 2023)	✓	✓
Local	West Clare Local Area Plan (2012-2018)	✓	✓
Local	North Clare Local Area Plan (2011 – 2017)	✓	✓
Local	South Clare Local Area Plan (2012-2018)	✓	✓
Local	Shannon Town & Environs LAP (2012-2018)	✓	✓
Local	Ennis & Environs Local Area Plan 2008-2014;	✓	✓
Local	Kilrush Town & Environs Development Plan (2014- 2020)	✓	✓
Local	Kilkee Town Improvement & Economic Development Strategy (2014-2024)	✓	Screened out

10.4.2 Conservation Plans

There is potential for Biodiversity/conservation plans, arising from policy commitments in area plans, to positively influence European sites through protection and enhancement measures for their QIs.

There was at least one nature conservation plan relevant in the context of UoM 27, namely the Draft Clare Biodiversity Action Plan 2014-2017.

The NPWS have not drafted Conservation Management Plans for any of the 'relevant European sites affected by the draft FRMP for UoM 27_28.

10.5 Projects

Given the large area covered by the draft FRMP for UoM 27_28, there are a large number of other existing and proposed projects with the potential for significant in-combination effects.

10.5.1 Interactions with Arterial Drainage Schemes

One Arterial Drainage Scheme was identified as having the potential for in-combination effects with the draft FRMP for UoM 27_28. Table 31 identifies the relevant options from the draft FRMP for UoM 27_28 which could act in-combination with the Lower River Shannon Scheme.

There was no potential for in-combination effects with the OPW's Creegh Arterial Drainage Scheme. The NIS for this scheme (OPW, 2012) did not identify LSEs with any sites affected by the draft FRMP for UoM 27_28.

Table 31: In-combination effects on European sites from draft FRMP for UoM 27 with OPW's Lower River Shannon Arterial Drainage Scheme

European site	Qualifying Interests ¹² (*Priority)	Relevant AFAs Directly Overlapping Scheme	Other Relevant AFAs which also affect the European site	Relevant UoM/Sub-catchment Scale Option which affect European site
Lower River Shannon cSAC	Atlantic salt meadows	Bunratty only	Kilkee, Kilrush, Bunratty, Shannon Town, and 'Shannon Airport Sub- Catchment and Coastal Area' (the latter was assessed at AFA-scale)	Additional Monitoring (Gauge installation)
	Coastal lagoons *			
	Estuaries			
	<i>Lutra lutra</i>			
	Mediterranean salt meadows			
	Mudflats and Sandflats			
	Sandbanks			
	Watercourses with floating river vegetation			
River Shannon and River Fergus SPA (All QIs non- breeding except <i>P. carbo</i> which is both breeding and non- breeding)	<i>Phalacrocorax carbo</i>	Bunratty only	Kilkee, Kilrush, Shannon Town, and 'Shannon Airport Sub-Catchment and Coastal Area' (the latter was assessed at AFA-scale)	None
	<i>Anas acuta</i>			
	<i>Anas clypeata</i>			
	<i>Anas crecca</i>			
	<i>Anas penelope</i>			
	<i>Aythya marila</i>			
	<i>Branta bernicla hrota</i>			
	<i>Calidris alpina</i>			
	<i>Calidris canutus</i>			
	<i>Charadrius hiaticula</i>			
	<i>Chroicocephalus ridibundus</i>			
	<i>Cygnus cygnus</i>			
	<i>Limosa lapponica</i>			
	<i>Limosa limosa</i>			
	<i>Numenius arquata</i>			
	<i>Phalacrocorax carbo</i>			
	<i>Pluvialis apricaria</i>			
	<i>Pluvialis squatarola</i>			
	<i>Tadorna tadorna</i>			
	<i>Tringa nebularia</i>			
	<i>Vanellus vanellus</i>			
	Wetlands			

¹² Accurate at time of writing

10.5.1 Other projects

In the specific context of UoM 27, the Strategic Integrated Framework Plan (SIFP) could, for instance have significant in-combination effects. The Framework area of the SIFP encompasses the marine area of the Shannon Estuary and its fringe lands, and whose objective is to develop an integrated approach to facilitating economic growth and promoting environmental management within and adjacent to the Shannon Estuary. Specifically of relevance to UoM 27 is the proposed further development of the 'Shannon Free Zone' industrial zone beside Shannon Airport. This and other projects would all be assessed within project-level assessments prior to implementation of any options

10.5.2 Concluding Remarks on In-Combination Effects

There is no uncertainty that project-level assessments would be carried out, given the existing statutory requirement to subject development works to AA, and given the precautionary Plan-level mitigation included in this NIS which imposes the requirement for project-level assessments on 'minor' works (e.g. gauge installation).

There is predicted to be no adverse effect to integrity from the draft FRMP for UoM 27_28, taking account of in-combination effects, given the dual approach of 'down the line' project level assessment and imposition of specific and exacting plan-level mitigation.

11 Step 4 – Mitigation Measures

11.1 Approach

As described in Section 4.5, mitigation by design has already been incorporated into the preferred option selection by virtue of the MCA scoring system, which discounted any options for which there was any risk that future mitigated projects could adversely affect the integrity of European sites.

The requirement to complete a project-level assessment is imposed for measures which would not otherwise be subject to further project-level assessments, and for which adverse effects to European site(s) were identified. Although Additional Monitoring measures requiring gauge installation at UoM/Sub-catchment scale would be highly localized, effects to European site integrity were predicted from installation of certain gauges. This was the only measure for which project-level assessments were required as mitigation.

The design team has confirmed that Property Resistance and Resilience measures would not be implemented in conjunction with structural measures (which would have ensured project level assessments in accordance with existing regimes). However, no further project level assessments are considered necessary for Property Resistance and Resilience measures, because no highly pollution-sensitive aquatic species were located downstream of potential construction works, and no other adverse effects to integrity were likely from these measures. As stated in the draft FRMP, options for Property Resistance and Resilience measures would in any case be considered under future government policies of the Inter-Departmental Flood Policy Coordination Group, because there was at the time of writing in 2016, no Scheme to provide financial assistance to home-owners wishing to install such measures where the risk might warrant financial assistance from the State.

Further project-level assessments would be legally imposed under existing regulatory regimes prior to detailed design and implementation of all other measures with potential to adversely affect the integrity of European sites. Such assessments will ensure mitigation is implemented to avoid adverse effects on integrity for many effects such as loss of priority habitats, spread of invasive species, and pollution effects (as per Section 3.3). Supplementary Plan-level mitigation would inform project-level assessments for other effects, and/or particularly sensitive QIs.

The proposed supplementary mitigation falls into four mitigation categories; namely

- A. Requirement for project-level assessments;
- B. Survey specifications informing project-level assessments;
- C. Detailed design specifications at project-level; and
- D. Ecological assessment specifications at project-level (e.g. flood modelling).

Predicted effects on a given European site were similar, where the options at different locations were similar. Therefore, to minimise repetition, mitigation measures were developed for specific relevant QIs, but applied to multiple AFAs. For ease of presentation, measures are described only once in detail, where first mentioned.

A mitigation summary table at the end of this Section illustrates which mitigation measures apply to different options, at each spatial scale.

11.2 Implementation

All mitigation measures proposed would be imposed by the OPW and/or Local Authority on all projects as a minimum, at project level.

11.3 Mitigation Category A: Requirement for Project-Level Assessments

Screening for AA, and if necessary AA, would be completed prior to the installation of gauges under 'Additional Monitoring'. The AA Screenings (and AAs if required), would in particular inform:

- Locations of gauges under Additional Monitoring;
- Design of gauges, and where possible exclusion of weirs from designs, as these would require significant instream working;
- Any pollution or other mitigation requirements associated with gauge installation.

The project-level assessments would follow the requirements for AA in the EC (Birds and Natural Habitats) Regulations 2011-2015 legislation.

Survey and assessment specifications for these project-level assessments would be imposed under related plan-level mitigation in Sections 11.4 (Survey Specifications), 11.5 (Detailed Design Specifications), and 11.6 (Assessment Specifications).

11.4 Mitigation Category B: Survey specifications

This mitigation will inform project-level assessments, namely for:

- Otter survey;
- Survey of 'Water courses of plain to montane levels' habitat; and
- Non-breeding bird survey.

11.4.1 Otter Survey specification

The survey guidance below would inform assessments of effects on QI otter of the Lower River Shannon cSAC from both construction *and* operation stages (i.e. maintenance works). Table 32 identifies the options to which this survey specification mitigation applies, and which options would be subject to project-level assessments as a result of NIS Mitigation Category A.

Table 32: Options for which Otter Survey Specification is a Mitigation Measure

Scale	UoM/Sub-catchment scale Gauge Reference (and Location)	AFA Name and Option	Relevant European site and QI	Existing Requirement for Project-Level Assessment	Project-Level Assessment Required under NIS Mitigation Category A
UoM/Sub-catchment	GS01 (in Kilrush AFA) GS02-04 (in Kilkee AFA) GS05 (south of Quin AFA) GS06-10 (within Shannon Town and Airport Sub-Catchment and Coastal Area)	N/A	Lower River Shannon cSAC: <i>Otter</i>	-	✓
AFA	N/A	-Bunratty (BUY_01) -Kilkee (KIE_02) -Kilrush (Kil_01) -Shannon Town AFA -Shannon and Shannon Airport Sub-Catchment and Coastal Area (SUBSHN_01; assessed at AFA scale)	Lower River Shannon cSAC: <i>Otter</i>	✓	-

Otter surveys would be in accordance with relevant guidance on identifying otter breeding/resting sites from:

- OPW (2007a) Ecological Impact Assessment (EclA) of the Effects of Statutory Arterial Drainage Maintenance Activities on the Otter (*Lutra lutra*);
- Highways Agency (2001) *Design Manual for Roads and Bridges. Nature Conservation Advice in relation to Otters*;
- National Roads Authority (NRA, 2009) *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*;
- National Roads Authority (NRA) (2006) *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes*; and
- O'Sullivan (1993) whose published study on 75 holts in part of the River Blackwater Catchment was the only such characterisation of otter holts in Ireland at the time of writing the NIS.

Table 33 lists the key requirements as set out in the above guidance:

Table 33: Key Otter Survey Specifications for Project-level Assessments

Aspect of Survey Specification	Specification
<i>Extent of survey</i>	150 m from works, since this is the minimum buffer distance for any works from breeding holts, if found. Surveys should focus on banks within 50 m of watercourses, as O'Sullivan (1993/ recorded 91% of holt entrances here.
<i>Survey effort</i>	Multiple visits over broadest seasonal window possible given programme, to account for infrequent and/or seasonal use of breeding/resting sites
<i>Survey seasonality</i>	September to May inclusive unless a qualified ecologist determines local vegetation poses no risk to overlooking hotels
<i>Rainfall/tidal considerations prior to survey</i>	O'Sullivan (1993) recorded 18% of holt entrances underwater, when using dogs to identify 75 holts on the Blackwater River. Survey of embankments in intertidal areas would be completed at low tide to search for underwater entrances. Where possible, surveys should not follow heavy rain when field signs indicating holt occupation may have be washed way and/or water levels obscure entrances.
<i>Survey access considerations</i>	Boats would be required if all potential habitat cannot be safely and comprehensively searched from the bankside.
<i>Survey timing prior to construction</i>	No more than 10-12 months. If more than this period, repeat pre-construction surveys required
<i>Confirming holt occupancy</i>	Otters may use holts in a transient fashion, so the frequency of occupancy can be difficult to identify. Remote cameras, used under licence from the NPWS, should be used to attempt to determine occupancy of potential holts. Presence of field signs from other mammals in riparian holes should not be assumed to indicate absence of otter, as otter can cohabit with rabbit <i>Oryctolagus cuniculus</i> (Chanin, 1993; O'Sullivan, 1993) and badger <i>Meles meles</i> (Sleeman and Smiddy, 1999). A 'confirmed' holt may be defined as a hole, inspected to confirm it was not shallow, from which an otter was observed to exit and/or where otter spraints (and/or footprints) were recorded close-by. This definition is similar to Ottino and Giller's (2004) definition applied in Munster

Detailed otter surveys have been proposed as a minimum requirement prior to implementing any projects under the Strategic Integrated Framework Plan for the Shannon Estuary (SIFP), and the NPWS may be conducting ongoing surveys of breeding/resting sites as part of Article 17 reporting requirements. Therefore, prior to commencing surveys at project-level, consultation should be undertaken with the proponents of relevant projects implemented under the Strategic Integrated Framework Plan for the Shannon Estuary (SIFP), and with relevant NPWS staff involved in cSAC monitoring to obtain any records for potential or confirmed otter breeding or resting sites.

11.4.2 Habitat survey specification for 'Water courses of plain to montane levels'

The survey specification below would inform assessments of effects on QI 'Water courses of plain to montane levels' habitat of the Lower River

Shannon cSAC. Table 34 identifies the single option to which this mitigation applies.

Table 34: Options for which Survey Specifications for ‘Water courses of plain to montane levels imposed as Mitigation

Scale	Gauge Reference	AFA Name and Option	European Site and QI	Existing Requirement for Project-level Assessment	Project-Level Assessment Required under NIS Mitigation Category A
UoM/Sub-catchment	None	N/A	N/A	N/A	N/A
AFA	N/A	-Bunratty (BUY_01)	Lower River Shannon cSAC: Water courses of plain to montane levels	✓	-

Habitat surveys would be informed by guidance on such habitats from:

- Interpretation Manual for EU Habitats (EC DG, 2007);
- Lower River Shannon cSAC Conservation objectives supporting document - water courses [Version 1] (NPWS, 2012); and
- *Ecological Impact Assessment (EclA) of the Effects of Statutory Arterial Drainage Maintenance Activities on Water Courses of Plain to Montane levels with Aquatic Vegetation (Floating River Vegetation)* (OPW, 2007b).

The OPW 's 2007 EclA states that: “*Flora include Ranunculus saniculifolius, Ranunculus trichophyllus, Ranunculus fluitans, Ranunculus penicillatus ssp. penicillatus, Ranunculus penicillatus ssp. Pseudofluitantis, Ranunculus aquatilis, Myriophyllum spp., Callitriche spp., Sium erectum (or Berula erecta), Zannichellia palustris, Potamogeton spp., and the moss Fontinalis antipyretica. Groenlandia densa (Opposite leaved pondweed) is also included in the list*”. The inclusion of the term “floating river vegetation” in the title of the OPW report reflects the types of vegetation considered to quality for this QI at the time, which fit with the community descriptions in the Interpretation Manual of European Habitats (EC DG, 2007).

However the OPW report predates the NPWS (2012) cSAC CO supporting documentation, which indicates there is uncertainty regarding the species indicative of this community: “*it is likely that other high conservation value sub-types exist within the site. Further investigation of all sub-types is required*” (p. 3).

Furthermore, the NPWS CO supporting document lists a large number of species not identified in the OPW report, or in the *Interpretation Manual of European Habitats* (EC DG, 2007). Most of these are bryophytes, at least two of which (i.e. *Cinclidotus riparia* and *Fissidens crassipes*) require microscopic identification to be distinguished from more common apparently non-QI species (e.g. *Cinclidotus fontinaloides* and *Fissidens rufulus*) (Atherton et al., 2010).

Specialist bryophyte surveys, which are not typical on project-level assessments, would be required for options with predicted effects on this habitat.

Consultation with the NPWS should be conducted to clarify the communities deemed to qualify as QI habitat.

11.4.3 Survey Specification for Non-Breeding Birds

The project-level assessment of effects from the options in the Kilkee AFA, Kilrush AFA, Shannon Town AFA, and Shannon Town and Airport Subcatchment and Coastal Area, to light-bellied brent goose and whooper swan of the River Shannon and River Fergus SPA, and from the Kilkee and Kilrush AFAs to barnacle geese of the Illaunonearaun SPA would be informed by a minimum of six monthly surveys (September to March) of potential feeding pasture within up to 500 m of the proposed options. The actual survey extent required may be reduced subject to the professional judgement of a qualified ornithologist with experience of monitoring non-breeding wetland birds. Some surveys would coincide with high tide, when shoreline feeding resources (e.g. eelgrass *Zostera* spp. Vegetation for light-bellied brent geese) are covered by tidal waters and birds may be more likely to forage inland.

Year-long monthly wetland bird surveys have been proposed as a minimum requirement prior to implementing any projects under SIFP. It is possible that these surveys, and associated analysis, may provide relevant data in the context of the assessments for these AFAs. Therefore, prior to commencing surveys at project-level, consultation would be undertaken with the proponents of relevant projects implemented under the Strategic Integrated Framework Plan for the Shannon Estuary (SIFP), to obtain mapped information on roost locations, to supplement Irish Wetland Bird Survey Data (which does not map roost sites) and the roost information in NPWS CO supporting documentation (typically recorded from a single visit during a single season).

11.5 Mitigation Category C: Detailed Design Specifications

The aim of the detailed option design process, in tandem with project-level assessments, would be to result in no loss of QI habitat, including non-priority QI habitats.

While it is anticipated that this would be the case for the majority of options, if a project-level assessment at detailed design fails to avoid adverse effects on the integrity of a European site following imposition of mitigation in AA, an Assessment of Alternatives would be undertaken to identify alternative options that would not lead to adverse effects on the integrity of any European site. This would be undertaken prior to any further decisions on how to address the flood risk in the relevant area or prior to progressing to further stages of AA.

11.6 Mitigation Category D: Project-level assessment specifications

11.6.1 Coastal Lagoons

The potential effect of the measures in the 'Shannon Town and Shannon Airport Sub-Catchment and Coastal Area' will be subject to project-level assessment under the existing regulatory regime. The hydrological conditions and salinity regimes supporting the invertebrate and plant communities of coastal lagoons are complex, and – in the case of the

Shannon Airport Lagoon – determined by a combination of temporally variable climatic and anthropogenic factors. Anthropogenic influence is particularly significant at the Shannon Airport, lagoon. The lagoon was artificially created to receive airport runway run-off. Both water levels, and salinity regime, are directly influenced by airport operations, in particular in relation to use of de-icing salts, maintenance of the sluice gate in the existing sea wall which has been historically prone to silting up, and the related over-pumping of water to the estuary to regulate water levels. The new flood defences proposed will increase the existing coastal flood protection to a 0.1% AEP or 1:1,000 year event. The following specifications will be imposed on future project level assessments:

- The Shannon Airport Authority (SAA; formerly the Dublin Airport Authority) have completed extensive survey and assessment work on the ecology of the lagoon, and its changing condition over time in relation to both anthropogenic and climatic factors; and should be consulted for existing data and reports, as well as to inform the potentially significant in-combination effects from the existing and future operation of the airport;
- Relevant experts on the ecology of the Shannon Airport Lagoon should be consulted on the potential resilience of the invertebrate and plant communities to changes in salinity and/or water level; given their prominence in literature on the lagoon. Dr. Geoff Oliver and Dr. Cillian Roden should be considered in this role (see literature in NPWS, 2013e);
- The above sources should be consulted when interpreting the effect of increasing defence to coastal flooding on lagoon conservation status, which should include modelling of coastal flooding with the option in place, and appropriate allowances for sea-level rise under likely climate change scenarios; and
- The Precautionary Principle should prevail, unless no reasonable scientific doubt remains about the absence of potential effects to site integrity, due to the Unfavourable (Bad) status of the Shannon Airport Lagoon (NPWS, 2013e), and the equivalent unfavourable status of the habitat nationally (NPWS, 2013a).

11.7 Options to which Mitigation Measures Apply

The options to which mitigation applies, to avoid adverse effects to integrity of cSACs and SPAs are respectively summarised in Table 35 and Table 36.

Table 35: Options to which Plan-Level Mitigation Measures apply to avoid adverse effects to cSACs

Name	Relevant Qualifying Interests ¹³ (*Priority)	Measures at UoM/Sub-Catchment Scale*	Mitigation Measures at AFA-Scale				
			Bunratty AFA	Kilkee AFA	Kilrush AFA	Shannon Town and Shannon Airport sub-Catchment and Coastal Area (Assessed at AFA-scale)	Shannon Town AFA
Lower River Shannon cSAC	<i>Atlantic Salt Meadows</i>	N/A	N/A	N/A	N/A	Cat. C Design	N/A
	<i>Coastal Lagoons*</i>	N/A	N/A	N/A	N/A	Cat. D Assessment	N/A
	<i>Estuaries</i>	N/A	Cat. C Design	N/A	N/A	Cat. C Design	N/A
	<i>Lutra lutra</i>	Cat. A Project-level Assessment Cat. B Survey Spec. (Otter)	Cat. B Survey Spec. (Otter)	Cat. B Survey Spec. (Otter)	Cat. B Survey Spec. (Otter)	Cat. B Survey Spec. (Otter)	Cat. B Survey Spec. (Otter)
	<i>Large shallow inlets and bays</i>	N/A	Cat. C Design	N/A	N/A	Cat. C Design	N/A
	<i>Mediterranean Salt Meadows</i>	N/A	N/A	N/A	N/A	Cat. C Design	N/A
	<i>Mudflats and Sandflats</i>	N/A	Cat. C Design	N/A	N/A	Cat. C Design	N/A
	<i>Sandbanks</i>	N/A	Cat. C Design	N/A	N/A	Cat. C Design	N/A
	Water courses of plain to montane levels	N/A	Cat. C Design Cat. B Survey Spec. (Watercourses)	N/A	N/A	N/A	N/A
Table Footnotes: -Refer to Sections 11 for details regarding mitigation measures abbreviated in this table. -N/A indicates no effects on integrity were predicted. -* indicates that effects from the 'Shannon Town and Shannon Airport Sub-Catchment and Coastal Area' were excluded but considered under AFA-scale.							

¹³ Accurate at time of writing

Table 36: Options to which Plan-Level Mitigation Measures apply to avoid adverse effects to SPAs

Name	Relevant Qualifying Interests ¹⁴ All are non-breeding	Measures at UoM/Sub-Catchment Scale*	Mitigation Measures at AFA-Scale*				
			Bunratty	Kilkee	Kilrush	Shannon and Shannon Airport Sub-Catchment and Coastal Area (*Assessed at AFA-scale)	Shannon Town AFA
River Shannon and River Fergus SPA (All non-breeding QIs)	<i>Anas acuta</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Anas clypeata</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Anas crecca</i>	N/A	Cat. B Survey Spec. (Birds)	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Anas penelope</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Aythya marila</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Branta bernicla hrota</i>	N/A	N/A	Cat. B Survey Spec. (Birds)	Cat. B Survey Spec. (Birds)	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Calidris alpina</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Calidris canutus</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Charadrius hiaticula</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Chroicocephalus ridibundus</i>	N/A	Cat. B Survey Spec. (Birds)	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Cygnus cygnus</i>	N/A	N/A	Cat. B Survey Spec. (Birds)	Cat. B Survey Spec. (Birds)	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Limosa lapponica</i>	N/A	Cat. B Survey Spec. (Birds)	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Limosa limosa</i>	N/A	Cat. B Survey Spec. (Birds)	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Numenius arquata</i>	N/A	Cat. B Survey Spec. (Birds)	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Phalacrocorax carbo</i>	N/A	Cat. B Survey Spec. (Birds)	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Pluvialis apricaria</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Pluvialis squatarola</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	

¹⁴ Accurate at time of writing

Name	Relevant Qualifying Interests ^{f4} All are non-breeding	Measures at UoM/Sub-Catchment Scale*	Mitigation Measures at AFA-Scale*				
			Bunratty	Kilkee	Kilrush	Shannon and Shannon Airport Sub-Catchment and Coastal Area (*Assessed at AFA-scale)	Shannon Town AFA
	<i>Tadorna tadorna</i>	N/A	N/A	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Tringa nebularia</i>	N/A	Cat. B Survey Spec. (Birds)	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Tringa totanus</i>	N/A	Cat. B Survey Spec. (Birds)	N/A	N/A	Cat. B Survey Spec. (Non- Breeding Birds)	
	<i>Wetlands</i>		N/A	N/A	N/A	Cat. C: Detailed Design Statement	N/A
Illeaunonearaun SPA	<i>Branta bernicla</i>	N/A	N/A	Cat. B Survey Spec. (Birds)	Cat. B Survey Spec. (Birds)	N/A	N/A

Table Footnotes:

-Refer to Sections 11 for details regarding mitigation measures abbreviated in this table.

-N/A indicates no effects on integrity were predicted.

-* indicates that effects from the 'Shannon Town and Shannon Airport Sub-Catchment and Coastal Area' were excluded

11.8 Potential Effects Remaining after Mitigation

By completing 'down the line assessments' at project-stage, as informed by the survey and assessment specifications proposed as Plan-level mitigation, the draft FRMP for UoM 27_28 would have no adverse effects on integrity of any European sites, either alone or in-combination with other plans or projects. This judgement has had regard for the 'integrity of site checklist' in EC guidance on AA (EC, 2001) in Table 37.

Table 37: Integrity of Site Checklist for all European sites (after EC, 2000)

Does the Plan, in-combination with other plans or projects, have the potential to...?	Conclusion (With Mitigation in place)
Cause delays in progress towards achieving the conservation objectives of the sites?	No
Interrupt progress towards achieving the conservation objectives of the sites?	No
Disrupt those factors that help to maintain the favourable conditions of the sites?	No
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the sites?	No
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	No
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No
Reduce the area of key habitats?	No
Reduce the population of key species?	No

12 Conclusion

With the dual approach of 'down the line' project level assessment and imposition of specific and exacting plan-level mitigation, the draft FRMP for UoM 27_28 would have no adverse effects on the integrity of any European sites, either alone or in-combination with other plans or projects.

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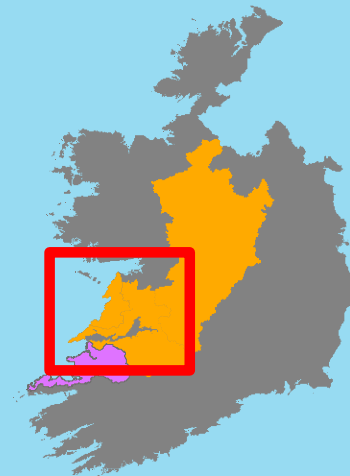
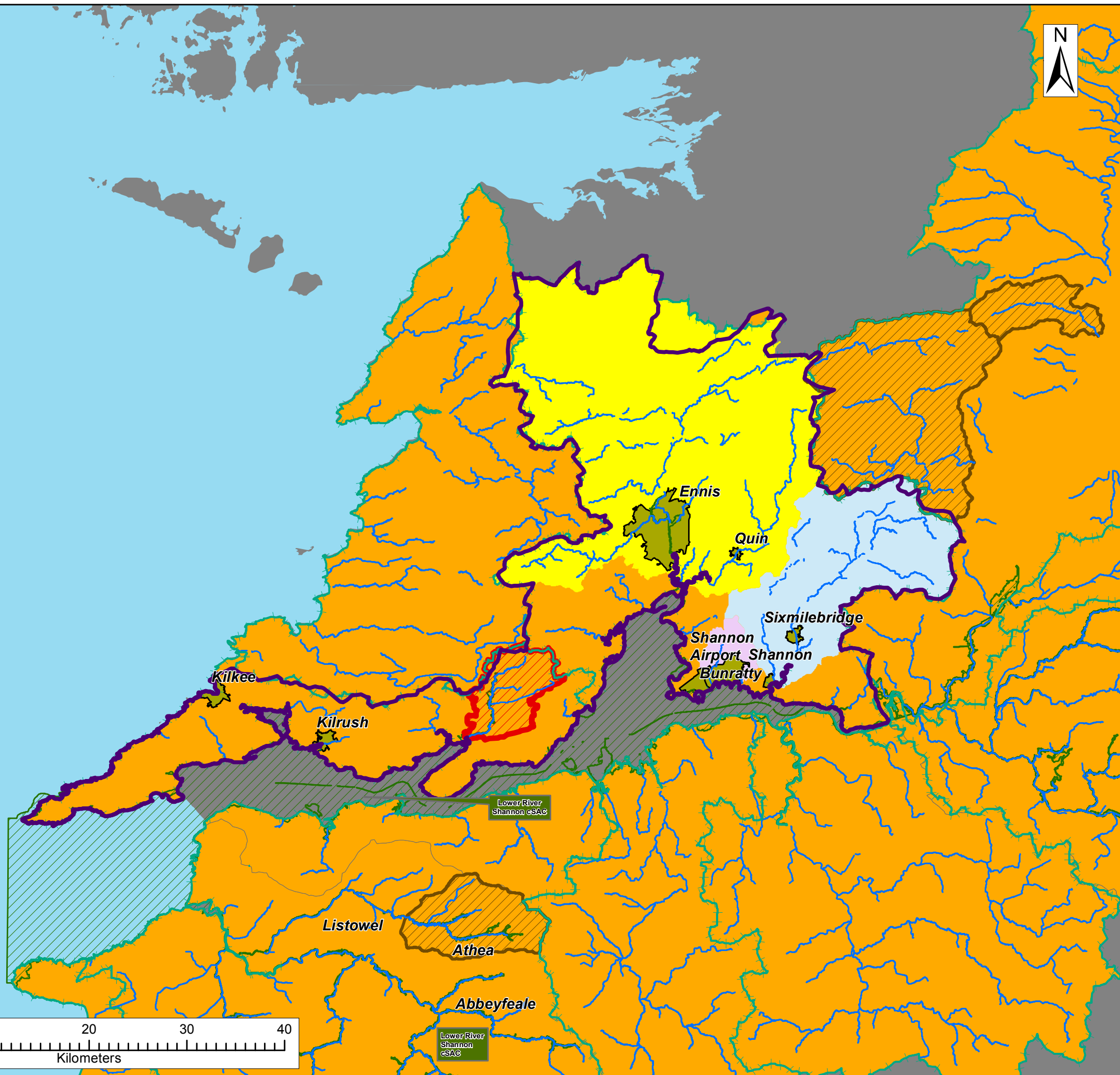
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Figures

Figure 1 Overview Map of European Sites

Figure 2 Freshwater Pearl Mussel and Relevant Catchment Boundaries



Legend

- FWPM - Catchments of cSAC populations
- FWPM - Potential Catchments of CSACs (Pre-1970 records only - presumed present)
- candidate Special Area Of Conservation (cSAC) with FWPM QI
- Water Management Units Boundary
- WFD Rivers

Spatial Scales on CFRAMS Project

- Unit of Management 27
- Area for Further Assessment

Sub Catchments

- Fergus_Merge Sub Catchments
- Owenogarney
- ShannonAFA

Rev.	Date	Purpose of revision	PW	RF	RF	RF
1	07/06/2016	Report Map				

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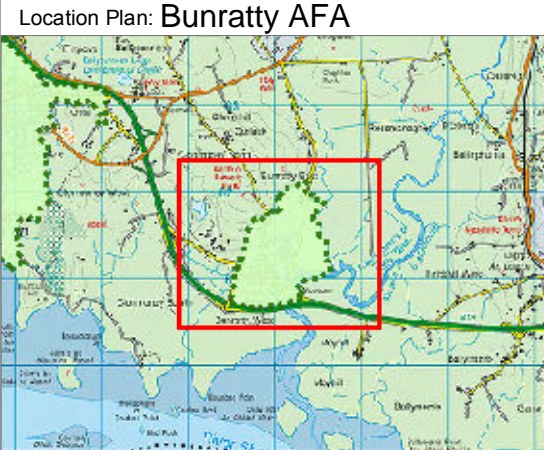
Project
SHANNON CFRAMS NIS -
UNIT OF MANAGEMENT (UOM) 23

Drawing Title
Figure 2 Freshwater Pearl Mussel
and Relevant Catchment Boundaries

Drawing Status		Issue	
Scale @A3	1:400,000	DO NOT SCALE	
Jacobs No.	32103500		
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Figure 3 Preferred Options and Relevant Features at AFA-Scale



- ### Legend
- AFA Boundary
 - Preferred Option: Individual Property Resilience
 - Preferred Option: Wall
 - Preferred Option: Existing Defences
 - Watercourses
 - Special Protection Areas (SPA)
 - candidate Special Area of Conservation (cSAC)
 - Known mudflats/sandflats (CO 1140)
 - Known cSAC marine communities (CO of various coastal features)
 - Known saltmarsh habitats (various; CO1310/1330/1410)
 - Known SPA 'Wetland' habitat (CO A999)
 - Known other habitats (terrestrial, freshwater, aquatic; CO 1355)
 - Known estuaries (CO 1130)
 - 1% AEP Fluvial Flood Extent
 - 0.5% AEP Coastal Flood Extent

IMPORTANT USER NOTE:
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Project: SHANNON CFRAM STUDY		
Map: BUNRATTY PREFERRED OPTION		
Drawn by:	AC	Date: June 2016
Checked by:	PW	Date: June 2016
Reviewed by:	RF	Date: June 2016
Map Scale: 1: 7,000		Plot Scale: 1:1 @ A3



Legend

- AFA Boundary
- Preferred Option: Replace Culvert
- Preferred Option: Increased Conveyance
- Preferred Option: Embankment
- Preferred Option: Wall
- Preferred Option: Existing Defences
- candidate Special Area of Conservation (cSAC)
- Known reefs (CO 1170)
- Known cSAC marine communities (CO of various coastal features)
- Known large shallow inlets/bays (CO 1160)
- 1% AEP Fluvial Flood Extent
- 0.5% AEP Coastal Flood Extent

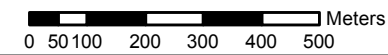
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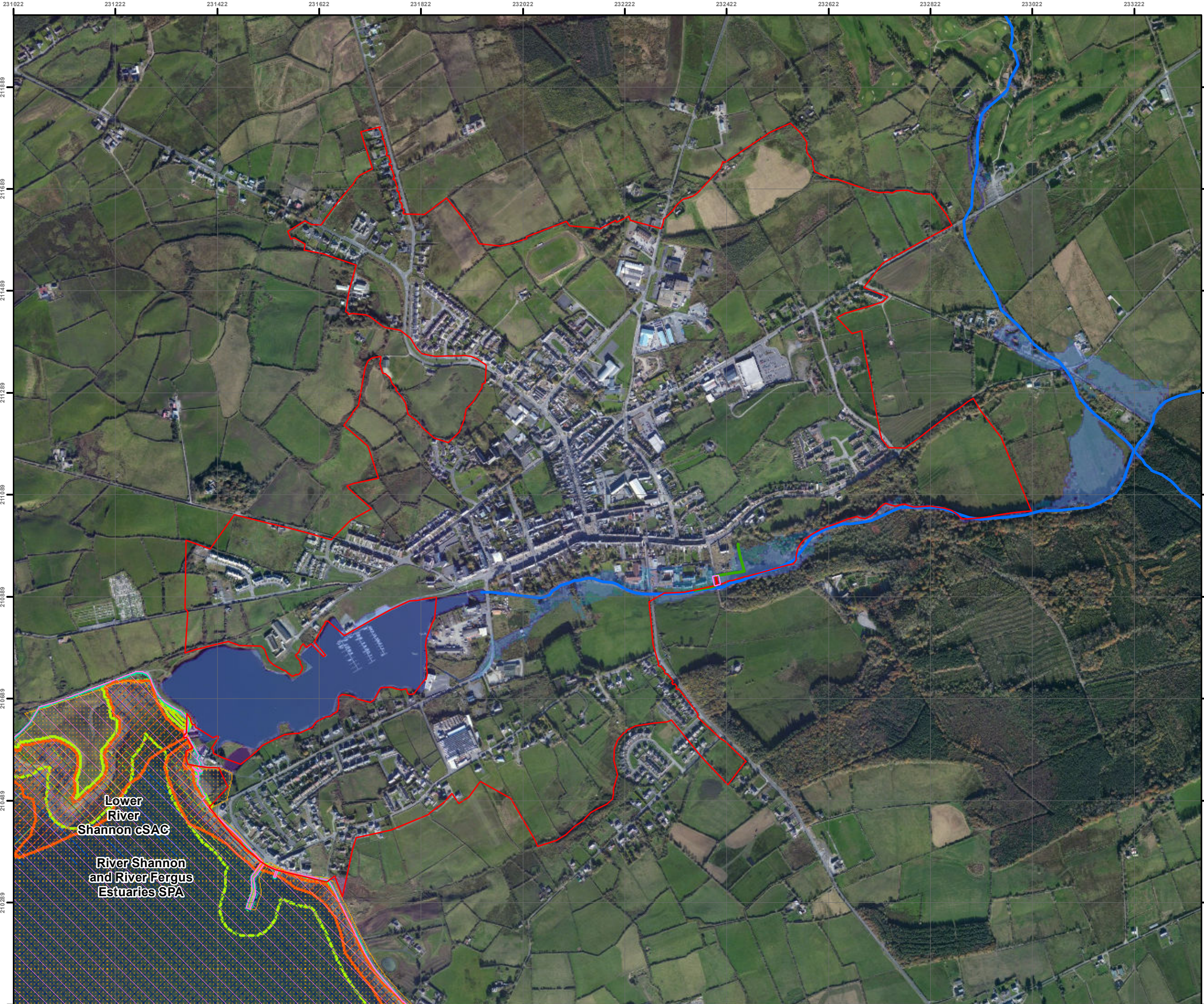


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Project: SHANNON CFRAM STUDY		
Map: KILKEE PREFERRED OPTION		
Drawn by:	AC	Date: June 2016
Checked by:	PW	Date: June 2016
Reviewed by:	RF	Date: June 2016
Map Scale: 1: 13,000		Plot Scale: 1:1 @ A3





Legend

- AFA Boundary
- Preferred Option: Wall
- Preferred Option: Embankment
- Watercourses
- Special Protection Areas (SPA)
- candidate Special Area of Conservation (cSAC)
- Known reefs (CO 1170)
- Known cSAC marine communities (CO of various coastal features)
- Known bottle-nosed dolphin suitable habitat (CO 1349)
- Known SPA 'Wetland' habitat (CO A999)
- Known otter habitats (terrestrial, freshwater, aquatic; CO 1355)
- Known large shallow inlets/bays (CO 1160)
- 1% AEP Fluvial Flood Extent
- 0.5% AEP Coastal Flood Extent

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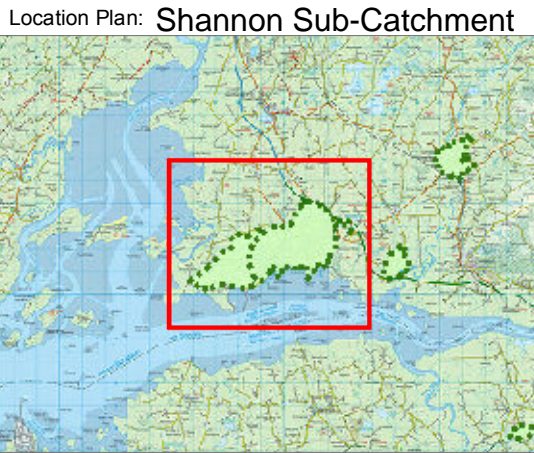
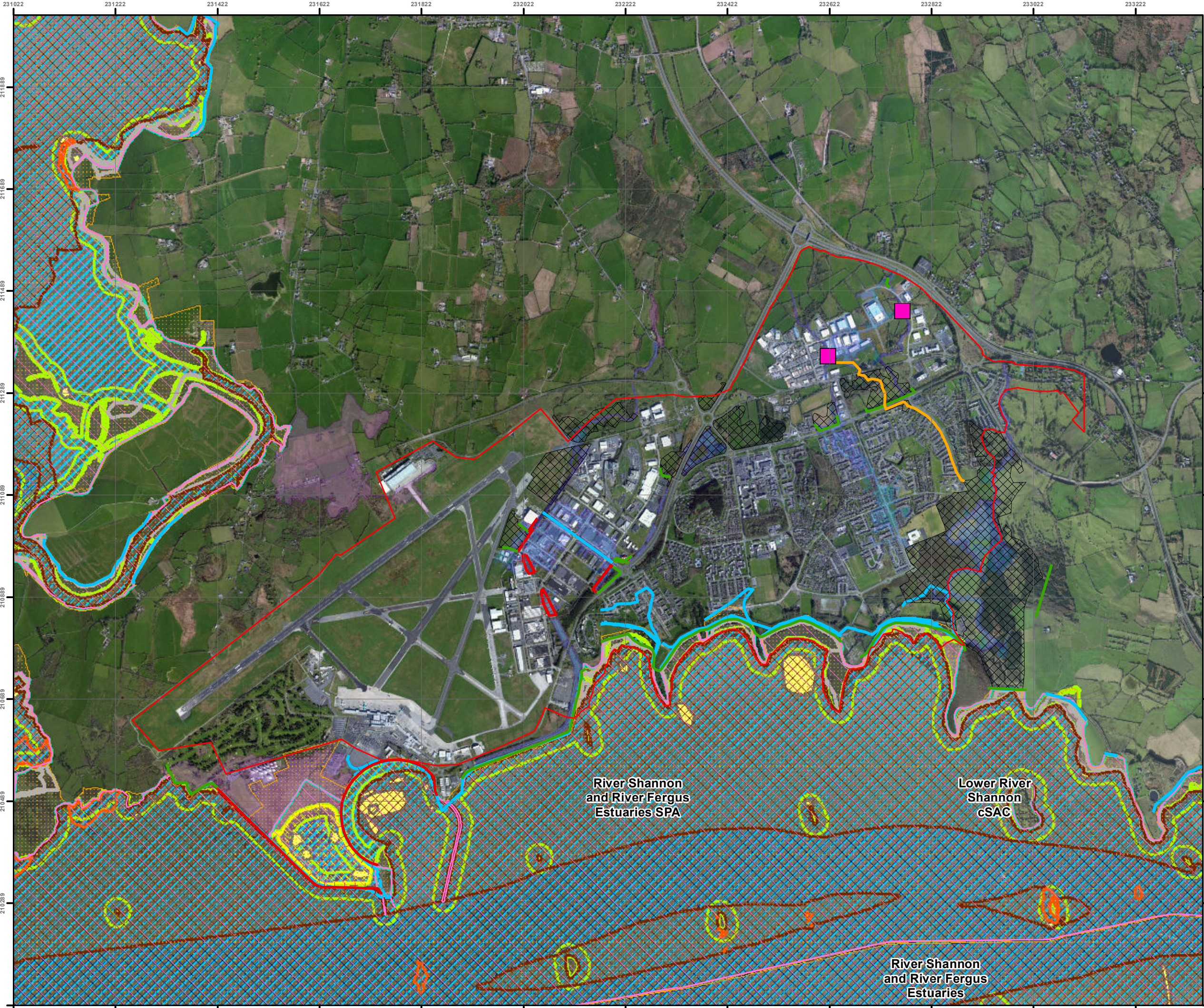
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Drawn by: AC Date: June 2016

Checked by: PW Date: June 2016

Reviewed by: RF Date: June 2016

Map Scale: 1: 11,000 Plot Scale: 1:1 @ A3



Legend

- AFA Boundary
- Preferred Option: Replace Culvert
- Preferred Option: Flow Diversion Channel
- Preferred Option: Embankment
- Preferred Option: Wall
- Preferred Option: Storage Area
- Preferred Option: Existing Defences
- Special Protection Areas (SPA)
- candidate Special Area of Conservation (cSAC)
- Known coastal lagoons (CO 1150)
- Known reefs (CO 1170)
- Known mudflats/sandflats (CO 1140)
- Known cSAC marine communities (CO of various coastal features)
- Known bottle-nosed dolphin suitable habitat (CO 1349)
- Known saltmarsh habitats (various; CO1310/1330/1410)
- Known SPA 'Wetland' habitat (CO A999)
- Known SPA bird roosts
- Known otter habitats (terrestrial, freshwater, aquatic; CO 1355)
- Known estuaries (CO 1130)
- 1% AEP Fluvial Flood Extent
- 0.5% AEP Coastal Flood Extent

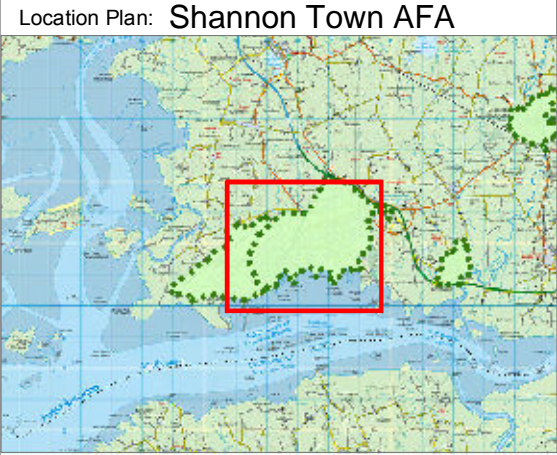
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Project: SHANNON CFRAM STUDY		
Map: SHANNON TOWN AND AIRPORT SUB-CATCHMENT/COASTAL AREA PREFERRED OPTION		
Drawn by:	AC	Date: June 2016
Checked by:	PW	Date: June 2016
Reviewed by:	RF	Date: June 2016
Map Scale: 1: 27,000		Plot Scale: 1:1 @ A3



Legend

- AFA Boundary
- Preferred Option: Replace Culvert
- Preferred Option: Flow Diversion Channel
- Preferred Option: Embankment
- Preferred Option: Wall
- Preferred Option: Storage Area
- Preferred Option: Existing Defences
- Watercourses
- Special Protection Areas (SPA)
- candidate Special Area of Conservation (cSAC)
- Known mudflats/sandflats (CO 1140)
- Known cSAC marine communities (CO of various coastal features)
- Known saltmarsh habitats (various; CO1310/1330/1410)
- Known SPA 'Wetland' habitat (CO A999)
- Known SPA bird roosts
- Known otter habitats (terrestrial, freshwater, aquatic; CO 1355)
- Known estuaries (CO 1130)
- 1% AEP Fluvial Flood Extent
- 0.5% AEP Coastal Flood Extent

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Project:
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Map: **SHANNON TOWN AFA PREFERRED OPTION**

Drawn by: AC Date: June 2016

Checked by: PW Date: June 2016

Reviewed by: RF Date: June 2016

Map Scale: 1: 15,000 Plot Scale: 1:1 @ A3

0 50100 200 300 400 500 Meters



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Appendix 1 Further Details on AA Methodology

The Interaction of AA and SEA

The SEA and AA processes have been completed in tandem with, and influenced the development of the draft FRMP for UoM 27. As per DoEHLG (2010) guidance, SEA outputs have been used to inform the AA. In particular, the SEA Scoping and Environmental Reports, produced by Jacobs on behalf of the OPW in 2012 and 2016 respectively, helped to contextualise the Shannon catchment regarding the distribution, and baseline condition of both coastal and fluvial waterbodies.

Incorporating Article 10 of the Habitats Directive

Under Article 10 of the Habitats Directive, Member States are required to endeavour in their land use planning and development policies to improve the ecological coherence of the European site network and to encourage the management of features such as rivers with their banks, traditional field boundaries and ponds or small woods which are essential for the migration, dispersal and genetic exchange of wild species which are of major importance for wild fauna and flora.

It is acknowledged that, in tandem with the AA process, the DoEHLG (2010) recommend that in general plans, and their policies, also reflect the requirements of Article 10 of the Habitats Directive.

Accordingly, the NIS addressed potential effects on all habitats outside European sites, with a potential supporting role to the European site network.

The Role of the Precautionary Principle in the NIS

The Precautionary Principle is fundamental to Appropriate Assessment. The Precautionary Principle has been defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005) as:

When human activities may lead to morally unacceptable harm [to the environment] that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. The judgement...should be grounded in scientific analysis.

Appendix 2: Zones of Influence Informing the AA

Introduction

Zones of Influence which informed the assessment are provided in the tables overleaf. The reference source and/or rationale is provided in each case

Qualifying Interest Habitats

Table A: Zones of Influence informing the NIS for QI Habitats

Habitats	Potentially Significant Effect and Pathway	Zol (m) for Potentially Significant Effects	Rationale
Terrestrial habitats and plant species without groundwater or surface-water dependency (e.g. oak woodlands, Killarney fern, limestone pavement)	Habitat loss or damage from flood defence construction	Footprint of construction overlapping QI habitats	No habitat loss/damage predicted beyond this area
	Habitat loss or damage or invasive species establishment from flooding	Potential flood extent for preferred option if overlaps QI habitat	No habitat loss/damage predicted beyond this area
Ground-Water Dependent habitats and plant species. (E.g. turloughs, petrifying springs, petalwort)	Habitat loss or indirect effects from interference to groundwater supply.	250 m from construction footprint if QI habitats/species present	The area over which intrusive excavation may pose a risk to Ground Water Dependent Terrestrial Ecosystems has been estimated at 250 m (SEPA, 2014)
	Habitat loss or indirect effects from flooding	Potential flood extent for preferred option where overlaps QI habitat	No habitat loss/damage predicted beyond this area.
Surface-water dependent habitats and plant species. (e.g. rivers, mudflats, saltmarsh, reefs)	Habitat loss or damage from flood defence construction	Footprint of construction overlapping QI habitats.	No habitat loss/damage predicted beyond this area
	Habitat loss or damage from changes to flooding regime	Potential flood extent for preferred option	Following discussions with design team, no habitat loss/damage predicted beyond this area
	Habitat loss or damage from changes to flow velocity	Extent of changes to river flow in vicinity of embankment, downstream of which flow will return to existing rate	Following discussions with design team, no habitat loss/damage predicted beyond this area

Qualifying Interest Species (Other than Birds)

Table B: Zones of Influence for QI mammal, fish, and invertebrate species informing the NIS

Species and feature	Potentially Significant Effect and Pathway	Zol (m) for Potentially Significant Effects	Rationale
Otter underground breeding or resting sites	Mortality or reduced breeding success resulting from loss or collapse of underground sites	10 km of works potentially damaging underground sites, if other cSACs present in this area	10 km is likely max. ranging of Irish otters outside cSACs (O'Neill, 2008, cited in Reid et al., 2013)
Lesser horseshoe bat roosts or foraging habitat	Mortality or reduced breeding success due to loss of roosts or foraging habitat within core area	4 km from effect damaging potential QI roosts or foraging habitat	Although maximum foraging ranges for the species have approached 6 km in Ireland (e.g. 5.2 km in Galway; Rush and Billington, 2014), and Wales (4.2 km; Bontadina et al., 2002) no studies have found core foraging ranges in excess of 4 km (Schofield, 1996; Bontadina et al., 2002; Rush and Billington, 2014)
Marsh fritillary individuals or their habitat	Direct injury to butterflies or their habitats	10 km from effects potentially damaging butterfly habitat	10 km is maximum dispersal range of Irish populations of the species (Seale, 2010) and Zimmerman et al., (2011)
Atlantic salmon, lamprey spp.	Loss or damage to spawning grounds or mussel beds during instream works	Footprint of instream works within potential spawning or mussel beds	No habitat loss/damage predicted beyond this area
Atlantic salmon, lamprey spp., and Freshwater Pearl Mussel (if present)	Siltation effects on gravels and mussel beds	Water Management Unit boundary	These species are highly sensitive to diffuse pollution including siltation. Once released, silt could be remobilised over time potentially reaching any downstream gravels or mussel beds. In some cases, there may WMUs downstream of, and hydrologically connected to the WMU within which silt is released. However, it is assumed there is unlikely to be significant exchange of silt between WMUs
Marine mammals	Disturbance causing injury or displacement, resulting from underground noise	10 km from dredging in marine mammal habitat	Coastal dredging operations can be detected by, and could temporarily displace marine mammals more than 10 km offshore (Richardson et al., 1995)

Qualifying Interest Bird species

Table C: Zones of Influence for QI Breeding Bird species informing the AA

Species and feature	Potentially Significant Effect	Zol (m) for Potentially Significant Effects	Sources for Revised Distance
Chough	Significant disturbance effect to nest site	Nests within 1 km of effect	Sensitivity Buffer from Bright et al., (2006)
Cormorant nests	Significant disturbance effect to nest site	Nests within 200 m of effect	Precautionary based on Carney & Sydeman (1999)
Gulls, terns, fulmar nests, storm petrel	Significant disturbance effect to nest site	Nests within 500 m of effect	Precautionary based on Carney & Sydeman (1999).
Hen harrier nests	Significant disturbance effect to nest site	Nests within 750 m of effect	Likely critical reaction distance based on Whitfield et al., (2008)
Merlin nests	Significant disturbance effect to nest site	Nests within 500 m of effect	Likely critical reaction distance based on Whitfield et al., (2008)

Table D: Zones of Influence for QI Wintering Bird species informing the AA

Species or Group of Species	ZoI Distance applied in AASS	Revised distance used in NIS	Sources for Revised Distance
Wading Birds	20 km applied to all wintering bird species	Up to 5 km for birds feeding at inland sites	Professional judgement, expert opinion from consultation exercise, and preliminary resighting data from Birdwatch Ireland
Barnacle Goose	20 km applied to all wintering bird species	None	SNH, 2013
Greenland white-fronted goose	20 km applied to all wintering bird species	8 km from roosts/feeding sites.	SNH, 2013
Greylag goose	20 km applied to all wintering bird species	12 km from designated roosts/feeding sites.	Bell 1988 and Hearn, personal communication cited in JNCC (2007)
Light-belled goose	20 km applied to all wintering bird species	15 km from designated roosts/feeding sites.	Benson (2009)
Whooper Swan	20 km applied to all wintering bird species	5 km from roosts/feeding sites.	SNH, 2013

Appendix 3 Revised AA Screening Tables for AFA-Scale Options

Bunratty

The preferred option for Bunratty is BUY_01. A summary of the option is provided below.

Option Measures:					
Baseline	B	Existing Regime (Assessed in-combination only)	Non Structural	K	Public Awareness (Scoped out)
Structural	Gi	Flood Defences: New Flood Defences		M	Individual Property Resilience

Measures Scoped out

- Public Awareness; and
- Existing Regime (considered in-combination only).

Pollution Pathways from Bunratty Option

The preferred option will be subject to further assessment at project-level. Precautionary Plan-level pollution mitigation could inform project-level pollution mitigation. However, there are no such highly-pollution sensitive QI features downstream of the AFA. LSEs from pollution were scoped out following the approach in section 3.3.

Candidate Special Areas of Conservation (cSAC) within 10km of AFA or with sensitive QI aquatic species (see section 3.3.1).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ¹⁵ (*Priority)	Potential source-pathway-receptor link (LSEs highlighted in pink)
Lower River Shannon cSAC	2165	0	Sandbanks	YES – Although there is no known QI habitat within the zone of influence of the options, the CO for this QI habitat includes conservation of the marine community type <i>Subtidal sand to mixed sediment with Nephtys spp. community complex</i> in natural condition. This community occurs within the footprint of the option, and likely significant habitat loss effects are predicted. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
			Estuaries	YES – NPWS CO mapping indicates QI estuary habitat is immediately adjacent/within the footprint of the proposed wall. LSEs from habitat loss cannot be excluded. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
			Mudflats and sandflats	YES – see estuaries.
			Coastal lagoons *	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Large shallow inlets and bays	YES – see sandbanks.
			Reefs	No – see coastal lagoons.
			Stony bank vegetation	No – see coastal lagoons.
			Vegetated sea cliffs	No – see coastal lagoons.
			Salicornia on mud and sand	No – see coastal lagoons.
			Atlantic salt meadows	No – see coastal lagoons.
			Mediterranean salt meadows	No – see coastal lagoons.
			Water courses with floating river vegetation	YES— in the absence of survey data, it cannot be excluded that this QI habitat could occur within, adjacent or downstream of the works, and within the zone of influence of habitat loss, and/or changes to water velocity or floodplain alterations. In the absence of mitigation, LSEs from changes to water flow and/or habitat extent cannot be excluded.
			Molinia meadows	No – see coastal lagoons.
			Alluvial forests*	No QI habitat within the intertidal reach of the Shannon within/downstream of the option. See text under coastal lagoons.
			<i>Margaritifera margaritifera</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Petromyzon marinus</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra planeri</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra fluviatilis</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Salmo salar</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Tursiops truncatus</i>	No – see coastal lagoons above.
			<i>Lutra lutra</i>	YES – there is potential for otter underground breeding or resting sites in close proximity to the works. There is a risk of collapse of any nearby resting sites and LSEs cannot be excluded. Otter are highly mobile and any resting sites could be those used by QI populations given the zone of influence in Appendix 2. There is also potential for loss of aquatic habitat, whose conservation is a target for the QI. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
Askeaton Fen Complex cSAC	2279	2	Cladium fens	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Alkaline fens	No – see Cladium fens.

¹⁵ Accurate as of January 2016

Site Name	Code	Distance from AFA (km)	Qualifying Interests ¹⁵ (*Priority)	Potential source-pathway-receptor link (LSEs highlighted in pink)
Ratty River Cave SAC	2316	6	<i>Rhinolophus hipposideros</i>	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Caves not open to the public	No – <i>Rhinolophus hipposideros</i> .
Lough Gash Turlough SAC	51	7	Turloughs*	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
Curraghchase Woods SAC	174	9	<i>Rhinolophus hipposideros</i>	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Alluvial forests*	No – see <i>Rhinolophus hipposideros</i> .
			<i>Taxus baccata</i> woods*	No – see <i>Rhinolophus hipposideros</i> .
There were no source-pathway-receptor links identified with more distant sites, from the preliminary list identified in the AASS.				

Special Protection Areas (SPA) within 20km of AFA (see section 3.6).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ¹⁶	Breeding or Non-Breeding	Potential source-pathway-receptor link
River Shannon and River Fergus Estuaries SPA	4077	0km (but 100m downstream of option)	<i>Phalacrocorax carbo</i>	breed	No source-pathway-receptor linkages based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			<i>Anas acuta</i>	non-b	No, this species does not utilise upper estuarine reaches. No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			<i>Anas clypeata</i>	non-b	No – see <i>Anas acuta</i> .
			<i>Anas crecca</i>	non-b	YES – The NPWS CO mapping and/or professional judgement indicates there could be significant roosting and/or feeding populations of QI species within the potential zone of influence of likely significant disturbance effects. No other source-pathway-receptor linkages identified, either alone or in-combination with other plans or projects, based on statements addressing pollution and invasive species in section 3.3.
			<i>Anas penelope</i>	non-b	No – see <i>Anas acuta</i> .
			<i>Aythya marila</i>	non-b	No – see <i>Anas acuta</i> .
			<i>Branta bernicla hrota</i>	non-b	No, based on statements addressing pollution and invasive species in section 3.3. Although option is within core foraging range of species (15km; Appendix 2), there is no habitat for the QI within the zone of influence of potential disturbance from the option.
			<i>Calidris alpina</i>	non-b	No – see <i>Anas acuta</i> .
			<i>Calidris canutus</i>	non-b	No – see <i>Anas acuta</i> .
			<i>Charadrius hiaticula</i>	non-b	No – see <i>Anas acuta</i> .
			<i>Chroicocephalus ridibundus</i>	non-b	YES – see <i>Anas crecca</i> .
			<i>Cygnus cygnus</i>	non-b	No, based on statements addressing pollution and invasive species in section 3.3. Although option is within core foraging range of species (5km; Appendix 2), there is no habitat for the QI within the zone of influence of the option.
			<i>Limosa lapponica</i>	non-b	YES – see <i>Anas crecca</i> .
			<i>Limosa limosa</i>	non-b	YES – see <i>Anas crecca</i> .
			<i>Numenius arquata</i>	non-b	YES – see <i>Anas crecca</i> .
			<i>Phalacrocorax carbo</i>	non-b	YES – see <i>Anas crecca</i> .
			<i>Pluvialis apricaria</i>	non-b	No – see <i>Anas acuta</i> .
			<i>Pluvialis squatarola</i>	non-b	No – see <i>Anas acuta</i> .
			<i>Tadorna tadorna</i>	non-b	No – see <i>Anas acuta</i> .
			<i>Tringa nebularia</i>	non-b	YES – see <i>Anas crecca</i> .
			<i>Tringa totanus</i>	non-b	YES – see <i>Anas crecca</i> .
			<i>Vanellus vanellus</i>	non-b	No – see <i>Anas acuta</i> .
					Wetlands
Slieve Aughty Mountains SPA	4168	19	<i>Circus cyaneus</i>	breed	No source-pathway-receptor linkages based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			<i>Falco columbarius</i>	breed	No – see <i>C. cyaneus</i> above
There were no source-pathway-receptor links identified with more distant sites, from the preliminary list identified in the AASS.					

¹⁶ Accurate at time of writing

Kilkee

The preferred option for Kilkee is KIE_02. A summary of the option is provided below.

Option Measures:					
Baseline	• B	Existing Regime (Assessed in-combination only)			Non Structural
Structural	• Fiii	• Increase Conveyance: Structure Enhancement/Works	• Gi	• Flood Defences: New Flood Defences	
	• Gii	• Flood Defences: Raise Existing Flood Defences			
					None

Measures Scoped out

- Existing Regime (Considered in-combination only).

Pollution Pathways from Kilkee Option

The preferred option will be subject to further assessment at project-level. Precautionary Plan-level pollution mitigation could inform project-level pollution mitigation. However, there are no highly-pollution sensitive QI features downstream of the AFA. LSEs from pollution were scoped out following the approach in section 3.3.

Candidate Special Areas of Conservation (cSAC) within 10km of AFA or with sensitive QI aquatic species (see section 3.3.1).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ¹⁷ (*Priority)	Potential source-pathway-receptor link (LSEs highlighted in pink)
Kilkee Reefs SAC	2264	0km (but 0.1km from nearest option)	Large shallow inlets and bays	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Reefs	No – see Large shallow inlets and bays.
			Sea caves	No – see Large shallow inlets and bays.
Lower River Shannon SAC	2165	1km (and at least 1km from option)	Sandbanks	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Estuaries	No – see Sandbanks.
			Mudflats and sandflats	No – see Sandbanks
			Coastal lagoons *	No – see Sandbanks
			Large shallow inlets and bays	No – see Sandbanks
			Reefs	No – see Sandbanks
			Stony bank vegetation	No – see Sandbanks
			Vegetated sea cliffs	No – see Sandbanks
			Salicornia on mud and sand	No – see Sandbanks
			Atlantic salt meadows	No – see Sandbanks
			Mediterranean salt meadows	No – see Sandbanks
			Water courses with floating river vegetation	No – see Sandbanks.
			Molinia meadows	No – see Sandbanks
			Alluvial forests*	No – see Sandbanks
			<i>Margaritifera margaritifera</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Petromyzon marinus</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra planeri</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra fluviatilis</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Salmo salar</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Tursiops truncatus</i>	No – see Sandbanks
			<i>Lutra lutra</i>	YES – there is potential for otter underground breeding or resting sites in close proximity to the works. Should the works involve any element of intrusive earthworks, there is a risk of collapse of any nearby resting sites and likely significant effects cannot be excluded.
Tullagher Lough And Bog SAC	2343	4	Active raised bogs*	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Degraded raised bogs	No – see Active raised bogs*
			Transition mires and quaking bogs	No – see Active raised bogs*
			Rhynchosporion Depressions	No – see Active raised bogs*
Carrowmore Dunes SAC	2250	10	Reefs	No – see Active raised bogs*
			Embryonic shifting dunes	No – see Active raised bogs*
			Shifting dunes (white dunes)	No – see Active raised bogs*
			Fixed coastal dunes (grey dunes)*	No – see Active raised bogs*
			<i>Vertigo angustior</i>	No – see Active raised bogs*
There were no source-pathway-receptor links identified with more distant sites, from the preliminary list identified in the AASS.				

¹⁷ Accurate as of January 2016

Special Protection Areas (SPA) within 20km of AFA (see section 3.6).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ¹⁸	Breeding or Non-Breeding	Potential source-pathway-receptor link (LSEs highlighted in pink)
River Shannon and River Fergus Estuaries SPA	4077	2 (but 3.3km from nearest option)	<i>Phalacrocorax carbo</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			<i>Anas acuta</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Anas clypeata</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Anas crecca</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Anas penelope</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Aythya marila</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Branta bernicla hrota</i>	non-b	YES –The option is within the core foraging distance for the QI from its designated areas (15km; Appendix 2). Brent geese could feed in coastal pasture adjacent to the proposed option and within the zone of influence of disturbance from works associated with it.
			<i>Calidris alpina</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Calidris canutus</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Charadrius hiaticula</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Chroicocephalus ridibundus</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Cygnus cygnus</i>	non-b	YES –The option is within the core foraging distance for the QI from its designated areas (5km; Appendix 2). Whooper swan could feed in coastal pasture adjacent to the proposed option and within the zone of influence of disturbance from works associated with it.
			<i>Limosa lapponica</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Limosa limosa</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Numenius arquata</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Phalacrocorax carbo</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Pluvialis apricaria</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Pluvialis squatarola</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Tadorna tadorna</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Tringa nebularia</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Tringa totanus</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Vanellus vanellus</i>	non-b	No – see <i>P. Carbo</i> .
			Wetlands	N/A	No – see <i>P. Carbo</i> .
Illaunonearaun SPA	4114	4	<i>Branta leucopsis</i>	non-b	YES –The option is within the core foraging distance for the QI from its designated areas (20km; Appendix 2). Geese could feed in coastal pasture adjacent to the proposed option and within the zone of influence of disturbance from works associated with it.
Mid-Clare Coast SPA	4182	10	<i>Phalacrocorax carbo</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			<i>Branta leucopsis</i>	non-b	No – but likely significant effects have not been excluded for this species from Illaunonearaun SPA which is closer to the option (within 4km of it).
			<i>Charadrius hiaticula</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Calidris alba</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Calidris maritima</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Calidris alpina</i>	non-b	No – see <i>P. Carbo</i> .
			<i>Arenaria interpres</i>	non-b	No – see <i>P. Carbo</i> .
			Wetlands	n/a	No – see <i>P. Carbo</i> .
Loop Head SPA	4119	18	<i>Rissa tridactyla</i>	breed	No – see <i>P. Carbo</i> .
			<i>Uria aalge</i>	breed	No – see <i>P. Carbo</i> .
There were no source-pathway-receptor links identified with more distant sites, from the preliminary list identified in the AASS.					

¹⁸ Accurate as of January 2016

Kilrush AFA

The preferred option for Kilrush is KIL_01. A summary of the option is provided below.

Option Measures:					
Structural	Gi	Flood Defences: New Flood Defences	Non-structural		None

Measures Scoped out

None.

Pollution Pathways from Kilrush Option

The preferred option will be subject to further assessment at project-level. Precautionary Plan-level pollution mitigation could inform project-level pollution mitigation. However, there are no such highly-pollution sensitive QI features downstream of the AFA. LSEs from pollution were scoped out following the approach in section 3.3.

Candidate Special Areas of Conservation (cSAC) within 10km of AFA or with sensitive QI aquatic species (see section 3.3.1).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ¹⁹ (*Priority)	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
Lower River Shannon cSAC	2165	0 (but 1.5km downstream of option)	Sandbanks	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Estuaries	No – see sandbanks.
			Mudflats and sandflats	No – see sandbanks.
			Coastal lagoons *	No – see sandbanks.
			Large shallow inlets and bays	No – see sandbanks.
			Reefs	No – see sandbanks.
			Stony bank vegetation	No – see sandbanks.
			Vegetated sea cliffs	No – see sandbanks.
			Salicornia on mud and sand	No – see sandbanks.
			Atlantic salt meadows	No – see sandbanks.
			Mediterranean salt meadows	No – see sandbanks.
			Water courses with floating river vegetation	No – see sandbanks.
			Molinia meadows	No – see sandbanks.
			Alluvial forests*	No – see sandbanks.
			<i>Margaritifera margaritifera</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Petromyzon marinus</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra planeri</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra fluviatilis</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Salmo salar</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Tursiops truncatus</i>	No – see sandbanks.
<i>Lutra lutra</i>	YES – Otter are highly mobile and there is potential for underground breeding or resting sites of QI otter to occur in close proximity to the works. There is a risk of collapse of any nearby resting sites and likely significant effects cannot be excluded.			
Tullagher Lough And Bog SAC	2343	6	Active raised bogs*	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Degraded raised bogs capable of regeneration	No – see Active raised bogs*.
			Transition mires and quaking bogs	No – see Active raised bogs*.
			Rhynchosporion depressions	No – see Active raised bogs*.
Carrowmore Dunes SAC	2250	10	Reefs	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Embryonic shifting dunes	No – see reefs.
			Shifting dunes (white dunes)	No – see reefs .
			Fixed coastal dunes (grey dunes)*	No – see reefs .
			<i>Vertigo angustior</i>	No – see reefs .
There were no source-pathway-receptor links identified with more distant sites, from the preliminary list identified in the AASS.				

¹⁹ Accurate as of January 2016

Special Protection Areas (SPA) within 20km of AFA (see section 3.6).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²⁰	Breeding or Non-Breeding	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
River Shannon and River Fergus Estuaries SPA	4077	0 (but 1.5km from nearest option)	<i>Phalacrocorax carbo</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			<i>Anas acuta</i>	non-b	No – see P.carbo
			<i>Anas clypeata</i>	non-b	No – see P. Carbo
			<i>Anas crecca</i>	non-b	No – see P. Carbo
			<i>Anas penelope</i>	non-b	No – see P. Carbo
			<i>Aythya marila</i>	non-b	No – see P. Carbo
			<i>Branta bernicla hrota</i>	non-b	YES –The option is within the core foraging distance for the QI from its designated areas (15km; Appendix 2). Brent geese could feed in coastal pasture adjacent to the proposed option and within the zone of influence of disturbance from works associated with it.
			<i>Calidris alpina</i>	non-b	No – see P. Carbo
			<i>Calidris canutus</i>	non-b	No – see P. Carbo
			<i>Charadrius hiaticula</i>	non-b	No – see P. Carbo
			<i>Chroicocephalus ridibundus</i>	non-b	No – see P. Carbo
			<i>Cygnus cygnus</i>	non-b	YES – The option is within the core foraging distance for the QI from its designated areas (5km; Appendix 2). Brent geese could feed in coastal pasture adjacent to the proposed option and within the zone of influence of disturbance from works associated with it.
			<i>Limosa lapponica</i>	non-b	No – see P. Carbo
			<i>Limosa limosa</i>	non-b	No – see P. Carbo
			<i>Numenius arquata</i>	non-b	No – see P. Carbo
			<i>Phalacrocorax carbo</i>	non-b	No – see P. Carbo
			<i>Pluvialis apricaria</i>	non-b	No – see P. Carbo
			<i>Pluvialis squatarola</i>	non-b	No – see P. Carbo
			<i>Tadorna tadorna</i>	non-b	No – see P. Carbo
			<i>Tringa nebularia</i>	non-b	No – see P. Carbo
			<i>Tringa totanus</i>	non-b	No – see P. Carbo
			<i>Vanellus vanellus</i>	non-b	No – see sandbanks.
			Wetlands	N/A	No – see sandbanks.
Mid-Clare Coast SPA	4182	10			No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			<i>Phalacrocorax carbo</i>	breed	
			<i>Branta leucopsis</i>	non-b	No – see P. carbo .
			<i>Charadrius hiaticula</i>	non-b	No – see P. carbo .
			<i>Calidris alba</i>	non-b	No – see P. carbo .
			<i>Calidris maritima</i>	non-b	No – see P. carbo .
			<i>Calidris alpina</i>	non-b	No – see P. carbo .
			<i>Arenaria interpres</i>	non-b	No – see P. carbo .
			Wetlands	N/A	No – see P. carbo .
Illaunonearaun SPA	4114	15	<i>Branta leucopsis</i>	non-b	YES –The option is within the core foraging distance for the QI from its designated areas (20km; Appendix 2). Brent geese could feed in coastal pasture adjacent to the proposed option and within the zone of influence of disturbance from works associated with it.
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	4161	15	<i>Circus cyaneus</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any likely significant effects, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
There were no source-pathway-receptor links identified with more distant sites, from the preliminary list identified in the AASS.					

²⁰ Accurate as of January 2016

Shannon Town and Shannon Airport Sub-Catchment and Coastal Area (Assessed as AFA-scale option)

The preferred option for Shannon and Shannon Airport is SUBSHN_01. A summary of the option is provided below.

Note: Although strictly speaking a sub-catchment, this has structural measures, unlike other sub-catchments on the Shannon CFRAMS and is therefore assessed as an AFA.

Option Measures:								
Baseline	B	Existing Regime (assessed in-combination only)					Non Structural	None
Structural	Di	Online Storage	Diii	Other Storage	Fii	Flood Relief Channel		
	Fiii	Structure Enhancement/ Works	Gi	New Flood Defences				

Measures Scoped out

- Existing regime was assessed in-combination only (see section

Pollution Pathways from Option

The preferred option will be subject to further assessment at project-level. Precautionary Plan-level pollution mitigation could inform project-level pollution mitigation. However, there are no highly-pollution sensitive QI features downstream of the Sub-Catchment. LSEs from pollution were scoped out following the approach in section 3.3.

Candidate Special Areas of Conservation (cSAC) within 10km of AFA or with sensitive QI aquatic species (see section 3.3.1).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²¹ (*Priority)	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
Lower River Shannon cSAC	2165	0 (and Option overlaps cSAC)	Sandbanks	YES – Although there is no known QI habitat within the zone of influence of the options, the CO for this QI habitat includes conservation of the marine community type Subtidal sand to mixed sediment with Nephtys spp. community complex in natural condition. This community occurs within the footprint of the option, and likely significant habitat loss effects are predicted. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
			Estuaries	YES – NPWS CO mapping indicates QI mudflat habitat is immediately adjacent/within the footprint of the proposed walls/embankments. LSEs from habitat loss cannot be excluded. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either alone or in-combination with other plans or projects
			Mudflats and sandflats	YES – see estuaries.
			Coastal lagoons *	YES – the structure and function of the lagoon at Shannon Airport may depend upon fresh or saltwater inputs from coastal and/or fluvial flooding regime which will be altered by the proposed option. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either alone or in-combination with other plans or projects.
			Large shallow inlets and bays	Yes– see sandbanks.
			Reefs	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Stony bank vegetation	No– see reefs.
			Vegetated sea cliffs	No– see reefs.
			Salicornia on mud and sand	No– see reefs.
			Atlantic salt meadows	YES – see estuaries.
			Mediterranean salt meadows	YES – see estuaries.
			Water courses with floating river vegetation	No– see reefs.
			Molinia meadows	No– see reefs.
			Alluvial forests*	No– See reefs.
			<i>Margaritifera margaritifera</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Petromyzon marinus</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra planeri</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra fluviatilis</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Salmo salar</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Tursiops truncatus</i>	No – Although the NPWS CO indicate ‘potentially suitable’ habitat adjacent to the proposed flood defences, there will be no dredging or other activities in these areas, with potential for LSEs in light of the species’ conservation objectives. No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
			<i>Lutra lutra</i>	YES – there is potential for otter underground breeding or resting sites in close proximity to the works. There is a risk of collapse of any nearby resting sites and LSEs cannot be excluded. Otter are highly mobile and any resting sites could be those used by QI populations given the zone of influence in Appendix 2. There is also potential for loss of aquatic habitat, whose conservation is a target for the QI. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
Lough Gash Turlough cSAC	51	3	Turloughs*	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.

²¹ Accurate as of January 2016

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²¹ (*Priority)	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
Askeaton Fen Complex cSAC	2279	6	Cladium fens	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Alkaline fens	No– see Cladium fens.
Ratty River Cave cSAC	2316	6	<i>Rhinolophus hipposideros</i>	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Caves not open to the public	No– see <i>Rhinolophus hipposideros</i> .
Curraghchase Woods cSAC	174	8	<i>Rhinolophus hipposideros</i>	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Alluvial forests*	No– see <i>Rhinolophus hipposideros</i> .
			<i>Taxus baccata</i> woods*	No– see <i>Rhinolophus hipposideros</i> .
Poulnagordon Cave (Quin) cSAC	64	9	<i>Rhinolophus hipposideros</i>	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Caves not open to the public	No– see <i>Rhinolophus hipposideros</i> .

Special Protection Areas (SPA) within 20km of AFA (see section 3.6).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²²	Breeding or Non-Breeding	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
River Shannon and River Fergus Estuaries SPA	4077	0 (and option abuts SPA)	<i>Phalacrocorax carbo</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, the scientifically-supported zones of influence in Appendix 2.
			<i>Anas acuta</i>	non-b	YES – The NPWS CO mapping shows there are significant roosting and/or feeding populations of QI species within the potential zone of influence of likely significant disturbance effects. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
			<i>Anas clypeata</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Anas crecca</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Anas penelope</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Aythya marila</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Branta bernicla hrota</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Calidris alpina</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Calidris canutus</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Charadrius hiaticula</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Chroicocephalus ridibundus</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Cygnus cygnus</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Limosa lapponica</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Limosa limosa</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Numenius arquata</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Phalacrocorax carbo</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Pluvialis apricaria</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Pluvialis squatarola</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Tadorna tadorna</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Tringa nebularia</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Tringa totanus</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Vanellus vanellus</i>	non-b	YES – see <i>Anas acuta</i> .
			Wetlands	N/A	YES – The NPWS CO mapping shows there is QI wetland within the potential footprint of flood defence walls/embankments. Likely significant habitat loss effects cannot be excluded. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
Ballyallia Lough SPA	4041	17	<i>Anas penelope</i>	non-b	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, the scientifically-supported zones of influence in Appendix 2.
			<i>Anas strepera</i>	non-b	No– See <i>Anas penelope</i> .
			<i>Anas crecca</i>	non-b	No– See <i>Anas penelope</i> .
			<i>Anas platyrhynchos</i>	non-b	No– See <i>Anas penelope</i> .
			<i>Anas clypeata</i>	non-b	No– See <i>Anas penelope</i> .
			Wetlands	N/A	No– See <i>Anas penelope</i> .
Slieve Aughty Mountains SPA	4168	18	<i>Circus cyaneus</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, the scientifically-supported zones of influence in Appendix 2.
			<i>Falco columbarius</i>	breed	No– See <i>Circus cyaneus</i> .

²² Accurate as of January 2016

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²²	Breeding or Non-Breeding	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	4161	19	<i>Circus cyaneus</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, the scientifically-supported zones of influence in Appendix 2.
There were no source-pathway-receptor links identified with any more distant SPAs identified in the AASS.					

Shannon Town AFA

The preferred option for Shannon Town AFA is SHN_01. A summary of the option is provided below.

Note: All measures in this option are included within SUBSHN_01. However SUBSHN_01 additionally includes structural measures along the coastal boundary between the Shannon Estuary and the Shannon Airport (including the Shannon Airport Lagoon). It is also notable that SUBSHN_01 exceeds the design standard for coastal flood protection (i.e. 0.1%; 1:1000 year), while SHN_01 meets the design standard for coastal flood protection (0.5%; 1:1000 year).:

Option Measures:								
Baseline	B	Existing Regime (assessed in-combination only)					Non Structural	No ne
Structural	Di	Online Storage	Diii	Other Storage	Fii	Flood Relief Channel		
	Fiii	Structure Enhancement/ Works	Gi	New Flood Defences				

Measures Scoped out

- Existing regime was assessed in-combination only (see section

Pollution Pathways from Option

The preferred option will be subject to further assessment at project-level. Precautionary Plan-level pollution mitigation could inform project-level pollution mitigation. However, there are no highly-pollution sensitive QI features downstream of the AFA. LSEs from pollution were scoped out following the approach in section 3.3.

Candidate Special Areas of Conservation (cSACs) within 10km of AFA or with sensitive QI aquatic species (see section 3.3.1).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²³ (*Priority)	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
Lower River Shannon cSAC	2165	0 (and Option overlaps cSAC)	Sandbanks	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Estuaries	No. In contrast to SHN_01, there are no structural measures bordering QI coastal habitats. All structural measures are inland within the urban fabric of Shannon Town. There is one non-structural measure (a proposed flood storage area) adjacent to QI estuary habitat, but there is no direct overlap of the measure with the QI habitat as mapped by the NPWS in their CO mapping. No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Mudflats and sandflats	No. In contrast to SHN_01, there are no structural measures bordering QI coastal habitats. All structural measures are inland within the urban fabric of Shannon Town. There is one non-structural measure (a proposed flood storage area) adjacent to QI mudflat habitat, but there is no direct overlap of the measure with the QI habitat as mapped by the NPWS in their CO mapping. No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.

²³ Accurate as of January 2016

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²³ (*Priority)	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
			Coastal lagoons *	No, in contrast to SHN_01, there are no structural measures bordering QI lagoon habitats, and there will be no replacement of the existing coastal defences which form the boundary between lagoonal and estuarine habitats. No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Large shallow inlets and bays	No – see sandbanks.
			Reefs	No – see sandbanks.
			Stony bank vegetation	No – see sandbanks.
			Vegetated sea cliffs	No – see sandbanks.
			Salicornia on mud and sand	No – see sandbanks.
			Atlantic salt meadows	No. In contrast to SHN_01, there are no structural measures bordering QI coastal habitats. All structural measures are inland within the urban fabric of Shannon Town. There is one non-structural measure (a proposed flood storage area) adjacent to QI saltmarsh habitat, but there is no direct overlap of the measure with the QI habitat as mapped by the NPWS in their CO mapping. No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Mediterranean salt meadows	No – see Atlantic salt meadows.

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²³ (*Priority)	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
			Water courses with floating river vegetation	No. There are no designated freshwater habitats in this coastal AFA. No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
			Molinia meadows	No – see reefs.
			Alluvial forests*	No – See reefs.
			<i>Margaritifera margaritifera</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Petromyzon marinus</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra planeri</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Lampetra fluviatilis</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Salmo salar</i>	No source-pathway-receptor linkages identified (refer to text preceding this table).
			<i>Tursiops truncatus</i>	No – Although the NPWS CO indicate ‘potentially suitable’ habitat adjacent to the proposed non-structural flood storage areas, there will be no dredging or other activities in these areas, with potential for LSEs in light of the species’ Conservation Objectives. No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
			<i>Lutra lutra</i>	YES – there is potential for otter underground breeding or resting sites in close proximity to the works. There is a risk of collapse of any nearby resting sites and LSEs cannot be excluded. Otter are highly mobile and any resting sites could be those used by QI populations given the zone of influence in Appendix 2. No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²³ (*Priority)	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
Lough Gash Turlough cSAC	51	3	Turloughs*	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2.
Askeaton Fen Complex cSAC	2279	6	Cladium fens	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Alkaline fens	No— see Cladium fens.
Ratty River Cave cSAC	2316	6	<i>Rhinolophus hipposideros</i>	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Caves not open to the public	No— see <i>Rhinolophus hipposideros</i> .
Curraghchase Woods cSAC	174	8	<i>Rhinolophus hipposideros</i>	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..
			Alluvial forests*	No— see <i>Rhinolophus hipposideros</i> .
			<i>Taxus baccata</i> woods*	No— see <i>Rhinolophus hipposideros</i> .
Poulnagordon Cave (Quin) cSAC	64	9	<i>Rhinolophus hipposideros</i>	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3, either for the option alone or in combination with other plans or projects. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, and the scientifically-supported zones of influence in Appendix 2..

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²³ (*Priority)	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
			Caves not open to the public	No– see <i>Rhinolophus hipposideros</i> .

Special Protection Areas (SPA) within 20km of AFA (see section 3.6).

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²⁴	Breeding or Non-Breeding	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
River Shannon and River Fergus Estuaries SPA	4077	0 (and option abuts SPA)	<i>Phalacrocorax carbo</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, the scientifically-supported zones of influence in Appendix 2.
			<i>Anas acuta</i>	non-b	YES – There is potential for significant populations of QI species within the potential zone of influence of likely significant disturbance effects, and potential for habitat loss of coastal pasture used by feeding/roosting birds within the footprint of the proposed flood storage area (non-structural measure). No other source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
			<i>Anas clypeata</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Anas crecca</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Anas penelope</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Aythya marila</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Branta bernicla hrota</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Calidris alpina</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Calidris canutus</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Charadrius hiaticula</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Chroicocephalus ridibundus</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Cygnus cygnus</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Limosa lapponica</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Limosa limosa</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Numenius arquata</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Phalacrocorax carbo</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Pluvialis apricaria</i>	non-b	YES – see <i>Anas acuta</i> .

²⁴ Accurate as of January 2016

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²⁴	Breeding or Non-Breeding	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
			<i>Pluvialis squatarola</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Tadorna tadorna</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Tringa nebularia</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Tringa totanus</i>	non-b	YES – see <i>Anas acuta</i> .
			<i>Vanellus vanellus</i>	non-b	YES – see <i>Anas acuta</i> .
			Wetlands	N/A	No. In contrast to SHN_01, there is no potential for overlap of proposed measures with QI wetland habitat. The proposed flood storage area (non-structural measure) is adjacent to, but would not overlap QI wetland habitat. No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3.
Ballyallia Lough SPA	4041	17	<i>Anas penelope</i>	non-b	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, the scientifically-supported zones of influence in Appendix 2.
			<i>Anas strepera</i>	non-b	No– See <i>Anas penelope</i> .
			<i>Anas crecca</i>	non-b	No– See <i>Anas penelope</i> .
			<i>Anas platyrhynchos</i>	non-b	No– See <i>Anas penelope</i> .
			<i>Anas clypeata</i>	non-b	No– See <i>Anas penelope</i> .
			Wetlands	N/A	No– See <i>Anas penelope</i> .
Slieve Aughty Mountains SPA	4168	18	<i>Circus cyaneus</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, the scientifically-supported zones of influence in Appendix 2.
			<i>Falco columbarius</i>	breed	No– See <i>Circus cyaneus</i> .

Site Name	Code	Distance from AFA (km)	Qualifying Interests ²⁴	Breeding or Non-Breeding	Potential source-pathway-receptor link (LSEs Highlighted in Pink)
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	4161	19	<i>Circus cyaneus</i>	breed	No source-pathway-receptor linkages identified, based on statements addressing pollution and invasive species in section 3.3. The QI is not within the zone of influence of any LSEs, given the nature and scale of the preferred options, the scientifically-supported zones of influence in Appendix 2.
There were no source-pathway-receptor links identified with any more distant SPAs identified in the AASS.					

Appendix 4 Detailed Flood Risk Management Measures

Refer to *Section 8 Managing Flood Risk* of Draft FRMP for UoM 27 (specifically sub-sections 8.1 Overview and 8.2 Methods of Flood Risk Management).

Appendix 5 Exacting Silt Fence Requirements

Table 3: Techniques and Materials to Improve Standard Silt Fences

Geotextile¹

- Slurry flow rate lower than 0.3 cfs
- Tensile strength greater than 50 lbs/in
- Ultraviolet stability >90%
- Filtering efficiency >75%

Stakes/ Posts²

- Use wood stakes at least three inches in diameter or 2" X 4" and five feet tall or metal posts of 1.3 lb/ft


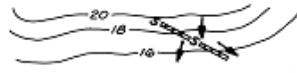
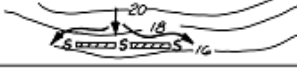
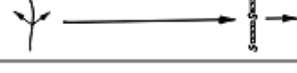

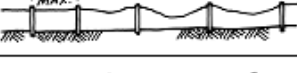





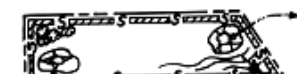
Installation

- Drive posts a minimum of 16" into the ground
- Embed geotextile placed in a 8"x8" trench
- Place stakes a maximum of eight feet apart, unless a wire backing is used (10 ft.)
- Maintain a ten-foot border between the silt fence and construction activity
- Install along contour lines
- Use a continuous sheet of geotextile to prevent failure at joints

Maintenance

- Check after every ½ inch storm and weekly
- Remove sediment when it reaches one half of fence height
- Patch torn fences, or replace the entire fence section when tears occur

Table 2: Conditions that Limit the Effectiveness of Silt Fences

1		Slope and/or Length of Slope 5% to 10%: no more than 50 feet 10% to 20%: no more than 25 feet more than 20%: no more than 15 feet
2		Silt fence is not aligned parallel to slope contours
3		Edges of the silt fence are not curved uphill, allowing flow to bypass the fence
4		Contributing length to fence is greater than 100 feet
5		Fabric is not entrenched deeply enough to prevent undercutting
6		Spacing between posts is greater than eight feet
7		Fence receives concentrated flow without reinforcement
8		Installed below an outlet pipe or weir
9		Silt fence is <i>upslope</i> of the exposed area
10		Silt fence alignment does not consider construction traffic
11		Sediment deposits behind silt fence reduce capacity and increase breach potential
12		Alignment of silt fence mirrors the property line or limits of disturbance, but does not reflect ESC needs



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