E.3. Natura Impact Statement - Stage 1 Screening Appropriate Assessment

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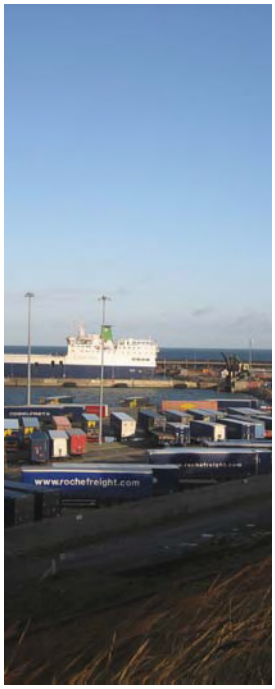

N11-N25 Oilgate to Rosslare Harbour

Natura Impact Statement - Stage 1 Screening Appropriate Assessment

June 2011

Wexford County Council

Mott MacDonald

N11-N25 Oilgate to Rosslare Harbour

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Content

1. Introduction

1.1 Overview of Project

It is proposed to upgrade the existing N11 and N25 roads between Oilgate, Co. Wexford and Rosslare Harbour, Co. Wexford. At the northern extent of the scheme the road will connect into the end of proposed N11 Enniscorthy Bypass at Oilgate and will link to Rosslare Europort at the southern extent. The project is currently at route selection stage, whereby an assessment is being undertaken to identify the preferred route option.

The potential for the proposed route options to impact on the designated European sites primarily arise due to the requirement for each route option to cross over the Slaney River Valley Special Area of Conservation (cSAC) and the Wexford Harbour and Slobs Special Protection Area (SPA), by way of a bridge.

Due to the fact that all of the proposed route options have the potential to impact on the Slaney River Valley Special Area of Conservation (cSAC) and the Wexford Harbour and Slobs Special Protection Area (SPA), an Appropriate Assessment is required under Article 6, paragraph (3) of *Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora* (commonly referred to as the Habitats Directive). The Appropriate Assessment is undertaken to ascertain if any of the route options have the potential to have a significant effect on the designated conservation sites, either individually or in combination with other developments.

1.2 Legislative Background

Article 6, paragraph (3) of the Habitats Directive requires that:

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.

Article 6, paragraph (4) of the Directive requires that:

If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.

The Habitats Directive was transposed into Irish law by the *European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94/1997)* and subsequent amendments.

2. Methodology

2.1 Appropriate Assessment

In the preparation of this assessment, the following guidelines have been reviewed.

- National Roads Authority (2009). *Guidelines for Assessment of Ecological Impacts of National Road Schemes*;
- Department of Environment, Heritage and Local Government (2009). *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities*;
- European Commission (2000) *Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*;
- European Commission *(2001) 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*;

The NRA's G*uidelines for Assessment of Ecological Impacts of National Road Schemes* (hereafter referred to as the NRA Guidelines) specify the approach to be used in undertaking AA for national road schemes in Ireland. Figure 2.1 illustrates the process to be followed for AA during the Route option corridor Selection (RCS) assessment.

An Appropriate Assessment must be carried out in a stage-by-stage approach as follows:

Stage 1 - Screening for a likely significant effect: An initial assessment of the project or plans effect on a European Site(s). If it cannot be concluded that there will be no significant effect upon a European Site, or where impact is identified, a Stage 2 assessment is required;

Stage 2 - Appropriate Assessment: The consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects of plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts;

Stage 3 – Assessment of alternative solutions: The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site;

Stage 4 – Assessment where no alternative solutions exist and where adverse impacts remain: An assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed.

Each stage determines whether a further stage in the process is required. If, for example, the conclusions at the end of Stage One are that there will be no significant impacts on the Natura 2000 site, there is no requirement to proceed further.

Having determined the feasible route option corridors the next step is to determine if any of these route option corridors are likely to have a significant impact on a Natura 2000 Site, either individually or in combination with other developments (RCS Stage 1 AA). In the event that none of the route option corridors are likely to have an impact on a Natura 2000 site, the assessment is completed and documented in the Natura Impact Statement. As part of this Appropriate Assessment field visits were undertaken to

each of the proposed bridge crossings to determine if the qualifying features of the designated sites were present within the footprint of the proposed bridge crossings.

Where one or more of the route option corridors has the potential, or is likely, to have a significant effect on a Natura 2000 site, a further assessment is required to determine if these route option corridors will adversely affect the integrity of the Natura 2000 site, individually or in combination with other developments (RCS Stage 2 AA).

The process flow diagram in Figure 2.1 illustrates the various steps to be taken dependent on the outcomes of RCS Stage 1 AA and RCS Stage 2 AA.

In the event that none of the route option corridors will adversely affect the integrity of the Natura 2000 site, the assessment is completed and documented.

Where one or more of the route option corridors has an adverse affect on the integrity of the Natura 2000 site and alternative route option corridors exist which do not have an adverse affect on the integrity of the Natura 2000 site, those which do adversely affect the integrity of the Natura 2000 site are disregarded and only those route option corridors which do not have an effect on the integrity of the Natura 2000 site are assessed further.

If feasible alternatives exist which affect priority habitats, these feasible alternatives are disregarded. For those feasible alternatives which do not affect priority habitats, the alternative solution which has the least adverse affect on the integrity of the European site is determined.

2.2 Route Selection Process

The NRA's Project Management Guidelines, 2010 outlines a process for undertaking *Phase 2: Route Selection*. The route selection process consists of three main stages as follows:

- ***Stage 1 Preliminary Options Assessment;*** Carry out a preliminary options assessment on a long list of route options (typically 6 or more), resulting in the refinement of the proposed route options.
- ***Stage 2: Project Appraisal of Route Options;*** Undertake a project appraisal of refined route options to result in a preferred route option corridor.
- ***Stage 3: Selection of Preferred Route option corridor:*** Selection of the proposed route option corridor and the production of a project appraisal balance sheet (PABS) on the preferred route option.

This Appropriate Assessment was undertaken during the Stage 1 Preliminary Options Assessment of this project. At this stage of the project there were eight primary route options being considered. Each of these route options (A to H) has the potential to impact on the Slaney River Valley Special Area of Conservation (cSAC) and the Wexford Harbour and Slobs Special Protection Area (SPA), as a crossing of the River Slaney is required for each of the route options. Routes D, E and G also have the potential to impact on the Slaney River Valley cSAC in the townland of Kyle.

The eight route options (A-H) and some associated links consisting of 187 potential route option combinations were assessed for the purposes of the Stage 1 assessment. Arising from these combinations of route options a further fifteen route options were considered for further assessment at Stage 2 Project

Appraisal. In addition, the “Do Minimum” option and a “Management Option” were also brought forward for more in-depth assessment. The crossing locations over the Slaney River Valley cSAC and the Wexford Harbour and Slobs Special Protection Area assessed for the purposes of the Stage 1 assessment are the same as those proposed for the Stage 2 assessment, with the following exceptions:

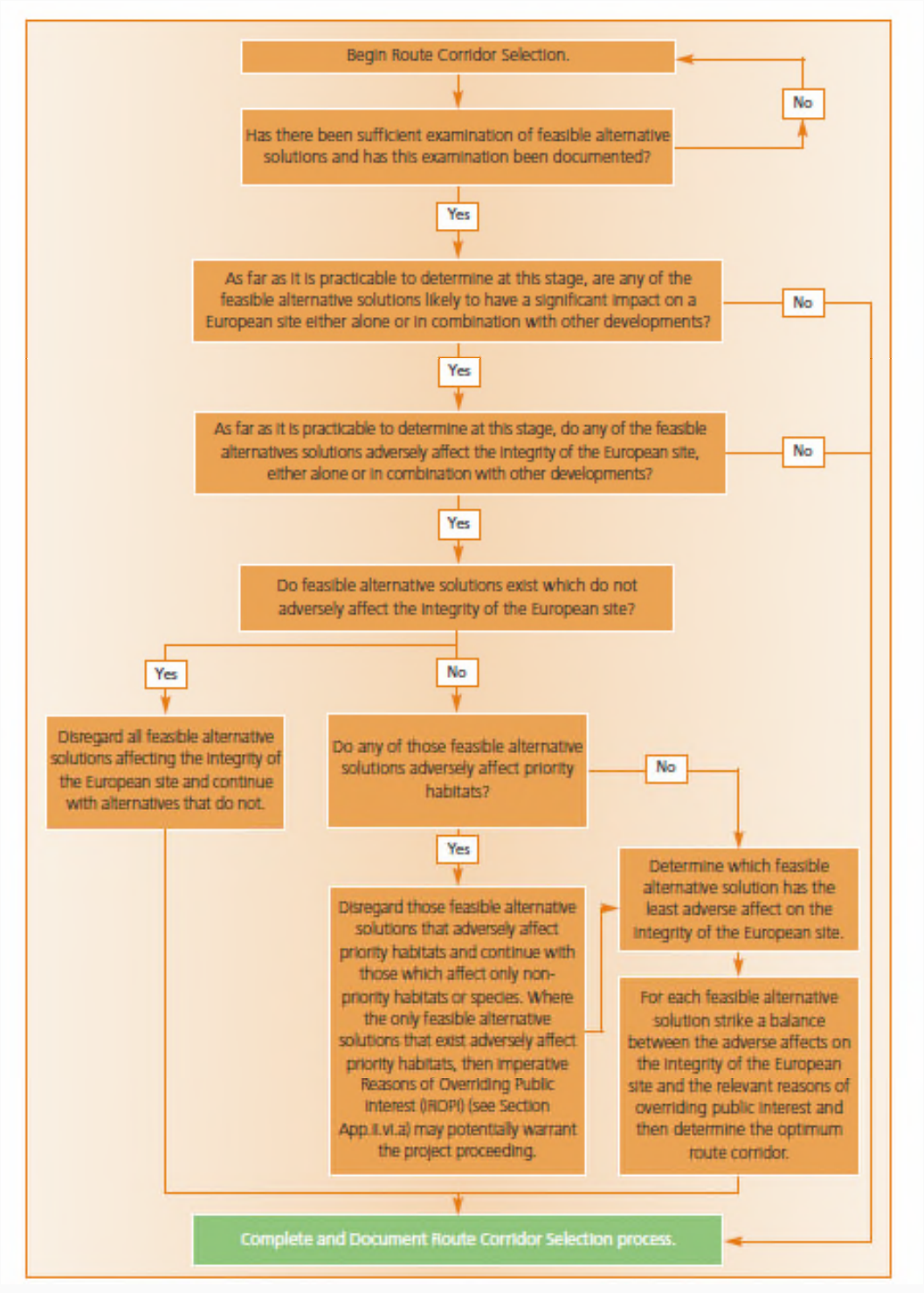
- Crossing options for route options F, G and H were not progressed to Stage 2 assessment;
- For the purposes of the Stage 2 assessment, the Do minimum and Management Options were assessed however these route options utilise the existing bridge crossing at Ferrycarrig (Crossing Location C1).

See Table 3.1 Crossing Locations over the Slaney River Valley Special Area of Conservation (cSAC) and the Wexford Harbour and Slobs Special Protection Area (SPA) for details of the route options from Stage 1 and Stage 2 that cross the River Slaney at each of the crossing locations.

Table 3.1 Crossing Locations over the Slaney River Valley Special Area of Conservation (cSAC) and the Wexford Harbour and Slobs Special Protection Area (SPA

Crossing Location	Stage 1 Route Options	Stage 2 Route Options	Notes
C1	Route Options A & B	Route Options Do-Min, Management Opt, 104, 106 & 107	The Do-min and Management options would utilise the existing bridge crossing at this location.
C2	Route Options C & D	Route Options 69, 89, 108,109,113,115,116,117,118,119 & 120	
C3	Route Option E	132	
C4	Route Options F & G	N/A	This crossing location was not brought forward to Stage 2 Project Appraisal
C5	Route Option H	N/A	This crossing location was not brought forward to Stage 2 Project Appraisal

Figure 2.1: Process flow diagram of Route Selection Process in relation to Natura 2000 Sites and Appropriate Assessment



Source: NRA (2009) *Guidelines for Assessment of Ecological Impacts of National Road Schemes*

3. Description of the Project

The proposed upgrade of the N11/N25 Oilgate to Rosslare Harbour Road Improvement Scheme is part of a comprehensive development programme for the network of national roads over the period 2006 to 2015 as set out in Transport 21. In terms of the N11 and N25 route, Transport 21 outlines the following strategies:

- Complete the development of dual carriageways to Gorey on the N11;
- Develop the Atlantic Road Corridor from Letterkenny to Sligo, Galway, Limerick and Waterford.
- Improve other key national primary routes including the N25 to Rosslare.

The N11 roadway consists of a national primary route linking Dublin to Wexford Town with a further section of roadway south of Wexford Town to Rosslare Harbour consisting of the N25. The route forms part of the European Route EO1 (developed by the United Nations Economic Commission for Europe) which runs from Larne in Northern Ireland to Rosslare Europort and beyond through Portugal and Spain. The N25 section between Wexford Town and Rosslare Harbour forms part of the N25 roadway which links Cork City to Rosslare Harbour via Waterford. The N25 route forms part of the European Route E30 which runs from Cork to Rosslare Europort and beyond through Europe to Moscow. Sections of the N11 route have been upgraded significantly in recent years with further upgrades currently underway or at the design/planning stages for a number of different sections of the road. Once the N11/M11 route is completed as far as Enniscorthy there will be a 30 km stretch from Enniscorthy to Rosslare Europort with a single carriageway cross section. This section of road between Oilgate in Co. Wexford to Rosslare Harbour, Co. Wexford including a route bypassing Wexford town is the subject of this proposed upgrade for this project.

The N25 roadway, of which the road between Wexford Town and Rosslare Harbour is a small section, is also undergoing a significant upgrade with major upgrades including the N25 Waterford Bypass which consists of 23 km of Dual Carriageway and the New Ross Bypass Scheme consisting of 13.6 km of Dual Carriageway. The N25 New Ross Bypass has received planning approval from An Bord Pleanala and the N25 Waterford Bypass was completed in 2010. The N25 route will act as a strategic link between the Atlantic Corridor road scheme (which connects all the major towns and cities from Letterkenny, Co. Donegal to Waterford via Galway, Limerick and Cork) to Rosslare Europort.

The section of the N25 from Stephenstown to Rosslare Harbour has already undergone a Route Selection Stage but it is now being incorporated into the N11/N25 Oilgate to Rosslare Harbour Road Improvement Scheme to provide good continuity of carriageway.

4. Description of the Natura 2000 Sites

4.1 Introduction

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, the Habitats Directive, requires the designation of SACs for the protection and restoration of habitats and species considered to be of European importance. The Habitats Directive was transposed into Irish law through the European Communities (Natural Habitats) Regulations, 1997-2010.

The intention of the Directive is to aim to ensure bio-diversity through the conservation of natural habitats and wild fauna and flora in Europe. A network of sites of conservation importance hosting habitats and/or species identified in the Directive as needing to be either maintained at or returned to favourable conservation status have been identified by each Member State. These sites are known as the Natura 2000 network and in Ireland, Natura 2000 sites comprise areas designated as Special Areas of Conservation (SACs) and/or Special Protection Areas (SPAs).

Habitats of European Community interest whose conservation requires the designation of a SAC are listed in 'Annex I' of the Directive. These are habitats which:

- Are in danger of disappearance in their natural range; or
- Have a small natural range following their regression or by reason of their intrinsically restricted area; or
- Present outstanding examples of typical characteristics of one or more of the nine following biogeographical regions: Alpine, Atlantic, Black Sea, Boreal, Continental, Macaronesian, Mediterranean, Pannonian and Steppic.

Annex I habitats which are in danger of disappearance are further classified as 'priority natural habitat types'.

Species (animals and plants) of European Community interest are listed in 'Annex II', 'Annex IV' or 'Annex V' of the Habitats Directive. Those species of European Community interest for which SACs must be designated are listed in Annex II of the Habitats Directive. These are species which are:

- Endangered; or
- Vulnerable, i.e. believed likely to move into the endangered category in the near future if the causal factors continue operating; or
- Rare, i.e. with small populations that are not at present endangered or vulnerable, but are at risk. These species are located within restricted geographical areas or are thinly scattered over a more extensive range; or
- Endemic and requiring particular attention by reason of the specific nature of their habitat and/or the potential impact of their exploitation on their habitat and/or the potential impact of their exploitation on their conservation status.

Council Directive 79/409/EEC on the conservation of wild birds, commonly referred to as the Birds Directive, requires designation of Special Protection Areas (SPAs) for bird species. The Birds Directive is implemented in Ireland under the Wildlife Acts (1976 – 2000).

SPAs are designated for the following reasons:

- Rare and vulnerable bird species (listed in Annex I of the Directive);
- Regularly occurring migratory species, such as ducks, geese and waders; and
- Wetlands, especially those of international importance, which attract large numbers of migratory birds each year. (Internationally important means that 1% of the population of a species uses the site, or more than 20,000 birds regularly use the site).

Those species and / or habitats for which SACs and SPAs are selected are referred to as the qualifying features / interests of the designated sites.

4.2 Slaney River Valley cSAC (Site Code: 000781)

4.2.1 Slaney River Valley cSAC – Qualifying Features

The Annex I habitats which are qualifying features of the Slaney River Valley cSAC are as follows:
- Old sessile oak woods with *Ilex* and *Blechnum* in British Isles (91A0);
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) (91E0);
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260);
- Estuaries (1130); and
- Mudflats and sandflats not covered by seawater at low tide (1140)

The Annex II species which are qualifying features of the Slaney River Valley cSAC are as follows:
- Twaite shad (*Alsa fallax)*
- River lamprey *(Lampetra fluviatilis)*
- Brook lamprey *(Lampetra planeri)*
- *Sea lamprey (Petromyzon marinus)*
- Atlantic salmon *(Salmo salar)*
- Freshwater pearl mussel *(Margaritifera margaritifera)*
- Otter (*Lutra lutra*)

Freshwater Pearl Mussel is listed under Annex II and V of the Habitats. This species is listed as one of the qualifying features of the Slaney River Valley cSAC; however, it occurs at a significant distance upstream of the study area within the Derreen River, a tributary of the Slaney, and will not be affected by the proposed scheme and therefore is not considered further in this assessment. Similarly the habitat 'Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260)' does not occur within the cSAC in those areas affected by the proposed route options and is not considered further.

4.2.2 Slaney River Valley cSAC – Conservation Objectives

The draft conservation objectives for the Slaney River Valley cSAC (000781) are as follows:
- **Objective 1:** To maintain the Annex I habitats for which the cSAC has been selected at favourable conservation status: Old sessile oak woods with *Ilex* and *Blechnum* in British Isles; Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae); Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation; Estuaries; Mudflats and sandflats not covered by seawater at low tide.

- **Objective 2:** To maintain the Annex II species for which the cSAC has been selected at favourable conservation status: *Alosa fallax*, *Lampetra fluviatilis, Lampetra planeri*, *Petromyzon marinus*, *Salmo salar*, *Margaritifera margaritifera*, *Lutra lutra*
- **Objective 3:** To maintain the extent, species richness and biodiversity of the entire site
- **Objective 4:** To establish effective liaison and co-operation with landowners, legal users and relevant authorities.

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as candidate Special Areas of Conservation. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

According to the EU Habitats Directive, favourable conservation status of a habitat is achieved when:
- Its natural range, and area it covers within that range, is stable or increasing, and
- The ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and

The conservation status of its typical species is favourable as defined below. The favourable conservation status of a species is achieved when:
- Population data on the species concerned indicate that it is maintaining itself, and
- The natural range of the species is neither being reduced or likely to be reduced for the foreseeable future, and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

4.3 Wexford Harbour and Slobs SPA (Site Code 4076)

4.3.1 SPA – Qualifying Features

The Wexford Harbour and Slobs SPA is selected for the following bird species:
- Cormorant;
- Bewick's Swan;
- Whooper Swan;
- Greenland White-fronted Goose;
- Light-bellied Brent Goose;
- Shelduck;
- Teal;
- Scaup;
- Red-breasted Merganser;
- Oystercatcher;
- Golden Plover;
- Grey Plover;
- Lapwing;
- Sanderling;
- Black-tailed Godwit;
- Bar-tailed Godwit;
- Curlew;
- Black-headed Gull;
- Little Tern; and

- 20,000 wintering waterbirds.

Additional Special Conservation Interests (SCIs) are as follows:
- Little Grebe;
- Great Crested Grebe;
- Grey Heron;
- Mallard;
- Wigeon;
- Pintail;
- Goldeneye;
- Hen Harrier;
- Coot;
- Knot;
- Dunlin;
- Redshank;
- Lesser Black-backed Gull; and
- Wetland & Waterbirds.

4.3.2 SPA - Conservation Objectives

The main conservation objective for the Wexford Harbour and Slobs SPA is:
- To maintain the special conservation interests for this SPA at favourable conservation status: Cormorant; Bewick's Swan; Whooper Swan; Greenland White-fronted Goose; Light-bellied Brent Goose; Shelduck; Teal; Scaup; Red-breasted Merganser; Oystercatcher; Golden Plover; Grey Plover; Lapwing; Sanderling; Black-tailed Godwit; Bar-tailed Godwit; Curlew; Black-headed Gull; Little Tern ; 20,000 wintering waterbirds; Little Grebe; Great Crested Grebe; Grey Heron; Mallard; Wigeon; Pintail; Goldeneye; Hen Harrier; Coot; Knot; Dunlin; Redshank; Lesser Black-backed Gull; Wetland & Waterbirds.

4.4 Designated Conservation Sites in proximity to the Study Area

Tacumshin Lake SAC (Site Code 000709) and SPA (Site Code 004092) as well as Lady's Island Lake pNHA (Site Code 000704), SAC (Site Code 000704) and SPA (Site Code 004009) are located on the south Wexford Coast in excess of 5 km from the study area. These sites are brackish coastal lagoons that support coastal habitats and marine habitats and associated flora and fauna. These designated areas would not be impacted by the proposed development.

4.5 Consultation with NPWS

A consultation meeting was held with NPWS on the 9th March 2010. NPWS outlined the importance of the Slaney River Valley from an ecological perspective and in particular for birds. NPWS highlighted that an Appropriate Assessment would need to be conducted for each of the route options. A consultation letter was also received from the Development Applications Unit of the Department of the Environment, Heritage and Local Government which stated that an Appropriate Assessment would be required.

5. Potential Ecological Impacts and Significance

5.1 Conditions Required to Maintain Site Integrity

In order to maintain site integrity, the conservation objectives for each of the qualifying features must be achieved or measures taken to improve the conditions within the Natura 2000 site. In terms of the Slaney River Valley cSAC and the Wexford Harbour and Slobs SPA, the sensitivities of the cSAC Annex I habitats and Annex II species for which the site has been designated have to be determined in order that those conditions which aid in sustaining those habitats and populations are maintained. Section 5.2 details the primary sensitivities of each of the qualifying features. More detailed accounts for each qualifying feature are presented in Appendix B. Similarly, the sensitivities of the qualifying features and Special Conservation Interests (SCIs) for the Wexford Harbour and Slobs SPA have to be determined and are detailed in Section 5.2. The sensitivities of the qualifying features for the Wexford Harbour and Slobs SPA are the water birds for which the site was selected and the wetland habitats on which these birds depend.

5.2 Sensitivity of Qualifying Features

Detailed under each qualifying feature hereunder is a description of the habitat in Ireland and its current status, including the threats and sensitivities to change of each qualifying features.

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

This habitat is found on both waterlogged and non-waterlogged soils in Ireland and often forms mosaics with other woodland habitats. The canopy species is sessile oak; however, pedunculate oak may also be present or hybrids. Old sessile oak woodlands are particularly susceptible to fragmentation and edge effects and have been significantly altered through human activity. In addition, under grazing and over grazing by mammals impacts on the understorey species. Invasive species also impact on this habitat and result in lower numbers of regenerating canopy and sub-canopy native species.

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

This habitat in Ireland has been heavily modified by thousands of years of human activity and only fragmented examples of this woodland remain. In Ireland, the broader interpretation of this Annex I habitat includes riparian alluvial willow woodland in addition to riparian alder ash woodland. This habitat is sensitive to under and over grazing which impacts on characteristic understorey species and natural regeneration. Invasive species may also impact on natural regeneration of canopy and sub-canopy species. This habitat is also sensitive to changes in the water table level which would lead to drying of the soils which would be reflected in changes in species composition.

Estuaries (1130)

Estuaries can be described as the downstream part of a river valley which is subject to the tide and extends from the limit of brackish waters and there is generally a substantial freshwater influence. Adverse impacts arising from aquaculture, fishing, coastal development and water pollution are considered the principal threats on this habitat.

Mudflats and sandflats not covered by seawater at low tide (1140)

In Ireland this habitat type is submerged at high tide and exposed at low tide and is normally associated with inlets, estuaries or shallow bays. This habitat supports diverse communities of invertebrates, algae and eel grass. The high diversity of invertebrates in this habitat often provides an important food source for waders and wildfowl. This habitat often occurs as part of a mosaic of habitats in estuaries and shallow inlets and bays. It is considered that aquaculture, professional fishing, bait digging, removal of fauna, reclamation of land, coastal protection works and invasion by a species are the most serious pressures and threats to this habitat in Ireland.

Twaite shad (*Alosa fallax*)

The Central Regional Fisheries Board have confirmed the presence of twaite and allis shad, in addition to hybrids, in the SAC waters of the Slaney, Barrow-Nore, Suir and Munster Blackwater. Twaite shad are considered to be highly sensitive to pollution and this is thought to be a factor in their disappearance from many watercourses, although pollution in combination with heavy metals is considered to be a particularly significant threat.

River lamprey (*Lampetra fluviatilis*), Brook lamprey (*Lampetra planeri*) and Sea lamprey (*Petromyzon marinus*)

Lamprey species are susceptible to disturbance and pollution at any stage during the life cycle. They are most often disturbed during spawning, when the normally nocturnal adults will openly congregate, often in shallow water and can be vulnerable to a number of natural predators. After spawning the eggs can be disturbed during incubation and the juveniles in silt beds are also vulnerable to disturbance.

It is generally accepted that deterioration in water quality is likely to impact lamprey survival. Poor water quality can act as a barrier to migration. Both spawning and nursery habitats can be adversely affected by the direct toxic impacts of pollution from agriculture, industry, road and other hard surface run-off, and from the smothering effect of increased suspended solids and from algae and bacterial production resulting from any subsequent eutrophication. Eutrophication may also result in anoxic conditions within the larval burrows which, if persistent for more than a few hours, require the larvae to evacuate or die.

Atlantic salmon (Salmo salar)

Salmon are susceptible to disturbance and pollution at any stage during the life cycle. They are most often disturbed during spawning, when the adults will openly congregate, often in shallow water and can be vulnerable to a number of natural predators. After spawning the eggs can be disturbed during incubation and the juveniles are also vulnerable to disturbance.

Salmon require very good water quality, typical of that found in upland streams and spring-fed chalk streams and are therefore, susceptible to deteriorating water quality as a result of both direct point-source discharges and diffuse or non-point-source pollution.

Otter (Lutra lutra)

Otters have not been shown to be particularly sensitive to pollution, unless the pollution comprises toxic chemicals such as polychlorinated biphenols, however, it is also clear from the experience in Britain that

when water quality and terrestrial habitat needs are met, this species is capable of strong and sustained population expansion.

Other wetland habitats important for birds

Within the Natura 2000 sites there are extensive reed beds present which are important for bird species for which the SPA has been designated. The fringing reed communities within the study area support Sea Club-rush (*Scirpus maritimus*), Grey Club-rush (*S. tabernaemontani*) and abundant Common Reed (*Phragmites australis*). Other species occurring are Bulrush (*Typha latifolia*), Reed Canary-grass (Phalaris *arundinacea*) and Branched Bur-reed (*Sparganium erectum*).

Bird Species

Bird species present within the SPA and for which the SPA has been designated are considered together, as their sensitivities relate primarily to available feeding and roosting habitat. Within the Natura 2000 sites, the mudflats are a primary source of food for migrant and resident birds and the sensitivities of this habitat are described above. In terms of roosting and breeding habitat within the Natura 2000 sites, reedbeds and woodland are of importance for birds. Birds are particularly susceptible to noise impacts and may avoid roosting or feeding in an area as a result of increased noise. In addition, any impacts on water quality or water levels would have the potential to impact on feeding areas for birds.

5.3 RCS Stage 1 AA – Route option corridor Significance Test

Table 5.1 details the results of the Stage 1 Screening Assessment of the development on the Slaney River Valley cSAC and the Wexford Harbour and Slobs SPA. It should be noted that this assessment is based on a 300m corridor for each route option and does not include mitigation measures, as per the EC and DEHLG guidance on Appropriate Assessments.

Table 5.1: Stage 1 Screening Appropriate Assessment

Plan Background	
Brief description of the project or plan	Provision of new national road between Oilgate Co. Wexford and Rosslare, Co. Wexford. Eight feasible route option corridors with crossovers were developed for the purpose of the Stage 1 assessment, consisting of a total of 187 possible route option combinations. For the purpose of the stage 2 assessment, these route options were refined to 17 potential route options. The AA assessment was undertaken at the Stage 1 assessment, with a slight modification for the purpose of the Stage 2 assessment. Eight of the route options require a crossing of the Slaney River Valley cSAC and the Wexford Harbour and Slobs SPA. The Do-minimum and Management options do not require a new crossing of the Slaney River Valley cSAC and the Wexford Harbour and Slobs SPA.

Natura 2000 Site	
Brief description of the Natura 2000 site	Slaney River Valley cSAC: The site is a cSAC for the following Annex I habitats: ■ Old sessile oak woods with *Ilex* and *Blechnum* in British Isles (91A0); ■ Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) (91E0); ■ Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260); ■ Estuaries (1130); and ■ Mudflats and sandflats not covered by seawater at low tide (1140) The is a cSAC selected for the following species: ■ Twaite shad (*Alsa fallax)* ■ River lamprey *(Lampetra fluviatilis)* ■ Brook lamprey *(Lampetra planeri)* ■ *Sea lamprey (Petromyzon marinus)* ■ Atlantic salmon *(Salmo salar)* ■ Freshwater pearl mussel *(Margaritifera margaritifera)* ■ Otter (*Lutra lutra*)
Brief description of the Natura 2000 site	Wexford Harbour and Slobs SPA: The site is selected as an SPA for the following species: ■ Cormorant; ■ Bewick's Swan; ■ Whooper Swan; ■ Greenland White-fronted Goose; ■ Light-bellied Brent Goose; ■ Shelduck; ■ Teal; ■ Scaup; ■ Red-breasted Merganser; ■ Oystercatcher; ■ Golden Plover; ■ Grey Plover; ■ Lapwing; ■ Sanderling; ■ Black-tailed Godwit; ■ Bar-tailed Godwit; ■ Curlew; ■ Black-headed Gull; ■ Little Tern; and ■ 20,000 wintering waterbirds.

Natura 2000 Site	
	Additional Special Conservation Interests (SCIs) are: ■ Little Grebe; ■ Great Crested Grebe; ■ Grey Heron; ■ Mallard; ■ Wigeon; ■ Pintail; ■ Goldeneye; ■ Hen Harrier; ■ Coot; ■ Knot; ■ Dunlin; ■ Redshank; ■ Lesser Black-backed Gull; and ■ Wetland & Waterbirds.

Assessment Criteria	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	There is potential for direct impacts on the cSAC and SPA due to the provision of a new bridge crossing of the River Slaney. Each of the eight route option corridors (A-H) will involve a new crossing of the River Slaney. The Do-minimum and Management options will not require a new bridge crossing of the River Slaney and therefore impacts will not arise as a result of these route option corridors. There is also potential for direct impacts on the cSAC in the townland of Kyle by three of the Stage 1 route option corridors (D, E and G). The proposed route options also have the potential to indirectly impact on the cSAC through a crossing of a tributary of the cSAC, the College Stream, which discharges into the cSAC ca. 650m downstream of the crossing points of route options A and B; ca. 1km downstream of C, D and F and ca. 1.5km downstream of route option corridor E.
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of: ■ Size and scale ■ Land-take ■ Distance from the Natura 2000 site or key features of the site	As a result of the proposed development potential impacts on bird species in the SPA may include the following: ■ Local air pollution effects; ■ Disturbance effects of artificial lighting on birds (and their insect prey); ■ Noise pollution impacts on birds; ■ Disturbance due to increased human presence; ■ Foraging and roosting habitat loss from access routes and lay-down areas;

Assessment Criteria	
■ Resource requirements (water abstraction etc) ■ Emissions (disposal to land, water or air) ■ Excavation requirements ■ Transportation requirements ■ Duration of construction, operation, decommissioning etc. ■ Other	■ Mortality or injury on site from collisions; ■ Severance and fragmentation of habitat; and ■ Local water pollution effects. In terms of the qualifying features (Annex I habitats and Annex II species) of the cSAC the following are potential impacts associated with the development: ■ Loss of habitat; ■ Habitat fragmentation; ■ Potential Increase of edge effects; ■ Potential interference with aquatic species migration, ■ Interference with mammal movement and fragmentation of linear wildlife corridors; ■ Alteration of flow regime/hydrology; ■ Harmful discharges during construction and operation including surface water run-off, spillages and pollutant releases leading to a deterioration in water quality; ■ Impacts on flood conveyance; ■ Effects of dewatering from cuts can impact on water supplies to nearby waterbodies; ■ Disturbance to aquatic habitats and stream beds from excavations; and ■ Storm water run-off from the new route would be composed of rainwater and contaminants. The contaminants would be mobilised from the surface and boundaries of the road and hard surfaces and would consist of: – Particulate matter such as grit and dust from vehicles; – Organic matter such as leaves, rubbish etc.; – Hydrocarbon residues and heavy metals from badly serviced vehicles etc. and – De-icing agents during certain conditions. There are no known planned or existing plans or projects which would act in combination with this proposed development.
Describe any likely changes to the site arising as a result of: ■ Reduction in habitat area ■ Disturbance to key species ■ Habitat or species fragmentation ■ Reduction in species density ■ Changes in key indicators of conservation value (water quality etc) ■ Climate change	A new bridge crossing of the cSAC and SPA will result in a loss of habitat (terrestrial and aquatic). The bridge crossing may also result in the impediment of protected aquatic species protected under the Habitats Directive from moving along the river. The bridge construction and operation may also result in indirect impacts on water quality due to accidental spillages and runoff.
Describe any likely impacts on the	A reduction in water quality through accidental spillages, runoff

Assessment Criteria	
Natura 2000 site as a whole in terms of: ■ Interference with the key relationships that define the structure of the site ■ Interference with key relationships that define the function of the site.	or increased sedimentation would also impact on the qualifying aquatic species present in the River Slaney. Their food source may be affected and also increased sedimentation may impair salmonids, shad and lamprey species. A reduction in the quality of water may also impact on bird species feeding in the SPA. Fragmentation or destruction of Annex I habitats and wetland habitats as a result of the bridge crossing would be detrimental to the structure and function of the Natura 2000 sites in terms of the habitats and the species (lamprey, Atlantic salmon, twaite shad, otter and bird species) which rely on these habitats for food and shelter.
Provide indicators of significance as a result of the identification of effects set out above in terms of: ■ Loss; ■ Fragmentation; ■ Disruption ■ Disturbance ■ Change to key elements of the site	There would be loss and fragmentation of Annex I habitats within each of the route option corridors; however, there is considerable scope to avoid these habitats through mitigation measures in the design. During construction and operation there is potential to cause disruption to protected aquatic and bird species through noise disturbance, increased light and indirect impacts on water quality. However, there is scope to reduce these impacts in the design of the alignments at the crossing locations.
Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	Without the inclusion of mitigation measures at this stage of the assessment, it is likely that there will be significant adverse impacts on the Natura 2000 sites by the eight route option corridors A – H and therefore, a Stage 2 Appropriate Assessment is required for these route option corridors. As the Do-minimum and Management options do not require a new bridge crossing of the Slaney River Valley cSAC or the Wexford Harbour and Slobs SPA, there are no foreseen impacts of these route option corridors on these designated conservation sites and therefore a Stage 2 Appropriate Assessment is not required for these route options.

6. Comparative Assessment of Route Options

6.1 Introduction

Each of the route options, has the potential to imapact on the Slaney River Valley cSAC and the Wexford Harbour and Slobs SPA. Each of the route options will involve a bridge crossing over the River Slaney, thus potentially impacting both of these Natura 2000 sites. Described hereunder are each of the route options and the qualifying features present within the Natura 2000 sites.

6.2 Description of Qualifying Features Present in Route Options

6.2.1 Bird Species

Table 6.1 lists all the qualifying features and special conservation interests of the Wexford Harbour and Slobs SPA, their conservation status in Ireland, whether they are resident or migrant visitors and the peak counts of each observed during the winter bird surveys (Ecofact, Winter Bird Survey Report 2009-2010) at each of the crossing points of the SPA and cSAC. The crossing points of the River Slaney are considered to be the most significant areas of conservation concern in relation to bird species and the principle conservation interests for the SPA are wintering birds and the wetlands that support these species.

Table 6.1: Bird species observed at route options crossing points.

Qualifying Features and SCIs	Conservation Status	Seasonal Factors	Peak Counts at C1	Peak Counts at C2	Peak Counts at C3	Peak Counts at C4	Peak Counts at C5
Qualifying Features							
Cormorant	Amber	Resident	2	4	1	3	2
Bewick's Swan	Red (Annex I)	Winter migrant	-	-	-	-	-
Whooper Swan	Amber (Annex I)	Winter migrant	-	-	-	-	-
Greenland White-fronted Goose	Amber (Annex I)	Winter migrant	-	-	-	-	-
Light-bellied Brent Goose	Amber	Winter migrant	-	-	-	-	-
Shelduck	Amber	Resident and winter migrant	-	-	2	-	1
Teal	Amber	Resident and winter migrant	128	14	12	182	98
Scaup	Amber	Winter migrant	-	-	-	-	-
Red-breasted Merganser	Green	Resident and winter migrant	-	-	-	-	3
Oystercatcher	Amber	Resident and winter migrant	7	-	-	-	-
Golden Plover	Red (Annex I)	Summer migrant and winter migrant	-	-	-	-	-
Grey Plover	Amber	Winter migrant	-	-	-	-	-
Lapwing	Red	Resident and winter migrant	44	-	-	-	14
Sanderling	Green	Winter migrant	-	-	-	-	-
Black-tailed Godwit	Amber	Winter migrant	17	-	-	-	52

Qualifying Features and SCIs	Conservation Status	Seasonal Factors	Peak Counts at C1	Peak Counts at C2	Peak Counts at C3	Peak Counts at C4	Peak Counts at C5
Bar-tailed Godwit	Amber (Annex I)	Winter migrant	-	-	-	-	-
Curlew	Red	Resident and winter migrant	2	-	5	20	1
Black-headed Gull	Red	Resident	45	10	2	62	150
Little Tern	Amber (Annex I)	Summer migrant	-	-	-	-	-
Additional Special Conservation Interests							
Little Grebe	Amber	Resident	2	-	-	1	7
Great Crested Grebe	Amber	Resident	-	-	-	-	-
Grey Heron	Green	Resident	3	1	3	2	1
Mallard	Green	Resident	18	8	8	26	26
Wigeon	Amber	Winter migrant	-	-	-	4	1
Pintail	Red	Winter migrant	-	-	-	-	-
Goldeneye	Amber	Winter migrant	-	-	-	-	1
Hen Harrier	Amber (Annex I)	Summer migrant and winter migrant	-	-	-	-	-
Coot	Amber	Resident	-	-	-	-	1
Knot	Red	Winter migrant	-	-	-	-	-
Dunlin	Amber (Annex I)	Summer migrant and winter migrant	-	-	-	-	-
Redshank	Red	Resident, winter migrant and passage migrant	20	2	15	1	15
Lesser Black-backed Gull	Amber	Summer migrant and winter migrant	2	-	-	-	3
Other Species Observed							
Great Northern Diver	Green						1
Little Egret	Green		2	1	1	-	4
Mute Swan	Amber		6	3	-	-	19
Water Rail	Amber		-	-	-	1	5
Moorhen	Green		2	-	2	4	8
Snipe	Amber		9	-	1	-	-
Greenshank	Amber		1	-	1	-	-
Kingfisher	Amber		1	-	-	-	-
Common Gull	Amber		1	1	-	-	4
Herring Gull	Amber		-	-	-	-	1
Species Diversity for each route option			**19**	**9**	**12**	**11**	**23**

Table 6.2 and Table 6.3 detail I-Webs counts from two subsites: Ferrycarrig Bridge – Killurin (Deep's) Bridge and from Killurin (Deep's) Bridge – Edermine Bridge. It is important to note that Edermine Bridge is located approximately 3.5 km upstream of the northern-most upstream proposed crossing point at Oilgate.

This I-WeBS sub-site between Killurin Bridge and Edermine Bridge therefore includes bird counts from within and upstream of the current study area, where approximately 5 km of the River Slaney is within the study area (between Killurin Bridge and Oilgate) and 3.5 km of the river upstream of Oilgate is outside of the study area. Counts from this sub-site, therefore, are not fully representative of the wintering birds present within the upstream portion of the study area on the River Slaney. However, the counts themselves do provide a useful indication of the bird species utilising this section of the River.

Table 6.2: I-Webs Counts from Killurin (Deep's) Bridge to Endermine Bridge

I-WeBS

River Slaney

Killurin (Deep's) Bridge - Edermine Bridge

Species	1% National	1% International	1995/96	1996/97	1997/98	1998/99	1999/00	2004/05	2007/08
Mute Swan	110	110	77	194	243	310	301	52	93
Shelduck	150	3,000	3	2	9	7		11	
Wigeon	820	15,000	149	244	8	105	55	119	30
Teal	450	5,000	243	474	213	271	979	525	164
Mallard	380	20,000	154	224	178	236	203	176	74
Pintail	20	600		2					
Shoveler	25	400		8	3				
Pochard	380	3,500	1	10					
Tufted Duck	370	12,000	209	402	13	32	117		
Goldeneye	95	11,500	42	62	32	68	25	16	
Red-breasted Merganser	35	1,700	15	9	1	5		2	
Little Grebe	25	4,000	1	4	1			2	2
Slavonian Grebe		55	1						
Cormorant	140	1,200	54	35	39	54	38	47	26
Little Egret		1,300						8	12
Grey Heron	30	2,700	3	8	9	8	7	10	3
Water Rail					1				2
Moorhen	20		1	3		4	1		
Coot	330	17,500	3						
Golden Plover	1,700	9,300		6					
Lapwing	2,100	20,000	175	920		16			420
Snipe		20,000		8	5	17			
Curlew	550	8,500	100	62		136	101	2	
Redshank	310	3,900	12	38	2	100	131	40	30
Black-headed Gull		20,000	606	234	2,954	2,170	895	870	432
Common Gull		16,000	86	50		50	45	40	58
Lesser Black-backed Gull		4,500	40	45	38	482	570		14
Herring Gull		13,000	1	10	14	50	25	42	5
Great Black-backed Gull		4,800	23	20	2	10	25	1	15
Kingfisher					1				

Source: <Insert Source here or delete this table row>

Table 6.3: I-Webs Counts from Ferrycarrig Bridge to Killurin (Deep's) Bridge

I-WeBS

Ferrycarrig Bridge - Killurin (Deep's) Bridge

Species	1% National	1% International	1995/96	1996/97	1997/98	1998/99	1999/00	2004/05	2007/08
Mute Swan	110	110	8	24	11	3		4	
Shelduck	150	3,000	17	19	1	5	7	6	
Wigeon	820	15,000			16			30	
Teal	450	5,000	125	224	52	81	83	85	560
Mallard	380	20,000	69	48	27	25	81	27	129
Tufted Duck	370	12,000	50	25					
Red-breasted Merganser	35	1,700	3	4			1		
Little Grebe	25	4,000	1	3		1		1	5
Great Crested Grebe	55	3,600	1						
Cormorant	140	1,200	22	73	25	39	35	26	31
Little Egret		1,300		1				6	3
Grey Heron	30	2.700	8	14	18	5	4	4	8
Moorhen	20		1	3		3		3	
Oystercatcher	680	10,200	20	35	1	1			
Lapwing	2,100	20,000	400	500		80		104	20
Snipe		20,000				21			
Black-tailed Godwit	140	470		116					25
Bar-tailed Godwit	160	1,200					1		
Curlew	550	8,500	78	24	18	28	5	30	66
Spotted Redshank		900							2
Greenshank	20	2,300		7		2	4	3	2
Redshank	310	3,900	5	50	32	6	30	22	5
Turnstone	120	1,500			1				
Mediterranean Gull			1						
Black-headed Gull		20,000	745	1,555	1,641	5,030	2,910	1,400	1,398
Common Gull		16,000	60	60	12	145	56	12	95
Lesser Black-backed Gull		4,500	584	1,020	475	1,005	940	350	20
Herring Gull		13,000	61	160	180	450	80	10	4
Great Black-backed Gull		4,800	170	102		111	85	5	4
Kingfisher				1					

Source: <Insert Source here or delete this table row>

6.2.1.1 Crossing Location C1

Directly upstream and downstream of the existing N11 Ferrycarrig Bridge, within this narrow channel, there is limited suitable habitat for wintering birds. However, within crossing location C1 the River Slaney channel widens to include tidal mudflats of importance for wintering birds. At the upstream end of crossing location C1, the mudflats are most extensive on the southern side of the channel, with additional mudflat recorded from the northern channel. On the downstream side of the proposed route crossing, downstream of Ferrycarrig Bridge, the mudflats were found to be more extensive in area; however, were utilised less by wintering birds during low tide conditions. It should also be noted that at crossing location C1, the existing bridge at Ferrycarrig is already a disturbed habitat in terms of wintering birds.

6.2.1.2 Crossing Location C2

On the northern bank of the River Slaney at the crossing points of crossing location C2, there is limited intertidal mud, while muds on the southern bank are limited to a narrow band bordered by a treeline. The intertidal and riparian habitats at this location were found to be of limited importance for wintering birds and low diversities and abundances were recorded at this crossing point.

6.2.1.3 Crossing Location C3

On the northern bank of the River Slaney at crossing point E there is a narrow band of riparian woodland and scrub along the river corridor. There was no valuable mudflat or reed bed habitat at this location. The southern bank of the Slaney at this crossing point contained some narrow mudflat habitat and reed beds, although this was found to be of low value to wintering birds.

6.2.1.4 Crossing Location C4

The proposed crossing location C4, located downstream of Killurin / Deep's Bridge were found to cross the River Slaney where considerable reed beds have formed on the depositing bend of the river at the southern bank. There is an extensive reed bed adjoining riparian woodland on the northern bank. Mud flat habitats on both the north and south banks at this location were found to be utilised by wintering birds during low tide, while the channel itself and the margins of the reed beds along the river channel were also found to be of importance.

The riparian woodland on both banks at this location are not of significance for wintering birds but are of conservation interest with regard to breeding birds. In addition, the reed bed habitats at this crossing point are considered to provide an important habitat function (food and shelter) for breeding birds during the summer months.

6.2.1.5 Crossing Location C5

This crossing site was found to contain significant wintering bird habitat comprising extensive reed beds and a network of inter-tidal creeks and back channels on the north-eastern bank of the Slaney. The reed beds recorded at this crossing point extend upstream from the crossing point and as the channel narrows the reed beds widen to comprise a significant wildlife habitat of importance for both wintering and breeding birds at Macmine Marsh. The south-western bank was found to be of limited importance for wintering birds with no reed beds and an absence of mudflat habitat.

The significance of the reed bed habitat for wintering birds at the crossing location C5 was found to be comparable to the importance of the mudflat habitat recorded at the upstream and downstream extents of crossing location C1 at Ferrycarrig. However, the reed bed habitat at this upstream crossing point is considered to provide more significant breeding bird habitat during the summer months.

6.2.2 Aquatic Species

The following aquatic species which are qualifying features of the Slaney River Valley cSAC are present within the study area and at each of the crossing points of the River Slaney cSAC and Wexford Harbour and Slobs SPA:

- Sea, river and brook lamprey
- Atlantic salmon

- Otter
- Twaite shad

All species are likely to be present at each of the crossing points of the route options.

Sea, River and Brook Lampreys

All three species of lamprey known to occur in Ireland have been recorded from the River Slaney (Kurtz & Costello, 1999). Brook lamprey and Sea lamprey are listed in Appendix II, while River lamprey is listed in both Appendices II and IV of the Habitats Directive (92:43:EEC). All three species are listed in Appendix III of the Berne Convention.

An extensive sampling programme for lamprey and shad was undertaken in the Slaney SAC, including the estuary by staff of the Southern and Eastern Regional Fisheries Boards (King and Linnane, 2004). The project was undertaken between April 2003 and March 2004. Juvenile river / brook lamprey were found to be widespread in the Slaney SAC upstream of Enniscorthy. Juvenile sea lamprey were also recorded in the Slaney with adult spawning recorded in the main channel of the Slaney. River / brook lamprey were recorded in the Slaney main channel at Deep's Bridge during the current field survey work. No spawning habitat was recorded in the main channel.

Atlantic Salmon

The Atlantic salmon is listed under Annexes II and V of the EU Habitats Directive and Appendix III of the Berne Convention. The River Slaney is considered to be a nationally important salmon fishery. Salmon spawning and nursery areas are present throughout the upper reaches of the River; however, these do not occur within the estuarine and tidal reaches of the study area.

Otter

The otter is a legally protected species under the Wildlife Act, 1976 (and Wildlife (Amendment) Act, 2000). It is listed under Annex II of the EU Habitats Directive and under Annex II of the Berne Convention. Otters can be expected to utilise the estuary and an otter was observed close to the shore along the southern bank of the River Slaney close to crossing location C4. Slides were noted at this area also. Otters are likely to be present and utilising habitat at each of the crossing points of the River Slaney.

Shad

Twaite Shad are among the rarest species of fish breeding in Irish freshwaters and are listed under Annexes II and V of the EU Habitats Directive (1992). This species is also listed in Appendix III of the Bern Convention. Shad have an anadromous life cycle and both twaite and allis shad species have been recorded from the Slaney Estuary. No juvenile shad were taken during the current surveys in the Slaney Estuary. Both twaite and allis shad are likely to occur within the study area in the Slaney Estuary. The status of both shad species is considered to be very vulnerable in the Slaney River SAC.

6.2.3 Habitats

Figures 6.1 to 6.5 illustrate the habitats present at within the cSAC and SPA at each of the route corridor options crossing locations. Figure 6.1 illustrates the habitats present at crossing location C1. Figure 6.2 illustrates the habitats present at crossing location C2 and C3, Figure 6.3 illustrates the habitats present at crossing locations C4, Figure 6.4 illustrates the habitats present at crossing location C5 and Figure 6.5 illustrates habitats present in the townland of Kyle potentially impacted by stage 1 route options D, E and G.

6.2.3.1 Crossing Location C1

North bank of the River Slaney:

At crossing location C1 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the northern bank of the river:

- ***Annex I Habitats present:***
    - WN1 Oak-birch-holly woodland (Annex I habitat 91A0)
- ***Other Habitats Present:***
    - WN2 Oak-ash-hazel woodland / WS1 Scrub / WD1 (Mixed) broadleaved woodland / BL3 Buildings and Artificial Surfaces
    - Sessile oak woodlands (ca. 180m in length within route option A) are present on the northern bank (west of the existing N11) of route option A crossing point of the River Slaney. At this location there is a mosaic of WN1 (Annex I habitat 91A0) and WN2 due to the presence of ash also being dominant in the canopy and holly present in the understorey. This area of woodland is approximately 3800m^2 in area.
    - Also contained in this area is an area of gorse scrub which is also contained within the cSAC. Understorey species include willow, gorse, bramble and holly with a good cover of lichens and bryophytes. To the east of the existing N11 is an area of scrub to the south of Passage Tower and to the north of the tower is an area of mixed broadleaved woodland.

South bank of the River Slaney:

At crossing location C1 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the southern bank of the river:

- ***Annex I Habitats Present:*** None
- ***Other Habitats Present:***
    - WN2 – Oak-ash-hazel woodland; To the south east of the existing Ferrycarrig Bridge is an area of oak-ash-hazel woodland adjacent to the road, however this woodland is infested with the non-native species sycamore and beech and is of poor quality.

- BL3 Buildings and Artificial Surfaces: To the south west of the Ferrycarrig Bridge there is a paved surface contained within the cSAC which is not of any conservation interest.

6.2.3.2 Crossing Location C2

North Bank of River Slaney

At crossing location C2 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the northern bank of the river

- ***Annex I Habitats Present:***
  - WN6 Wet willow-alder-ash woodland / WN1 Oak-birch-holly woodland
- ***Other Habitats Present:***
  - WL2 Treeline: To the north east of crossing location C2 is an area of ca. 4600m^2 of woodland which is contained within the cSAC at this location. The woodland is classified as a mix of WN1 (Annex I habitat 91A0) and WN6 (Annex I priority habitat 91E0) and adjacent to it is a treeline.
  - FS1 Reed and large sedge swamps: Also contained within the cSAC at this location is an area of reed bed (FS1) which is ca. 4900m^2.

South Bank of River Slaney

At crossing location C2 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the southern bank of the river:

- ***Annex I Habitats Present:*** None
- ***Other Habitats Present:***
  - WL2 Treelines: On the southern bank of the River Slaney within crossing location C2 and contained within the cSAC is a treeline (WL2) of oak and sycamore adjacent to the R730 road.
  - FS1 Reed and large sedge swamps: Contained within the cSAC at this location is a small area of reeds (FS1 ca. 4300m^2).

6.2.3.3 Crossing Location C3

North Bank of River Slaney

At crossing location C3 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the northern bank of the river:

- ***Annex I Habitats Present:*** None

- ***Other Habitats Present:***

    - WN5 Riparian woodland: Within the cSAC at route option E there is a riparian strip of woodland which extends for ca. 80m within route option E. The woodland width at this location, contained within the cSAC boundary, ranges from ca. 20-25m deep. Ash is dominant within this riparian strip with oak, beech and willow species also present. This woodland extends to the north west into more extensive woodland. This woodland is classified as riparian woodland at this location due to the narrow extent of woodland. Elements of WN4 (Wet pedunculate oak-ash woodland) exist at this location which is priority woodland under the EU Habitats Directive, however, due to the restricted narrow line of trees contained within the cSAC at this location, it is classified as a riparian strip.

    - WS1 Scrub/ GS4 Wet grassland: Within the cSAC along the shorelines is a narrow band of gorse and grey willow scrub. A small area of wet grassland is also present within the cSAC to the north of the scrub and south of the existing access track for the gun club. Species present include creeping willow, horsetail, soft rush, jointed rush, glaucous sedge, common bird's-foot-trefoil, daisy, dandelion, creeping buttercup, hawksbit and eyebright.

    - WS1 Scrub / GS4 Wet grassland: An area of gorse and willow scrub (WS1) is also present within the cSAC to the north of the area of wet grassland and north of the existing access track.

    - WD1 (Mixed) Broadleaved woodland: An area of mixed broadleaved woodland is present along a stream within the cSAC also within this route option corridor. The area of woodland at this location is ca. 7500m^2. The woodland is classified as WD1 (Mixed Broadleaved Woodland) due to the presence of ash (dominant canopy species) with lime, horse chestnut, hazel, holly, blackthorn and hawthorn. Understorey species include great mullein, bramble, giant hogweed and umbellifers.

South Bank of River Slaney

At crossing location C3 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the southern bank of the river:

- ***Annex I Habitats present:*** None

- ***Other Habitats Present:***

    - WL2 Treelines: A treeline of oak and sycamore is present along the roadside within the cSAC on the southern bank of the River Slaney. The majority of the treeline is 1 tree deep, extending to 3 trees deep towards the south east of route option E.

    - FS1 Reed and large sedge swamps: An extensive area of reedbed is present within route option corridor E at this location and is ca. 26,000 m^2 in size.

6.2.3.4 Crossing Location C4

North Bank of River Slaney

At crossing location C4 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the northern bank of the river:

- ***Annex I Habitats Present:*** None
- ***Other Habitats Present:***
    - WN5 Riparian woodland: A narrow riparian strip of woodland is present within the cSAC adjacent to the reed bed at this location. Grey willow is the dominant species adjacent to the area of reeds to the south, with white willow, ash, oak, alder, elder and blackthorn. Understorey species include hartstongue fern, angelica, giant hogweed, bramble, ferns, ivy, meadowsweet, ragged robin, great mullein, nettle, dock and umbellifers.
    - FS1 Reed and large sedge swamps:An extensive area of reed bed is present in this area which is a valuble habitat for feeding and roosting birds..
    - WD1 (Mixed) Broadleaved woodland: A small area of mixed broadleaved woodland is present within the cSAC. Grey willow is the dominant species adjacent to the reed bed at this location. Further north species present include beech, ash, sycamore, conifers, grey willow, blackthorn and holly.

South Bank of River Slaney

At crossing location C4 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the southern bank of the river:

- ***Annex I Habitats Present:*** None
- ***Other Habitats Present:***
    - WN5 Riparian woodland:A narrow strip of riparian woodland is present within the cSAC along the southern bank of the River Slaney. Oak is the dominant species along the water's edge with ash, sycamore, beech, holly, hawthorn and hazel more prevalent further up along the bank. At the water's edge the following species were present: oak, willow, sweet chestnut, holly, Himalayan balsam, gorse, blackthorn and bramble.
    - FS1 Reed and large sedge swamps: Adjacent to this riparian woodland is an area of reed bed ca. 9510m^2 in area.

6.2.3.5 Crossing Location C5

North Bank of River Slaney

At crossing location C5 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the northern bank of the river:

- ***Annex I Habitats Present:*** None

- ***Other Habitats Present:***

    - WN5 Riparian woodland (including WN6 / WS1 Scrub: The riparian woodland along the northeastern bank of the River Slaney at route option H is ca. 2760m^2 in area. The riparian woodland or willow scrub at this location consists of primarily willow species including grey willow, crack willow, white willow, osier and some alder is also present. Pockets of willow scrub are intermingled with the reeds at this crossing of the River Slaney.

    - FS1 Reed and large sedge swamps: There is an extensive area of reed bed present adjacent to the riparian strip which is of high importance for wintering birds. The reed bed is ca. 41,470m^2 in area at this location.

South Bank of River Slaney

At crossing location C5 there is potential to impact on the following qualifying criteria of the cSAC and SPA on the southern bank of the river:

- ***Annex I Habitats Present:*** None

- ***Other Habitats Present:***

    - WL2 Treelines: On the southern bank of the River Slaney there are treelines adjacent to the railway contained within the cSAC. Species identified from a distant view include gorse, ash, hawthorn and hazel. This treeline extends the full length of the route option corridor to 300m.

6.2.3.6 Kyle

Stage 1 route options D,E & G potentially impact a small area of the designated cSAC in the townland of Kyle. These route options have potential to impact on a number of qualifying criteria in the area as detailed below:

Annex I Habitats Present: None

Other Habitats Present:

- WN2 Oak-ash-hazel woodland: In the townland of Kyle, stage 1 route options D, E & G intersects with the Slaney River Valley cSAC. The habitat at this location is WN2 and GS4, with oak and ash being the dominant canopy species. Beech is also present in the canopy. Understorey species are mixed with hazel, holly, hawthorn and alder present in places. This area of woodland is ca. 5300m^2.

- GS4 Wet grassland: The wet grassland is characterised by rushes, however, this area has been cleared in places and drained, thus more resembling GA1 Improved agricultural grassland.

6.3 Potential Changes as a Result of the Development

As a result of the proposed development potential impacts on bird species during construction are likely to be:

- Local air pollution effects;
- Disturbance effects of artificial lighting on birds (and their insect prey);
- Noise pollution impacts on birds;
- Disturbance due to increased human presence;
- Foraging and roosting habitat loss from access routes and lay-down areas;
- Mortality or injury on site;
- Severance and fragmentation of habitat; and
- Local water pollution effects.

In terms of the qualifying features (Annex I habitats and Annex II species) of the cSAC the following are general potential impacts associated with the construction of the development:

- Loss of habitat;
- Habitat fragmentation;
- Increase of edge effects;
- Interference with aquatic species migration,
- Interference with mammal movement and fragmentation of linear wildlife corridors;
- Alteration of flow regime/hydrology;
- Harmful discharges during construction and operation including surface water run-off, spillages and pollutant releases leading to a deterioration in water quality;
- Impacts on flood conveyance;
- Effects of dewatering from cuts can impact on water supplies to nearby waterbodies;
- Disturbance to aquatic habitats and stream beds from excavations; and
- Storm water run-off from the new route would be composed of rainwater and contaminants. The contaminants would be mobilised from the surface and boundaries of the road and hard surfaces and would consist of:
  - Particulate matter such as grit and dust from vehicles;
  - Organic matter such as leaves, rubbish etc.;
  - Hydrocarbon residues and heavy metals from badly serviced vehicles etc. and
  - De-icing agents during certain conditions.

In accordance with the ‘Guidelines for Assessment of Ecological Impacts of National Road Schemes’ (NRA 2009), many of these impacts can be minimised by applying sound design principles to the structures and by following good work practices during their construction.

7. Comparative Assessment Conclusions

The comparative assessment focussed on the potential impacts affecting the key qualifying features of the Slaney River Valley cSAC and Wexford Harbour and Slobs SPA. The preceding text describes each the species and habitats within the cSAC and SPA which would be affected by each of the route options. Table 6.4 below summarises the key findings. Species and habitats are described according to presence and absence. Bird diversity was assessed on a scale from low – high due to counts available at each of the crossing points and likewise bird roosting and feeding habitat is assessed based on a scale of low to high.

Table 7.1: Qualifying Features within Crossing Locations.

Qualifying Features	C!	C2	C3	C4	C5
Bird species and diverisity (low – high)	High	Low	Moderate	Moderate	High
Bird roosting and feeding wetland habitat quality (low – high)	High	Low	Low	High (extensive reed beds)	High (extensive reed beds)
River, Brook and Sea Lamprey	Present	Present	Present	Present	Present
Atlantic salmon	Present	Present	Present	Present	Present
Twaite Shad	Present	Present	Present	Present	Present
Otter	Present	Present	Present	Present	Present
Old Sessile Oak Woodlands (91A0)	Present (limited to periphery of corridor)	Present (limited to periphery of corridor)	-	-	-
Alluvial woodlands (91E0) (Priority Habitat)	-	Present (limited to periphery of corridor)	-	-	-
Estuaries (1130)	Present	Present	Present	Present	Present
Mudflats and sandflats (1140)	Present	Limited presence	Limited presence	Present	Limited presence

In terms of comparing each of the crossing locations, all impacts on the qualifying species of the cSAC are the same i.e. brook, river and sea lamprey, twaite shad, Atlantic salmon and otter are present along each of the route options. The impact on the Annex I habitat 'Estuaries' is also the same across each of the route options. Therefore in comparing the route options, the Annex I habitats and the qualifying features of the SPA (birds and their habitats) are comparatively assessed.

It should be noted that in terms of the Annex I habitats, the crossing locations being assessed are 300m in diameter and as the Annex I and Annex I priority terrestrial habitats present within each route option are at the periphery of the corridors, it is considered that these areas can be avoided by the actual alignment and land-take. Table 6.5 details the ranking of each route option based on the impacts on the qualifying features of the cSAC and SPA which due to the reasons stated above is primarily due to the qualifying features of the SPA i.e. wintering birds and their habitats.

Table 7.2: Comparative Assessment of Crossing Locations.

Crossing Option	Ranking	Stage 1 Route Options	Stage 2 Route Options	Comments
Crossing Location 1	High Preference	A, B	Do-min[1], Management Option[1], 104, 106 & 107	Presence of inter-tidal mudflats on the extremity of the area but at crossing location already disturbed by existing bridge crossing.
Crossing Location 2	High Preference	C,D	69,89,108,109,113,115,116,117, 118,119 & 120	Favoured route option due to the limited extent of wintering bird habitat and the limited extent of Annex 1 priority habitat
Crossing Location 3	High Preference	E	132	Favoured route option due to the limited extent of wintering bird habitat and the ability to avoid nearby Annex 1 priority habitat
Crossing Location 4	Low Preference	F&G	N/A	Not a favoured option due to the presence of extensive wintering bird habitat
Crossing Locations 5	Low Preference	H	NA	Least favoured option due to the presence of extensive wintering bird habitat

1 The Do-Min and Management Options cross at cross location 1, but unlike other route options do not require the construction of a new bridge.

As crossing locations 4 and 5 are deemed to have the most significant impacts on the Natura 2000 sites, based on the extensive areas of habitat available for wintering birds, these route options are not considered further. Therefore, route options A – E are examined in more detail hereunder.

7.1 Elements of the Plan Likely to Give Rise to Significant Effects on the Natura 2000 Sites

The crossing locations 1-3 of the Slaney River Valley cSAC and Wexford Harbour and Slobs SPA are likely to significantly impact on the qualifying features and conservation objectives of the designated sites without the inclusion of mitigation measures. In the townland of Kyle, there is potential for indirect impacts on the cSAC by stage 1 route options D and E. There is also potential for indirect impacts on the cSAC in the townland of College due to a crossing of the College Stream which discharges into the cSAC downstream of this location.

7.2 Conservation Objectives of the Natura 2000 Sites

The draft conservation objectives of the Slaney River Valley cSAC area as follows:

- Objective 1: To maintain the Annex I habitats for which the cSAC has been selected at favourable conservation status: Old sessile oak woods with *Ilex* and *Blechnum* in British Isles; Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae); Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation; Estuaries; Mudflats and sandflats not covered by seawater at low tide.
- Objective 2: To maintain the Annex II species for which the cSAC has been selected at favourable conservation status: *Alosa fallax, Lampetra fluviatilis, Lampetra planeri, Petromyzon marinus, Salmo salar, Margaritifera margaritifera, Lutra lutra*
- Objective 3: To maintain the extent, species richness and biodiversity of the entire site
- Objective 4: To establish effective liaison and co-operation with landowners, legal users and relevant authorities.

The draft conservation objectives for the Wexford Harbour and Slobs SPA are as follows:

- To maintain the special conservation interests for this SPA at favourable conservation status: Cormorant; Bewick's Swan; Whooper Swan; Greenland White-fronted Goose; Light-bellied Brent Goose; Shelduck; Teal; Scaup; Red-breasted Merganser; Oystercatcher; Golden Plover; Grey Plover; Lapwing; Sanderling; Black-tailed Godwit; Bar-tailed Godwit; Curlew; Black-headed Gull; Little Tern ; 20,000 wintering waterbirds; Little Grebe; Great Crested Grebe; Grey Heron; Mallard; Wigeon; Pintail; Goldeneye; Hen Harrier; Coot; Knot; Dunlin; Redshank; Lesser Black-backed Gull; Wetland & Waterbirds.

7.3 Description of the crossing locations and their effects on key species and habitats

7.3.1 Crossing Location 1

Figure 7.1 illustrates the habitats present in the Natura 2000 sites and the alignment of the bridge option for the crossing of the River Slaney. The alignment avoids the Annex I habitats old sessile oak woodlands (on the north west bank WN1) and mudflats present upstream and downstream of this location. The habitats that will be affected by this alignment are scrub (WS1) on the north (ca. 1135m^2) and south side (ca. 1120m^2) of the crossing within the cSAC and also a small area of the oak-birch-holly woodland (WN2 ca. 1570m^2) within the cSAC. However, these habitats are not qualifying features of the Natura 2000 sites.

7.3.2 Crossing Location 2

Figure 7.2 illustrates the habitats present in the Natura 2000 sites and the alignment of the bridge option for the crossing of the River Slaney at this location. The alignment avoids the Annex I habitats old sessile oak woodlands (WN1) and alluvial woodlands (WN6) on the northern bank of the River Slaney. The habitats impacted by the alignment are a narrow strip of upper saltmarsh on the northern shore of the River Slaney and a treeline (ca. 85m in length) on the southern shore. These habitats are not qualifying features of the Natura 2000 sites.

7.3.3 Crossing Location 3

Figure 7.2 illustrates the habitats present in the Natura 2000 sites and the alignment of the bridge option for crossing location 3. The alignment avoids the mixed broadleaved woodland (WD1) and wet grassland (GS4) contained within the Natura 2000 site at this location. However, the riparian woodland (WN5 ca. 737m^2) and scrub (WS1 ca. 2057m^2) would be impacted by the alignment. In addition, the reed bed on the southern bank of the River Slaney would be impacted and fragmented as a result of this route option. This crossing location would impact on ca. 8750m^2 of the reed bed habitat at this location and would fragment this habitat.

7.3.4 Kyle

Figure 7.3 illustrates the habitats present in the Natura 2000 site in the townland of Kyle. Stage 1route option corridor D and route option corridor E will avoid the woodland and wet grassland habitats present at this location.

7.3.5 College Stream

Each of the route options A – E has the potential to indirectly impact on the cSAC in the townland of College, as a route crossing of the College Stream will be required. However, at these locations the

College Stream is not a designated cSAC. Provided mitigation measures are put in place as described in Section 7.5 it is not envisaged that there will be adverse effects on the cSAC.

7.3.6 Preferred Crossing Location

The determining factors for selection of a preferred route option corridor are the Annex I habitats and Annex II species of the cSAC that would be impacted by the route options and the bird species and wetland habitat for which the SPA is designated.

Impacts on the Annex II aquatic species: lamprey, Atlantic salmon, twaite shad and otter are deemed to be the same for each route option and impacts on these species can be avoided through mitigation in the design of the bridge and also with best construction practices for the control of pollutants and sediments.

In terms of the Annex I habitat for which the site is selected, the mudflats, old oak woodlands and alluvial woodlands will be avoided by the alignments.

Therefore, the ultimate determining factor is the impact on wintering birds and their habitats within each of the route options. Based on the results of the wintering bird survey (Ecofact, Wintering Bird Survey Report 2009-2010) crossing location 1 is the preferred crossing point of the river due to the mudflat habitat upstream and downstream of the alignment being avoided and also due to the fact that there is already disturbance at this location due to the existing Ferrycarrig Bridge. In addition, edge effects on the priority woodland WN6 at crossing location 2 would also be avoided.

Provided the mitigation measures detailed in Section 7.5 are implemented, it is considered that the integrity of the cSAC and SPA would not be adversely impacted by crossing location 1. However, as described as part of the Stage 1 Appropriate Assessment, the Do-minimum and Management options will not require a new bridge crossing of the Slaney River Valley cSAC or the Wexford Harbour and Slobs SPA and therefore any impacts on these designated sites would be avoided.

7.3.7 Stage 1 Route Options Analysis

As the Do-minimum and Management options do not require a new bridge crossing of the River Slaney and thus avoid impacts on the designated conservation sites and their qualifying features, these are the preferred route option corridors.

As part of the Stage 1 Assessment, the remaining route corridors A – H were assessed and route options A – E were described as being ‘high preference’, however due to a new bridge crossing being required there was potential for impacts on the designated conservation sites.

Field surveys were undertaken at each of the crossing points C1, C2 and C3 (corresponding to route option corridors A – E). Of these three crossing locations, it was found that C1 would have the least impacts on the designated conservation sites. Important mudflat habitat for birds would be avoided by this crossing point and also the priority woodland present on the northern bank at this crossing location.

It should also be noted that at Crossing C2, the alignment would also avoid the Annex I habitats at this location, however it is considered that due to the existing disturbance at C1 there would be less disturbance to bird species and therefore C1 is favoured over C2.

Overall, the preferred route option corridors are the Do-minimum and Management options due to the fact that a new bridge crossing will not be required at these locations. This is followed in order of preference by route option corridors A and B, followed by C and D and finally route option corridor E.

7.4 Factors affecting site integrity

The preferred Do-minimum and Management options will not require a new bridge crossing of the River Slaney and there will be no impacts on the qualifying features of the Slaney River Valley cSAC and Wexford Harbour and Slobs SPA and thus will not affect the integrity of these designated sites.

Of the route option corridors A – H, route option corridors A and B would be preferred. As this crossing location avoids Annex I habitats and has the least impact on bird species as outlined above, it is deemed that the site integrity will not be affected by these route option corridors. There will be a minor loss of habitats contained within the SAC. A small area of scrub will be lost on the northern and southern bank of the River Slaney and a small area of oak-ash-hazel woodland (WN2) will also be lost on the southern bank of the River Slaney, however, these are not qualifying features of the cSAC or SPA. There will be no impact on bird habitat at this location as the mudflats important for birds are located upstream and downstream of this location.

There is potential for impacts on Annex II species arising from the construction and operation of the development through water pollution events. Water pollution could result in a reduction in species diversity and density, however, provided mitigation measures as outlined in Section 7.5 are implemented there will be no adverse affect on site integrity.

7.5 Mitigation Measures

In terms of bird species, construction of the bridge should take place outside of the bird wintering season (October to March) to avoid impacts on wintering birds. Lighting should be minimised where possible and any lighting fixtures shall have a downward spill. Noise limits shall be adhered to in order that disturbance to bird species is minimised.

The alignment of the preferred route options A and B avoids Annex I habitats and habitats important for bird species in the SPA.

In terms of aquatic species, detailed planning and design of all watercourse crossings would be carried out in consultation with the Eastern Regional Fisheries Board. Where appropriate, the National Parks and Wildlife Service (NPWS) would be consulted in relation to requirements for protected freshwater and marine species listed in Annex II of the EU Habitats Directive. No instream works should be carried out during the period between spawning and the emergence of salmonid fry (October-April inclusive). No lamprey or shad spawning areas were identified in the River Slaney during the current survey, however, these species are present within the channel and are sensitive to water pollution events. Temporary impacts during construction will be mitigated by sensitive construction techniques. Careful construction practices would be used when working near waters following the guidelines prepared by the Eastern Regional Fisheries Board*: Requirements for the Protection of Fisheries Habitat During Construction and Development Works at River Sites* .and the NRA guidance document *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*. Measures would include:

- proper delivery, storage and usage of materials;
- use of wheel washing facilities;
- construction of bunds around site compounds;

- haul routes; and
- management of site drainage including the use of interceptors, settlement tanks, ponds or filters.

The pollution impacts of road runoff, such as heavy metals, oil/diesel, and particulates are cumulative with other developments within each catchment and would be minimised as far as practicable. Appropriate road drainage systems shall be installed, particularly close to sensitive receptors e.g. oil/water separators, gully pots, catch pits, sedimentation tanks, and lined storage ponds, as necessary.

Provided that these mitigation measures and best practice guidelines are put in place and adhered to, the Eastern Regional Fisheries Board and NPWS are consulted with regard to the design and construction of the bridge crossing there shall be no deterioration in water quality in the Slaney River Valley cSAC or significant impacts on birds and their habitats in the Wexford Harbour and Slobs SPA.

7.6 Conclusions

Provided that the mitigation measures and best practice guidelines are put in place and fully implemented, it is concluded that there shall be no adverse effects on the integrity of the Slaney River Valley cSAC and Wexford Harbour and Slobs SPA as a result of the Do-minimum and Management options which are the preferred route option corridors. Of the route corridor options A – E, it is considered that route corridor options A, B, C and D would not affect the integrity of the designated sites provided that mitigation measures are implemented in full. Of these route options, A and B are favoured over C and D due to disturbance being already present at crossing location C1.

Appendices

Appendix A – Site Synopses

Site name: Slaney River Valley

Site code: 000781

This site comprises the freshwater stretches of the Slaney as far as the Wicklow Mountains; a number of tributaries the larger of which include the Bann, Boro, Glasha, Clody, Derry, Derreen, Douglas and Carrigower Rivers; the estuary at Ferrycarrig and Wexford Harbour. The site flows through the counties of Wicklow, Wexford and Carlow. Towns along the site but not in it are Baltinglass, Hacketstown, Tinahely, Tullow, Bunclody, Camolin, Enniscorthy and Wexford. The River is up to 100 m wide in places and is tidal at the southern end from Edermine Bridge below Enniscorthy. In the upper and central regions almost as far as the confluence with the Derry River the geology consists of granite. Above Kilcarry Bridge, the Slaney has cut a gorge into the granite plain. The Derry and Bann Rivers are bounded by a narrow line of uplands which corresponds to schist outcrops. Where these tributaries cut through this belt of hard rocks they have carved deep gorges, more than two miles long at Tinahely and Shillelagh. South of Kildavin the Slaney flows through an area of Ordovician slates and grits.

The site is a candidate SAC selected for alluvial wet woodlands, a priority habitat on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for floating River vegetation, estuaries, tidal mudflats and old oak woodlands, all habitats listed on Annex I of the E.U. Habitats Directive. The site is further selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Twaite Shad, Atlantic salmon and Otter.

Floating River vegetation is found along much of the freshwater stretches within the site. Species present here include Pond Water-crowfoot (*Ranunculus peltatus*), Water-crowfoot (*Ranunculus* spp.), Canadian Pondweed (*Elodea canadensis*), Broad-leaved Pondweed (*Potamogeton natans*), Water Milfoil (*Myriophyllum* spp.), Common Club-rush (*Scirpus lacustris*), Water-starwort (*Callitriche* spp.), Hemlock Water-dropwort, Fine-leaved Waterdropwort (*Oenanthe aquatica*), Common Duckweed (*Lemna minor*), Yellow Water-lily (*Nuphar lutea*), Unbranched Bur-reed (*Sparganium emersum*) and the moss *Fontinalis antipyretica*. Two rare aquatic plant species have been recorded in this site: Short-leaved Water-starwort (*Callitriche truncata*), a very rare, small aquatic herb found nowhere else in Ireland; and Opposite-leaved Pondweed (*Groenlandia densa*), a species that is legally protected under the Flora Protection Order, 1999.

Good examples of wet woodland are found associated with Macmine marshes, along banks of the Slaney and its tributaries and within reed swamps. Grey Willow (*Salix cinerea*) scrub and pockets of wet woodland dominated by Alder (*Alnus glutinosa*) have become established in places. Ash (*Fraxinus excelsior*) and Birch (*Betula pubescens*) are common in the latter and the ground flora is typical of wet woodland with Meadowsweet (*Filipendula ulmaria*), Angelica (*Angelica sylvestris*), Yellow Iris, Horsetail (*Equisetum* spp.) and occasional tussocks of Greater Tussock-sedge (*Carex paniculata*). These woodlands have been described as two types: one is quite eutrophic, is dominated by Willow and is subject to a tidal influence. The other is flushed or spring-fed subject to waterlogging but not to flooding and is dominated by Alder and Ash.

Old oak woodlands are best represented at Tomnafinnoge though patches are present throughout the site. At Tomnafinnoge the wood is dominated by mature, widely spaced Sessile Oak (*Quercus petraea*), which were planted around 1700, with some further planting in 1810. There is now a varied age structure with overmature, mature and young trees; the open canopy permits light to reach the forest floor and encourages natural regeneration of Oak. As well as Oak, the wood includes the occasional Beech (*Fagus sylvatica*), Birch (*Betula* sp.), Rowan (*Sorbus aucuparia*) and Scots Pine (*Pinus sylvestris*).

The shrub layer is well-developed with Hazel (*Corylus avellana*) and Holly (*Ilex aquifolium*) occurring. The ground layer consists of Great Wood-rush (*Luzula sylvatica*) and Bilberry (*Vaccinium myrtillus*), with some Bracken (*Pteridium aquilinum*) and Brambles (*Rubus fruticosus* agg.). Herbaceous species in the ground layer include Primrose (*Primula vulgaris*), Wood-sorrel (*Oxalis acetosella*), Common Cow-wheat (*Melampyrum pratense*) and Bluebell (*Hyacinthoides non-scripta*). Many of the trees carry an epiphytic flora of mosses, Polypody Fern (*Polypodium vulgare*), and lichens such as *Usnea comosa, Evernia prunastri*, *Ramalina* spp. and *Parmelia* spp.

Tomnafinnoge Wood is a remnant of the ancient Shillelagh Oak woods, and it appears that woodland has always been present on the site. In the past, the wood was managed as a Hazel coppice with Oak standards, a common form of woodland management in England but not widely practised in Ireland. The importance of the woodland lies in the size of the trees, their capacity to regenerate, their genetic continuity with ancient woodland and their historic interest. The nearest comparable stands are at Abbeyleix, Co. Laois and Portlaw, Co. Waterford.

Below Enniscorthy there are several areas of woodland with a mixed canopy of Oak, Beech, Sycamore (*Acer pseudoplatanus*), Ash and generally a good diverse ground flora. Near the mouth of the River at Ferrycarrig is a steep south facing slope covered with Oak woodland. Holly and Hazel are the main species in the shrub layer and a species-rich ground flora typical of this type of Oak woodland has abundant ferns - *Dryopteris filix-mas, Polystichum setiferum, Phyllitis scolopendrium* - and mosses - *Thuidium tamariscinum, Mnium hornum, Eurynchium praelongum.* North of Bunclody, the River valley still has a number of dry woodlands though these have mostly been managed by the estates with the introduction of Beech and occasional conifers. The steeper sides are covered in a thick scrub from which taller trees protrude. At the southern end of the site, the Red Data Book species Yellow Archangel (*Lamiastrum galeobdolon*) occurs. Three more Red Data Book species have also been recorded from the site: Basil Thyme (*Acinos arvensis*), Blue Fleabane (*Erigeron acer*) and Small Cudweed (*Filago minima*). A nationally rare species Summer Snowflake (*Leucojum aestivum*) is also found within the site.

Mixed woodlands occur at Carrickduff and Coolaphuca in Bunclody. Oak trees, which make up the greater part of the canopy, were originally planted and at the present time are not regenerating actively. In time, if permitted, the woodland will probably go to Beech. A fair number of Yew (*Taxus baccata*) trees have also reached a large size and these, together with Holly give to the site the aspect of a south-western Oak wood.

The site is considered to contain a very good example of the extreme upper reaches of an estuary. Tidal reedbeds with wet woodland are present in places. The fringing reed communities support Sea Club-rush (*Scirpus maritimus*), Grey Club-rush (*S. tabernaemontani*) and abundant Common Reed (*Phragmites australis*). Other species occurring are Bulrush (*Typha latifolia*), Reed Canary-grass (*Phalaris arundinacea*) and Branched Bur-reed (*Sparganium erectum*). The reed-swamp is extensive around Macmine, where the River widens and there are islands with swamp and marsh vegetation. Further south of Macmine are expanses of intertidal mudflats and sandflats and shingly shore often fringed with a narrow band of salt marsh and brackish vegetation. Narrow shingle beaches up to 10 m wide occur in places along the River banks and are exposed at low tide.

Upslope the shingle is sometimes colonised by Saltmarsh Rush (*Juncus gerardi*), Townsend's Cord-grass (*Spartina townsendii*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Hemlock Water-dropwort (*Oenanthe crocata*) and Himalayan Balsam (*Impatiens glandulifera*).

Wexford Harbour is an extensive, shallow estuary which dries out considerably at low tide exposing large expanses of mudflats and sandflats. The harbour is largely sheltered by the Raven Point to the north and Rosslare Point in the south. Other habitats present within the site include species-rich marsh in which sedges such as *Carex disticha, Carex riparia* and *Carex vesicaria* are common. Among the other species found in this habitat are Yellow Iris (*Iris pseudacorus*), Water Mint (*Mentha aquatica*), Purple Loosestrife (*Lythrum salicaria*) and Soft Rush (*Juncus effusus*). Extensive marshes occur to the west of CastleBridge associated with the tidal areas of the River Sow. The site supports populations of several species listed on Annex II of the EU Habitats Directive including the three Lampreys - Sea Lamprey (*Petromyzon marinus*), River Lamprey (*Lampetra fluviatilis*) and Brook Lamprey (*Lampetra planeri*), Otter (*Lutra lutra*), Salmon (*Salmo salar*), small numbers of Freshwater Pearl Mussel (*Margaritifera margaritifera*) and in the tidal stretches, Twaite Shad (*Alosa fallax fallax*). A survey of the Derreen River in 1995 estimated the population of Freshwater Pearl Mussel at about 3,000 individuals. This is a significant population, especially in the context of eastern Ireland. The Slaney is primarily a spring salmon fishery and is regarded as one of the top Rivers in Ireland for early spring fishing. The upper Slaney and tributary headwaters are very important for spawning.

The site supports important numbers of birds in winter. Little Egret are found annually along the River. This bird is only now beginning to gain a foothold in Ireland and the south-east appears to be its stronghold. Nationally important numbers of Black-tailed Godwit, Teal, Tufted Duck, Mute Swan, Little Grebe and Black-headed Gull are found along the estuarine stretch of the River. The mean of the maximum counts over four winters (1994/98) along the stretch between Enniscorthy and Ferrycarrig is: Little Egret (6), Golden Plover (6), Wigeon (139), Teal (429), Mallard (265), Tufted Duck (171), Lapwing (603), Shelduck (16), Blacktailed Godwit (93), Curlew (81), Red-breasted Merganser (11), Black-headed Gull (3030), Goldeneye (45), Oystercatcher (19), Redshank (65), Lesser Black-backed Gull (727), Herring Gull (179), Common Gull (67), Grey Heron (39), Mute Swan (259) and Little Grebe (17).

Wexford Harbour provides extensive feeding grounds for wading birds and Little Terns, which are listed on Annex I of the E.U. Birds Directive, have bred here in the past. The Reed Warbler, which is a scarce breeding species in Ireland, is regularly found in Macmine Marshes but it is not known whether or not it breeds in the site. The Dipper also occurs on the River. This is a declining species nationally.

The site supports many of the mammal species occurring in Ireland. Those which are listed in the Irish Red Data Book include Pine Marten, Badger, Irish Hare and Daubenton's Bat. Common Frog (*Rana temporaria*), another Red Data Book species, also occurs within the site. Agriculture is the main landuse. Arable crops are important. Improved grassland and silage account for much of the remainder. The spreading of slurry and fertiliser poses a threat to the water quality of this salmonid River and to the populations of Annex II animal species within it. Run-off is undoubtedly occurring, as some of the fields slope steeply directly to the River bank. In addition, cattle have access to the site in places. Fishing is a main tourist attraction along stretches of the Slaney and its tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place. There are some gravel pits along the River below Bunclody and many of these are active. There is a large landfill site adjacent to the River close to Hacketstown and at Killurin. Boating, bait-digging and fishing occur in parts of Wexford Harbour.

Waste water outflows, runoff from intensive agricultural enterprises, a meat factory at Clohamon and a landfill site adjacent to the River and further industrial development upstream in Enniscorthy and in other towns could all have potential adverse impacts on the water quality unless they are carefully managed. The spread of exotic species is reducing the quality of the woodlands.

The site supports populations of several species listed on Annex II of the EU Habitats Directive, and habitats listed on Annex I of this directive, as well as important numbers of wintering wildfowl including some species listed on Annex I of the EU Birds Directive. The presence of wet and broad-leaved woodlands increases the overall habitat diversity and the occurrence of a number of Red Data Book plant and animal species adds further importance to the Slaney River site.

Site name: Wexford Harbour and Slobs SPA

Site code: 004076

Wexford Harbour is the lowermost part of the estuary of the River Slaney, a major River that drains much of the south-east region. The site is divided between the natural estuarine habitats of Wexford Harbour, the reclaimed polders known as the North and South 'Slobs', and the tidal section of the River Slaney. The seaward boundary extends from the Rosslare peninsula in the south to the area just west of The Raven Point in the north. Shallow marine water is a principal habitat, but at low tide extensive areas of intertidal flats are exposed. These vary from rippled sands in exposed areas to sandy-muds in the more sheltered areas, especially at Hopeland and the inner estuary to the west of Wexford Bridge. The flats support a rich macroinvertebrate fauna, including the bivalves Cockle (*Cerastoderma edule*), Baltic Tellin (*Macoma balthica*) and Peppery Furrow-shell (*Scrobicularia plana*), the polychaetes Lugworm (*Arenicola marina*), Catworm (*Nepthys hombergi*) and Ragworm (*Hediste diversicolor*) and the crustacean *Corophium volutator*. Beds of mussels (*Mytilus edulis*) also occur. Salt marshes fringe the intertidal flats, especially in the sheltered areas such as Hopeland and towards Castlebridge. The Slobs are two flat areas of farmland, mainly arable and pasture grassland, empoldered behind 19th century seawalls.

The lands are drained by a network of channels which flow into two central channels, in parts several hundred metres in width. Water from the channels is pumped into the sea with electric pumps. The channels often support swamp vegetation. The River section of the site is extensive, extending to Enniscorthy, a distance of almost 20 km from Wexford town. It is noticeably tidal as far as Edermine Bridge but with tidal influence right up to Enniscorthy. In places, such as the Macmine marshes, it is several hundred metres wide and here reedswamp is well developed

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Bewick's Swan, Whooper Swan, Greenland White-fronted Goose, Lightbellied Brent Goose, Shelduck, Wigeon, Teal, Mallard, Pintail, Scaup, Goldeneye, Red-breasted Merganser, Hen Harrier, Coot, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Knot, Sanderling, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Lesser Black-backed Gull and Little Tern.

The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds. The site is of international importance for several species of waterbirds but also because it regularly supports well in excess of 20,000 waterbirds (average peak of 49,030 for the 5 winters 1996/97-2000/01). Wexford Harbour and Slobs is one of the top three sites in the country for numbers and diversity of wintering birds. The combination of estuarine habitats, including shallow waters for grebes, diving duck and seaduck, and the farmland of the polders, which include freshwater drainage channels, provides optimum feeding and roost areas for a wide range of species. Of particular importance is that it is one of the two most important sites in the world for Greenland White-fronted Goose (9,353) (all given figures for species

are average peaks for the 5 winters 1995/96-1999/00). The geese feed almost entirely within the Slobs and roost at The Raven (a separate SPA). The site also has internationally important populations of Mute Swan (519), Light-bellied Brent Goose (1,469), Bartailed Godwit (1,843) and Black-tailed Godwit (768).

There are at least a further 25 species of wintering waterbirds which occur in numbers of national importance, i.e. Great Crested Grebe (123), Little Grebe (77), Cormorant (443), Whooper Swan (120), Bewick's Swan (191), Shelduck (903), Wigeon (2,838), Gadwall (37), Teal (1,601), Mallard (3,121), Pintail (78), Scaup (416), Goldeneye (151), Red-breasted Merganser (226), Coot (353), Oystercatcher (1,800), Golden Plover (5,590), Grey Plover (1,412), Lapwing (11,944), Knot (566), Sanderling (262), Dunlin (3,037), Curlew (1,924), Redshank (535), Black-headed Gull (6,136) and Lesser Black-backed Gull (1,036). Other species that use the site include Ringed Plover (69), Turnstone (41), Greenshank (12), Shoveler (24), Tufted Duck (114), Pochard (218), Common Gull (100+) and Little Egret. Several of the above populations represent substantial proportions of the national totals, especially Shelduck (6.2%), Scaup (6.6%), Red-breasted Merganser (6.2%), Grey Plover (21.9% and the top site in the country) and Black-headed Gull (6.1%). The Slobs is the most important and indeed one of the few sites in the country which supports a regular flock of Bewick's Swan. Numbers of wintering birds are often swelled by hard weather movements from Britain and Europe, notably Golden Plover and Lapwing.

The site is a regular location for scarce passage waders such as Ruff, Spotted Redshank and Green Sandpiper, as well as Curlew Sandpiper in varying numbers. The rare Wood Sandpiper is seen each year, mainly in autumn. Short-eared Owl and Hen Harrier are regular visitors in small numbers to the Slobs during winter. Of particular note is the presence of the Hen Harrier communal roost site.

The site is important for Little Tern as it has can hold a nationally important breeding colony (30 pairs were recorded in 2000). The Slobs support a nesting colony of Tree Sparrow, a much localised species in Ireland that is listed in the Irish Red Data Book. Another much localised breeding species, Reed Warbler, is well established within the swamp vegetation along the River Slaney and on the South Slob (estimated as at least 10 pairs). A range of duck species breed, including Teal, Tufted Duck and, probably in most years, Shoveler.

The site supports populations of Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Short-leaved Water-starwort (*Callitriche truncata*), both protected, Red Data Book species. The Slobs are well known for their population of Irish Hare. Part of the North Slob is a Nature Reserve and much of this slob is managed for the benefit of the wintering geese. Monitoring of the wintering birds of the Slobs extends back to the 1960s and nowadays there is an ongoing monitoring and research programme. The North Slob has a wildfowl collection and an interpretative centre.

There are no imminent significant threats to the wintering bird populations. In the long-term, however, projected increases in sea level could cause problems in maintaining the Slobs as farmland. In recent times, the South Slob has become less suitable due to changes in landuse, including forestry operations, and a sustained programme of scaring. An increase in the amount of new housing in the vicinity of the North Slob has led to increased levels of disturbance in recent times. Localised reclamation has occurred in Wexford Harbour and any further reclamation of estuarine habitat is undesirable. Aquaculture occurs in Wexford Harbour though it is not known what effects, if any, this has on the bird populations.

Wexford Harbour and Slobs SPA is one of the most important ornithological sites in the country. It is of world importance for Greenland White-fronted Goose, and supports internationally important populations of a further four species (Mute Swan, Light-bellied Brent Goose, Black-tailed Godwit and Bar-tailed Godwit). In addition, it has 25 species of wintering waterbirds with populations of national importance. Also of

significance is that several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Little Egret, Whooper Swan, Bewick's Swan, Greenland White-fronted Goose, Hen Harrier, Golden Plover, Bar-tailed Godwit, Ruff, Wood Sandpiper, Little Tern and Short-eared Owl. The site is an important centre for research, education and tourism.

Appendix B

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

These woodlands in Ireland have been heavily modified and fragmented and no pristine examples of Old Sessile Oak woodlands are present in Ireland. The area and range of old oak woodlands in Ireland has been severely reduced in Ireland over the last 5000 years, however, according to the Conservation Status Assessment Report (CSAR) the current habitat range is described as favourable, while the habitat extent is described as 'unfavourable bad'.

There are three vegetation types recognised for this type of woodland: *Vaccinium myrtillus* vegetation type, *Hedera helix* vegetation type and *scapanietosum* subassociation. In the interpretation manual (Anon. 2003), there are only three character species specified fro old sessile oak woodlands: *Quercus petraea*, *Ilex aquifolium* and *Blechnum* subspecies. This habitat is found on base-poor and acid soils which area waterlogged. However, these woodlands may also occur in localised non-waterlogged areas. Other common trees include downy birch, holly and rowan. In areas where the soils are less acidic, ash and hazel may also be present.

The National Survey of Native Woodlands (NSNW) in Ireland (Perrin *et. al*., 2008) is the most recent survey of these woodlands in Ireland on a national scale and the habitat structure and function of these woodlands was assessed based on the following factors: habitat fragmentation, natural regeneration, stand structure, deadwood and fauna. In Ireland this habitat was found to be highly fragmented with the result that there are now very few specialist species associated with this habitat and an increase in generalist species. This is largely due to the edge effects of fragmentation. Natural regeneration is integral to the function of this habitat and was assessed as being 'unfavourable inadequate' on a national scale due to the low numbers of regenerating oak. Stand structure was found to be 'unfavourable inadequate' also due to the small size of mature oak trees in these woodlands and the higher proportion of younger and smaller trees. Another important function of this habitat is the percentage of deadwood present in the habitat, which provides a substrate for lichens and bryophytes and provides niches for other species. Due to the lack of large deadwood, the factor was assessed as being 'unfavourable inadequate' on a national scale. The final factor assessed as part of this habitat's structure and function was fauna and it was assessed as being 'unfavourable bad'. Overall the structure and function of old sessile oak woodlands is assessed as being 'unfavourable bad'.

Substantive Threats

Threats to old sessile oak woodlands include:

- Over and under grazing – high levels of grazing impacts on natural regeneration and on the diversity of species in the field layer, whereas, low levels or a lack of grazing may result in competetitive species such as *Rubus fruticosus* dominating the field layer which impacts on species diversity and composition.
- Invasive species such as *Rhododendron ponticum, Prunus laurocerasus, Fagus sylvatica and Acer pseudoplatanus*.
- Planting of non-native conifers.
- Felling of native tree species.

References

Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91AO) Conservation Status Assessment Report, (NPWS, 2007).

National Survey of Native Woodlands 2003 – 2008, (Perrin *et. al*., 2008)

A Guide to Habitats in Ireland, (Fossitt, 2000).

Interpretation Manual of European Union Habitats. EUR 25. European Commission, DG Environment, (Anon., 2003).

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

In Ireland the alluvial woodlands have been heavily altered by thousands of years of human activity. Examples of this habitat today consist of highly fragmented samples of the primeval forests that covered significant areas of the island in the past.

There are three regional habitat variations presented in the Interpretation Manual (Anon., 2003) and the most relevant to Ireland is 'Riparian forests of Fraxinus excelsior and Alnus glutinosa, of temperate and Boreal Europe lowland and hill watercourses (44.3: Alno-Padion). However, a broader interpretation of this habitat has been employed in Ireland in which riparia, alluvial willow woodlands have been included also on the basis that they are, or would once have been, associated with alluvial oak-ash woodls. These sites match with a second regional habitat variation 'Arborescent galleries of tall *Salix alba*, *S.fragilis* and *Populus nigra*, along medio-European lowland, hill or sub-montane rivers (44.13: Salicion albae)'. This woodland type is typically dominated by a mixture of willow species including *Salix cinerea, S. alba, S. fragilis* and *S. viminalis* of which only *S. cinerea* is native to Ireland. *Alnus glutinosa* and *Fraxinus excelsior* are generally rare. Examples of this habitat in Ireland include communities that may occur in alluvial and non-alluvial conditions.

Currently this habitat range status is considered to be in a 'favourable' condition. However the habitat extent status is considered to be 'unfavourable bad', mainly due to habitat loss due to drainage and clearance of wetlands.

The habitat structure and function of these woodlands was assessed based on the following factors: habitat fragmentation, natural regeneration, stand structure, deadwood and fauna. Habitat fragmentation was found to be 'unfavourable bad'. In Ireland this habitat was found to be highly fragmented with the result that there are now very few specialist species associated with this habitat and an increase in generalist species. In terms of natural regeneration, the three most common tree species in this habitat area *Fraxinus excelsior*, *Alnus glutinosa* and *Salix cinerea* were found to be young samples and natural regeneration is assessed as being 'unfavourable inadequate'. Stand structure in this habitat was found to be 'unfavourable inadequate' with the three most common tree species being most frequent in smaller size classes. This is possibly due to past clearfelling, selective felling of larger trees, the recent establishment of new woodland on infilling fen peat or it may also reflect unfavourable conditions for the development of large trees, in particular on waterlogged sites. Another important function of this habitat is the percentage of deadwood present in the habitat, which provides a substrate for lichens and bryophytes and provides niches for other species. Due to the lack of large deadwood, the factor was assessed as being 'unfavourable inadequate' on a national scale. The final factor assessed as part of this habitat's structure and function was fauna and it was assessed as being 'unfavourable bad'. Overall the structure and function of old sessile oak woodlands is assessed as being 'unfavourable bad'.

Substantive Threats

Presently the major impacts and threats to this type of habitat are:

- Grazing: although a natural feature of alluvial forests, high levels of grazing can be detrimental. Heavy grazing reduces or precludes natural regeneration and consequently impacts on the species diversity. On the other hand, absence of grazing can be negative as strong competitors can dominate effecting negatively the diversity and species composition.

- Invasive species: these include the *Acer pseudoplatanus, Fagus sylvatica, Rhododendron ponticum, Prunus laurocerasus* and *Cornus sericea*.
- Drainage: this may have a negative effect as it lowers the water table leading to drying out of the soil and possible reduction of flooding. Over time changes in flora and fauna may occur.
- Planting of non-native conifers.
- Felling of native tree species.

References

Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0) Conservation Status Assessment Report (NPWS, 2007).

Interpretation Manual of European Union Habitats. EUR 25. European Commission, DG Environment (Anon., 2003).

Estuaries (1130)

Estuaries can be described as the downstream part of a river valley which is subject to the tide and extends from the limit of brackish waters and there is generally a substantial freshwater influence.

The habitat range is stable on a national level and the conservation assessment is 'favourable'. The habitat extent is also assessed as having 'favourable' conservation status. As estuaries have been poorly sampled in the past, there is currently insufficient data to determine the present structure and function of this habitat on a national basis. Overall, the conservation status of this habitat nationally is 'unfavourable inadequate'.

Typical species of estuaries include the following:

- Wildfowl including Little Tern, Cormorant, Brent goose, Oystercatcher, Dunlin, Bartailed Godwit, Redshank, Turnstone, Pale-bellied brent goose, Great Crested Grebe, Ringed plover, Black guillemots, Sandwich tern, Common tern, Shelduck, Scaup, Goldeneye, Red-breasted merganese, Teal, Greenshank, Mallard, Knot, Golden plover, Greylag goose, Pintail, Grey plover, Wigeon, Black-tailed Godwit, Curlew, Lapwing, Sanderling;
- Invertebrates including bivalves (*Mytilus edulis*), Polychaeta (*Capitella* spp., *Malacoceros* spp., *Hediste diversicolor, Nereis* spp, *Spio* spp., *Magelona* spp), Oligochaetes (*Tubificoides benedii*), Crustacea (*Corophium* spp.);
- Algal communities including *Ulva* spp., *Enteromorpha* spp., *Zostera marina, Pelvetia canaliculata, Fucus cerinoides* and other fucoids, and *Ascophyllum nodosum*; and
- Mammals including harbour seal, grey seal and otter.

Substantive Threats

Threats and pressures on estuarine habitats are detailed hereunder and of these, adverse impacts arising from aquaculture, fishing, coastal development and water pollution are considered the principal threats.

- Aquaculture;
- Recreational fishing;
- Housing development;
- Sewage outflow;
- Industrialisation;
- Autoroutes;
- Port/Marina;
- Motorised sports including boating;
- Water pollution;
- Reclamation of land;
- Drainage;
- Dredging; and
- Invasion of species.

References

Estuaries (1130) Conservation Status Assessment Report (NPWS, 2007).

Mudflats and sandflats not covered by seawater at low tide (1140)

In Ireland this habitat type are submerged at high tide and exposed at low tide and normally associated with inlets, estuaries or shallow bays. This habitat supports diverse communities of invertebrates, algae and eel grass. Mudflats are usually located in the most sheltered areas of the coast where silt is deposited. Sandflats are found on open coast beaches and bays where silt is not deposited due to wave action or strong tidal currents. The high diversity of invertebrates in this habitat often provides an important food source for waders and wildfowl. This habitat often occurs as part of a mosaic of habitats in estuaries and shallow inlets and bays.

In terms of habitat range and habitat area, the conservation assessment is considered to be 'favourable' in both cases at a national level. The structure and function of this habitat in Ireland is considered 'unfavourable-inadequate' due to the lack of work completed on this habitat at a national level. Overall, the conservation status assessment of this habitat nationally is 'unfavourable-inadequate'.

Typical species of this habitat include the following:

- Invertebrate communities such as Polychaeta: *Tubificoides, Capitella, Malacoceros; Arenicola marina, Hediste diversicolor, Lanice conchilega*;
- Bivalvia Molluscs: Abra alba, Mytilus edulis, Cerastoderma edule, Scrobicularia plana, Macoma balthica, Mya arenaria;
- Crustaceans: Talitrus sp, Bathyporeia Corophium spp Echinodermata: Echinocardium cordatum;
- Algal species: Ulva sp., Enteromorpha sp.;
- Angiosperms: Zostera spp.;
- Birds: Pale-bellied Brent Goose (*Branta bernicla hrota*), Oystercatcher (*Haematopus ostralegus*), Dunlin (*Calidris alpina*), Sanderling (*Calidris alba*); Sandwich Tern (*Sterna sandvicensis*), Common Tern (*Sterna hirundo*), Ringed plover (*Charadrius hiaticula*), Bar-tailed Godwit (*Limosa limosa*), Redshank (*Tringa totanus*), Knot (*Calidris canutus*), Golden plover (*Pluvialis apricaria*) may use the areas for either roosting or feeding; and
- Mammals: Harbour seal (*Phoca vitulina*), Grey seal (*Halichoerus grypus*).

Substantive Threats

Threats and pressures on this habitat are detailed hereunder and of these it is considered that aquaculture, professional fishing, bait digging, removal of fauna, reclamation of land, coastal protection works and invasion by a species are the most serious pressures and threats to this habitat in Ireland.

- Aquaculture;
- Professional fishing;
- Bait digging;
- Removal of fauna;
- Aggregate extraction (removal of beach material;
- Industrialisation;
- Port/Marina;
- Communications networks;
- Water Pollution;
- Reclamation of land;
- Coastal protection works; and
- Invasion by a species.

Twaite shad (Alosa fallax)

The twaite shad *Alosa fallax* is a member of the herring family. It has a streamlined body covered with distinct, large, circular scales which form a toothed edge on the lower margin and an adipose membrane which partially covers each eye. Rarely exceeding 40 cm length, twaite shad are usually smaller than allis shad, (30-50cm long). However, the only reliable way of separating the two species is to examine the gills. Twaite shad have only 40-60 gill-rakers (comb-like structures that are used to filter zooplankton) on the first gill arch, whereas allis shad have 90-130.

This species returns from the sea to spawn in spring, usually between April and June, hence the alternative name of 'May fish'. The habitat requirements of twaite shad are not fully understood. On the River Usk and the River Wye, twaite shad are known to spawn at night in a shallow area near deeper pools, in which the fish congregate. The eggs are released into the water column, sinking into the interstices between coarse gravel/cobble substrates. The majority of adults die after spawning, though UK populations appear to have an unusually high proportion of repeat spawners – up to 25%. After hatching the fry develop and slowly drift downstream. Recruitment seems to be highest in warm years, and high flows between May and August may result in fry being washed prematurely out to sea. In Ireland, twaite shad are known to spawn at St. Mullins on the Barrow and there are historical records for spawning at Carrick-on-Suir for the River Suir. King's Island, Cappoquin and Inistioge are the probable focus sites for twaite shad spawning on the Slaney, Blackwater and Nore respectively.

Population declines in many parts of Europe have been attributed to pollution, overfishing and migratory route obstructions. In Ireland, potential threats to shad populations have been identified as interception at sea or during spawning, obstruction to passage in river or estuaries and decline in water quality (King and Linnane, 2004).

Distribution

The twaite shad occurs along most of the west coast of Europe, from southern Norway to the eastern Mediterranean Sea, and in the lower reaches of large accessible rivers along these coasts. Spawning populations have been recorded from Estonia, Germany (especially the Elbe), Britain, Ireland, western France, Spain, Portugal, Morocco, Belgium and the Netherlands (ssp. Alosa f. fallax), southern France and Italy (ssp. Alosa fallax rhodanensis) and much of the eastern Mediterranean (ssp. Alosa fallax nilotica). There are several non-migratory populations of this fish in a few of the larger European lakes, including Como, Garda, Iseo, Lugano, Maggiore and Lough Leane.

With the exception of these isolated populations, the normal habitat of this species is the sea, and the lower reaches of large unpolluted rivers where there is easy access to spawning grounds. In general, populations of twaite shad have declined across Europe, though not as severely as the allis shad, perhaps due to an ability to use spawning sites close to the sea, often in smaller rivers.

In Ireland, although there has been a decline, spawning populations still occur in the rivers Suir, Nore and Barrow, and the Cork Blackwater. A low presence of spawning activity was recorded in the River Suir. Because of this decline, the twaite shad is now given legal protection. It is listed in annexes II and V of the EU Habitats and Species Directive, Appendix III of the Bern Convention. The IUCN Red List considers both species as of 'Least concern' (IUCN, 2009).

In Irish rivers, shad have been recorded 25 km upstream of the top of the tide, but it is likely that they are generally impeded by obstacles such as weirs. Twaite shad normally spawn near the tidal limits.

Life History

Mature fish that have spent most of their lives in the sea stop feeding and move into the estuaries of large rivers, migrating into fresh water during late spring (April to June). Males migrate upstream first, followed by females one or two weeks later. In some of the larger European rivers, allis shad have been known to ascend upstream for several hundred kilometres.

In the breeding areas, shoals of fish accumulate in suitable pools. Spawning, which involves much noisy splashing at the surface as males chase females, takes place at night in flowing water over clean gravel beds. Surviving adults drop downstream to the sea.

The clear eggs are non-adhesive, semi-buoyant and 2.5–4.5 mm in diameter. They are laid above gravely shallows, in water currents between 1 and 1.5 m s-1, and tend to drift downstream, most falling to the bottom and remaining there in crevices until they hatch four to eight days later. Some eggs drift for long distances below the spawning areas, sometimes several tens of kilometres.

The most successful rivers have substantial lengths of tidal channel or estuary downstream of the spawning areas to enable development of the juvenile stages prior to going to sea.

Water Quality Requirements

In the River Thames, pollution, which is thought to have wiped out the population of shad, is much less than formerly. Although some fish species have returned, water quality may still not be good enough for shad, which may be more sensitive to pollution than other estuarine species. Twaite shad is reported as being sensitive to pollution, but few data appear to be available.

The EPA has identified many Irish estuaries as being eutrophic, however, eel, salmon and shad still migrate upstream for spawning. However, there may be critical enrichment levels that trigger oxygen or other conditions that impact adversely on adult or juvenile shad activity and survival. Doherty et al. (2004) state that eutrophication of twaite shad spawning areas could have a critical impact on breeding success. Gravelled areas at spawning sites should be clear of algal growths to prevent smothering of the eggs falling onto the river bed.

Physical Habitat Requirements

Most of the substrates at the twaite shad spawning sites identified in rivers in England and Wales are described as 'gravel'. The spawning habitat of twaite shad in the rivers Wye, Usk, Tywi and Teme comprises a fast-flowing, shallow area of unconsolidated gravel/pebble and/or cobble substrate. The channel structure described for identified spawning sites in England and Wales varies. At one (River Wye at Builth Wells), there are 'shallow shelving banks with a few trees', whereas at others, undercut banks with overhanging trees are present. In-stream vegetation (commonly water crowfoot, Ranunculus spp.) may provide cover at some sites, and at many the surrounding land is pasture.

Little is known about the precise nature of the gravel beds used for spawning by shads. It seems likely, from the position of shad spawning beds at the tails of pools, and the obvious needs of shad eggs for shelter and oxygen, that the requirements are similar to those of brown trout (Salmo trutta).

In summary, the general habitat requirements of shad include larger rivers with a slow to moderate current speed and without significant natural or artificial obstructions in the lower reaches, accessible shallow

gravel beds for spawning, adjacent to slow flowing pools or glides that are not susceptible to strong flushing flows, a relatively unpolluted estuary with a good supply of small crustaceans, especially mysids, moderate flows in spring to allow good penetration into the catchment, followed by low flows and/or warm summer temperatures to stimulate growth.

The following can be considered significant risk factors: dams, barrages, weirs, sluices, etc., even if passable by salmonids, water intakes, especially from power stations or other industrial processes, habitat modification resulting in uniform channel structure, poor water quality, especially in summer and overfishing. In channels where both allis and twaite shad have existed, barrier restrictions may force the two species to breed together and lead to genetic loss through hybridisation. Improvement in fish passage facilities in major Irish channels could permit a spatial, and hence genetic, separation of allis and twaite shad in the same catchment (NPWS, Conservation Status Assessment Report). Possible pressures on shad include leisure fishing. At present, no commercial salmon fishing is permitted in any of the four SAC estuaries in Ireland designated for twaite shad. This may be a benefit to the species, although the number of specimens taken as by-catch appears to have been small.

Relatively little is known about the detailed ecological and habitat requirements of shads, and for this reason it is difficult to define and set absolute targets for favourable condition. In view of the lack of detailed information on the ecological requirements of the species, it is clear that initiatives to restore chemical and physical conditions in the river(s) concerned to those pertaining when shad were more widespread would be sensible.

References

King and Linnane (2004). Irish Wildlife Manuals No. 14. The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. Department of the Environment, Heritage and Local Government.

IUCN (2009). IUCN Red List of Threatened Species. Version 2009.1. <www.iucnredlist.org>. Downloaded on 04 August 2009.

JNCC (2009). 1103 Twaite Shad. www.jncc.gov.uk

Maitland PS and Hatton-Ellis TW (2003). Ecology of the Allis and Twaite Shad. Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough.

River lamprey (Lampetra fluviatilis), Brook lamprey (Lampetra planeri) and Sea lamprey (Petromyzon marinus)

Three lamprey species occur in Ireland: sea lamprey, river lamprey and brook lamprey. All three species are listed under Annex II of the EU Habitats Directive, which requires member states to designate SACs for their protection. The juvenile or ammocoete stages of all three species construct burrows in river sediment and feed on organic material. After metamorphosis, both the river and sea lamprey migrate downstream to the sea, where they feed on fish. Brook lamprey do not migrate and the adults do not feed (Igoe et al, 2004).

An extensive sampling programme for lamprey and shad was undertaken in the Slaney SAC, including the estuary by staff of the Southern and Eastern Regional Fisheries Boards (King and Linnane, 2004). The project was undertaken between April 2003 and March 2004. Juvenile River/brook lamprey were found to be widespread in the Slaney SAC upstream of Enniscorthy. Juvenile sea lamprey were also recorded in the Slaney with spawning of adult sea lamprey recorded in the main channel of the Slaney SAC in low numbers, indicating cause for concern on the status of sea lamprey in the Slaney SAC. Lamprey spawning was found to occur in the freshwater stretches of the River Slaney upstream of Enniscorthy

Brook lamprey are the only non-anadromous, non-parasitic lamprey found in Ireland. As a result of decline in some parts of its European range (Kelly and King, 2001; JNCC 2006) the brook lamprey is listed in Annexes IIa and Va of the EU Habitats Directive. It is also listed in Appendix III of the Bern Convention and as a Long List Species in the UK Biodiversity Action Plan. IUCN lists Lampetra planeri as 'Least Concern'. It is likely that book lamprey occur in most catchments throughout Ireland (Igoe et al, 2004).

River lamprey are found in coastal waters, estuaries and accessible rivers. The species is normally anadromous (spawning in freshwater but completing part of the life cycle in the sea). Pollution or artificial obstacles such as weirs or dams can impede migration. The IUCN lists river lamprey (Lampetra fluviatilis) as 'Least Concern'.

Sea lamprey are the largest of the lamprey species ad are listed as 'Least Concern' by the IUCN. The species occurs in estuaries and easily accessible rivers and is anadromous. Like other species of lamprey, sea lamprey require clean gravel for spawning and marginal silt or sand for the burrowing juvenile ammocoetes.

The information below mainly relates to brook lamprey. However, many of the requirements and potential impacts at stages during the life cycle are appropriate for all three species.

Distribution

Brook lamprey occur only in freshwater in streams and occasionally lakes in northwest Europe, particularly in basins associated with the North and Baltic Seas (Maitland, 2003; JNCC, 2006).

River lamprey are found only in western Europe, where they have a wide distribution from southern Norway to the western Mediterranean.

Sea lamprey have a preference for warmer waters in which to spawn. In comparison to river lamprey, sea lamprey are relatively poor at ascending obstacles to migration and are frequently restricted to the lower reaches of rivers.

Life History

The environmental requirements of brook lamprey relate to life stage (the spawning areas and nursery habitat) therefore an appreciation of life history is crucial when considering potential impacts on brook lamprey populations.

Brook lamprey spawn when the water temperature is in the range of 10-11oC which usually occurs between March and April (Kelly and King, 2001). Metamorphosed adults emerge from the silts in which they burrow and begin migrating upstream to spawning grounds. Suitable spawning grounds contain clean gravel beds in shallow (0.03-0.3 m) possibly shaded waters, with soft marginal silt or sand and where the current is not too strong (O'Connor, 2004). Such areas exist at the lower ends of pools, where the water breaks into a riffle (Maitland, 1980, Maitland and Campbell, 1992) and at eddies or backwaters, on the inside of bends or behind obstructions, where current velocity is below that of the main stream and where organic material tends to accumulate (Hardisty and Potter 1971b).

The spawning/hatching season extends from March or April until June (Kelly and King, 2001; SNH, 2006), after which the young distribute themselves by drifting downstream to suitable areas of silty sand where they burrow and develop for around 6 years before metamorphosing. During this time the larvae filter feed on fine organic particles, such as diatoms and other algae, as well as protozoa and detritus, from the surface of the silt around the mouths of the burrows.

Following metamorphosis the adults migrate upstream, usually nocturnally and possibly to their natal area (Maitland, 2003). Distances travelled vary and may be considerable (Hardisty and Potter 1971b) or be less than 1km (Kelly and King, 2001). However, it is thought to vary with the character of the stream and its gradient (Hardisty and Potter, 1971a). Upstream migration enables the adults to find suitable habitat for spawning whilst also allowing for the downstream drift of the larval population after hatching and during the larval phase into the slower currents and more silted habitats of the mid and lower river reaches (Kelly and King, 2001).

In the British Isles the average life expectancy of the brook lamprey ranges from six to seven years (Maitland, 2004; O'Connor, 2004) with the majority of this time spent in larval form (SNH, 2006; Maitland, 2003; Kelly and King, 2001). The suitability of available habitat is as important to ammocoetes as it is to spawning adults, since the majority of this life stage is spent sedentary within burrows in silt or sand. Ammocoetes possess light sensitive cells in the skin and are negatively phototactic . If disturbed, the ammocoetes will swim around rapidly until finding suitable silt in which to burrow and into which they can disappear in a matter of seconds (Maitland, 2003).

Brook lamprey are most often disturbed during spawning, when the normally nocturnal adults will openly congregate, often in shallow water, and can be vulnerable to a number of natural predators such as fish, birds and mammals. Spawning takes place over a limited period (between March and April) and it is during this time that brook lamprey are at their most sensitive. After spawning the eggs can be disturbed during incubation by physical disturbance to spawning grounds, and the juveniles in silt beds are also vulnerable. Ammocoetes remain present in the nursery areas all year round and are permanently vulnerable to disturbance.

Critical environmental requirements for the brook lamprey relate to suitable water quality and favourable physical conditions.

Water Quality Requirements

The impact of water quality on the brook lamprey has not been comprehensively quantified in the literature, possibly because incidence of poor water quality frequently coincides with poor physical habitat and (in the field at least) the impacts cannot be considered in isolation. Available information relates primarily to oxygen and temperature requirements (Damas, 1950; Potter et al, 1970, 1986; Hill and Potter, 1970; Kelly and King, 2001, Bond, 2003).

It is generally accepted that deterioration in water quality is likely to impact lamprey survival (Bond, 2001; Maitland, 2003; Igoe, et al., 2004; O'Connor, 2004; Reynolds, 2004; SNH, 2006). Poor water quality can act as a barrier to migration. Both spawning and nursery habitats can be adversely affected by the direct toxic impacts of pollution from agriculture, industry, road and other hard surface run-off, and from the smothering effect of increased suspended solids and from algae and bacterial production resulting from any subsequent eutrophication (Bond, 2001). Events such as eutrophication may also result in anoxic conditions within the larval burrows which, if persistent for more than a few hours, require the larvae to evacuate or die (Potter et al., 1970, 1986).

Physical Habitat Requirements

Sites that hold healthy populations of brook lamprey contain clean water and suitable areas of the gravels, silt or sand required for spawning (JNCC, 2006). According to Maitland (2003), the physical requirements of brook lamprey relate to the spawning areas and nursery habitat. Two different types of habitat are required during the brook lamprey's life cycle; therefore the success of the spawning populations is dependant upon sufficient in-stream habitat diversity. The adults breed in pits excavated in clean gravel beds and the juveniles live buried in silt beds, usually at the river edge or behind boulders.

Flow Regime

Brook lamprey have a basic need for suitable water volume to ensure sufficient water quality and quantity and to enable both upstream migration to spawning grounds and downstream dispersal to nursery areas. Spate flows may prove impassable to upstream migrants if they are too strong for the adults to negotiate. Low flows may prevent passage upstream over shallow areas, may exacerbate the impact of poor water quality (Maitland, 2003), increase temperatures and cause desiccation or increase siltation in spawning areas (Bond, 2001).

Gradient and flow characteristics are paramount in determining the location of spawning grounds and nursery areas and the distribution of ammocoetes within the channel. Brook lamprey use both slow and fast flowing areas of the river during their life cycle: adults breed in faster-flowing areas which are sufficiently well-oxygenated to nourish eggs and the juveniles live in reaches with sufficiently slow flowing water to allow deposition of silt and sand. The primary requirement is that both habitats are available and that they are within close proximity of one another. Therefore, if a river is to support brook lamprey it follows that it must be of suitable gradient to provide the diversity of flow regimes.

Whilst attempts have been made at quantifying the specific hydrological requirements of the brook lamprey, there is a lack of both reliable and of recent data, highlighting gaps in the current knowledge base.

Channel Substrate and Structure

Stream gradient, water velocity and substrate composition are intrinsically linked in river systems. The distribution of different substrate types is determined by in channel velocities. As for the hydrological requirements, the size and composition of substrate plays an important role in determining the suitability of spawning and juvenile habitat. The fast flowing areas utilised for spawning are characterised by relatively coarse, clean gravels. The slower flowing juvenile areas are characteristically dominated by fine sediments such as silt and sand.

Substantive Threats

Pressures on the brook lamprey come from water pollution, water resources, land-use and river engineering. Habitat juxtaposition is crucial in allowing brook lamprey to move easily from one habitat to another during their life cycle. Adequate consideration should be given to the need for silt beds in slower-flowing reaches by juveniles when considering the consequences of work affecting the river, as should the need for flows suitable (2 m/s) for upstream migration (Maitland, 2003). Any barrier (chemical or physical) which prevents migration between juvenile habitat and spawning areas and vice versa should be avoided. So too, should any action that widens, deepens and/or straightens the channel or which removes refugia or shading resulting in a reduction in the diversity of habitat available.

References

Bond, L. (2001). Brook, River and Sea Lamprey Action Plan. LIFE Freshwater and Wetland Working Group. 5. 5pp.

Bond, L. (2003). The Endrick Water cSAC Conservation Strategy. Conserving Natura 2000 Rivers. English Nature, Peterborough. 56pp.

Chapman, D.W. (1988). Critical review of variables used to define effects of fines in redds of large salmonids. Transactions of the American Fish Society 117, 1–21.

NPWS. Conservation Status Assessment Report, River Lamprey (Lampetra fluviatilis) 1099 / Brook Lamprey (L. planeri) 1096 and Sea Lamprey (Petromyzon marinum) 1095; www.npws.ie

Crisp, D.T. and Carling, P. (1989). Observations on siting, dimensions and structure of salmonid redds. Journal of Fish Biology 34, 119–134.

Damas, H. (1950). La ponte en aquarium des lamproies fluviatiles et de planer. Ann. Soc. R. Zool. Belg. 81,151–162.

Davies, C.E.; Shelley, J.; Harding, P.T.; McLean, I.F.G.; Gardiner, R. and Peirson, G. (2004). Freshwater Fishes in Britain - the species and their distribution. Project by the CEH, EA and JNCC. Harley Books, 176 pp.

Hardisty, M.W. and Potter, I.C. (1971a). The general biology of adult lampreys. In M.W. Hardisty and I.C. Potter (Eds), The Biology of Lampreys. Vol. 1,1–275. London. Academic Press. 260pp.

Hardisty, M.W. and Potter, I.C. (1971b). The behaviour, ecology and growth of larval lampreys. In M.W. Hardisty and I.C. Potter (Eds), The Biology of Lampreys. Vol. 1. London. Academic Press. 260pp.

Igoe, F.; Quigley, F.; Marnell, F.; Meskell, R.; O'Connor and Byrne, C. (2004). The Sea Lamprey Petromyzon marinus (L), River Lamprey Lampetra fluviatilis (L) and Brook lamprey Lampetra planeri (Bloch) in Ireland. General Biology, Ecology, Distribution and Status with Recommendations for Conservation. Biology and Environment Proceedings of the Royal Academy. 104B, 3, 43-56 (2004) Royal Irish Academy. 464pp.

IUCN (2009). IUCN Red List of Threatened Species. Version 2009.1, www.iucnredlist.org

JNCC (2006). Vertebrate species: fish. 1096 Brook lamprey Lampetra planeri. http://www.jncc.gov.uk

Kelly, F.L and King, J.J. (2001). A review of the ecology and distribution of three lamprey species, Lampetra fluviatilis (L.), Lampetra planeri (bloch) and Petromyzon marinus (L.): A context for conservation and biodiversity considerations in Ireland. Biology and Environment: Proceedings of the Royal Irish Academy, Vol. 101B, 3, 165-185.

King and Linnane (2004). The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. Irish Wildlife Manuals No. 14. Department of the Environment, Heritage and Local Government.

Maitland, P.S. (1980) Review of the ecology of lampreys in Northern Europe. Canadian Journal of Fisheries and Aquatic Sciences. 37, 1944–52.

Maitland, P.S. (1994). The ecology of lampreys (Petromyzonidae) in the Loch Lomond area. Hydrobiologia 290, 105-120.

Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No.5. English Nature, Peterborough. 52pp.

Maitland, P.S. and Campbell, R.N. (1992). Freshwater fishes of the British Isles. HarperCollins, London. 420pp.

O'Connor, W. (2004) A survey of juvenile lamprey populations in the Moy catchment. Irish Wildlife Manuals, No. 15. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Potter, I.C.; Hill, B.J. and Gentleman, S. (1970). Survival and behaviour of ammocoetes at low oxygen tensions. Journal of Experimental Biology. 53, 59–73.

Reynolds, B.; Norris, D.A.; Hilton, J.; Bass, J.A.B. and Hornby. D.D. (2004). The current and potential impact of diffuse pollution on water dependent biodiversity in Wales. Centre for Ecology and Hydrology. Project Number: C02351NEW.

Stuart, T.A. (1953). Spawning migration, reproduction and young stages of loch trout (Salmo trutta L.). HMSO, Edinburgh. 39pp.

Atlantic salmon (Salmo salar)

The following species summary is based on information contained in Hendry and Cragg-Hine (2003), the Joint Nature Conservation Committee website www.jncc.gov.uk and the NPWS Conservation Assessment Report Backing document at www.npws.ie.

Distribution

The Atlantic salmon (Salmo salar) is listed in Annexes II and V of the EU Habitats Directive as a species of European importance. Historically, the species was widely distributed in all countries whose rivers enter the North Atlantic. However, its current distribution has been restricted by anthropogenic effects, particularly man-made barriers to movement, and deterioration in water quality due to urban expansion and changes in agricultural practices. Consequently, the Atlantic salmon has declined or become locally extinct in many of the larger navigable rivers.

The current distribution ranges from Portugal to North America. It includes rivers in Spain, France, the UK, Ireland, Norway, Sweden, Finland and other countries draining into the Baltic, Iceland, Greenland, some Canadian provinces, and the northeast USA.

Life History

Salmon utilise rivers for reproductive and nursery phases, and the marine environment for adult development and rapid growth, migrating from the Atlantic Ocean to fresh water to spawn in areas of rivers with clean gravel. It has the advantage of utilising relatively low-risk spawning sites in rivers and benefiting from the rich resources of the sea to enable rapid growth. After hatching, the young fish develop in fresh water for two to four years before migrating to the sea to mature. Upon returning to the freshwater environment, both males and females undergo morphological changes to the teeth and jaws, and become darker in colour. Salmon spawn in autumn or winter in excavated depressions in the river substrate called ‘redds’. The female produces around 1,100 eggs per kg of body weight; a small female grilse of 2.3 kg will lay about 2,500 eggs, while a large female of 8 kg will lay about 8,800 eggs. The redd is usually covered by materials dug out during the construction of a new one upstream, into which further eggs are shed. On completion of spawning, females drop downstream, while males may remain to spawn with further females.

Water Quality Requirements

Hydrological conditions in rivers can be radically altered by activities such as regulation for flood protection and abstraction for water supply. Land-use change through intensive agriculture and urbanisation can also result in marked effects on flow regimes and increased requirement for flood-prevention measures. These man-induced changes in flow and flood dynamics can alter both the size composition of gravels available for spawning and the depth to which gravels are reworked and redds disrupted. Siltation of spawning gravels is a particularly common risk owing to disturbance in river catchments by activities such as forestry and mining, arable cultivation and intensive livestock-based agriculture. Under natural conditions, most spawning rivers in the UK would have suspended concentrations of sand, fine silt and clay of less than 5 mg l-1 during low flows and may be essentially clear-water rivers.

High concentrations of suspended solids in the water may physically choke fish or disrupt feeding behaviour. The fines smother salmonid eggs by preventing intra-gravel currents and by clogging the

interstices at the surface of the riverbed. This prevents or disrupts alevin emergence and reduces the fitness of the fry and parr, and hence their ability to cope with the natural pressures faced within the riverine environment.

Salmon are susceptible to deteriorating water quality as a result of both direct point-source discharges and diffuse or non-point-source pollution arising from land-use practices or industrialisation. Point discharges from sewage treatment works have come under more stringent control and received significant investment over the last 10 years. Future investment will continue and will be extended to reduce the risks from expanding urbanisation via improved infrastructure design and increased discharge standards. The implementation of the Water Framework Directive is likely to instigate further improvements that will have wider benefits for salmon.

Non-point-source pollutants include nutrients used as fertiliser in agriculture and forestry. For example, afforestation will increase the output of fertilisers such as nitrate and phosphate during initial site preparation, and again during clear-felling operations when soils are disturbed. There is also some evidence from Northern Ireland of an increase in water acidity and toxicity owing to peat drainage, which may have impacted salmon populations.

Large quantities of organic fine sediment or woody logging-debris can reduce oxygen levels by increasing the biochemical oxygen demand (BOD). The effect of BOD is exacerbated by increased water temperature, which reduces the solubility of oxygen and increases microbial activity. Furthermore, increased macrophyte growth as a consequence of eutrophication can lead to oxygen sags due to the respiratory phase during darkness. It is generally recognised that oxygen concentrations should not fall below a single-day mean of 8 mg l-1 for spawning fish, although 5.0–6.5 mg l-1 is acceptable to adult fish at other times.

Flow regime

Both high and low flows are likely to be affected by climate change in the future, with wetter summers and drier winters predicted. Low flows occur naturally during periods of drought, but may be exacerbated by human activities such as river regulation, abstraction, water transfers, large-scale forestry, agriculture and urbanisation. Low flows may result in elevated water temperatures and low dissolved oxygen during summer periods, causing salmon kills. Additional impacts include loss of spawning areas, a reduction in wetted perimeter, loss of juvenile rearing habitat and increased competition via a reduction in the number of territories available. In addition, flows may be insufficient to draw adult fish into the river or to provide plunge pools of sufficient depth beneath obstacles to allow adult salmon to pass.

The movement of gravels during natural or controlled high flows can cause the erosion of spawning beds and the downstream drift of salmon eggs and alevins .This will usually result in high egg and alevin mortality rates. Eggs laid by small salmon are therefore particularly vulnerable to being washed out of redds during high flow.

Physical Habitat Requirements

The principal in-stream physical habitat variables that determine suitability for juvenile salmon are water depth, water velocity, streambed substratum and cover. Typical spawning sites are the transitional areas between pool and riffle where flow is accelerating and depth decreasing, where gravel of suitable coarseness is present and interstices are kept clean by up-welling flow. Salmon fry and parr occupy shallow, fast-flowing water with a moderately coarse substrate with cover. Deep or slow-moving water, particularly when associated with a sand or silt substrate, does not support resident juvenile salmonids.

Suitable cover for juveniles includes areas of deep water, surface turbulence, loose substrate, large rocks and other submerged obstructions, undercut banks, overhanging vegetation, woody debris lodged in the channel, and aquatic vegetation.

The juxtaposition of habitat types is also important. The proximity of juvenile habitat to spawning gravels may be significant to their utilisation. In addition, adults require holding pools immediately downstream of spawning gravels in which they can congregate prior to spawning. Cover for adult salmon waiting to migrate or spawn can be provided by overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water and surface turbulence. Woody debris has been found to provide a significant amount of instream cover for salmon. If the holding pools and spawning areas have little cover, the fish present will be vulnerable to disturbance and predation.

Channel Substrate and structure

Substrate composition and flow are intimately connected in rivers. In general, the faster the water velocity, the coarser or more compacted the substrate. Conversely, fine substrates are associated with low velocities. Thus, in a typical riffle/pool sequence, the coarser substrate will be found in the fastest water at the top of the riffle, while the substrate in the slow-flowing deep pool will contain a high proportion of fine material. The distribution of different substrate types within a river is typically determined by the velocities prevalent during spate conditions.

Pebbly riffles without boulders (substrate particle size predominately 16–64 mm diameter) could be considered to be prime nursery habitat for salmon less than 7 cm long. Young salmon require different substrates according to their size, beginning with shallow riffle areas with pebbles. As they grow, they prefer deeper, faster-flowing water with cobbles or boulders 8–9 cm in length. In-stream cover provided by varied substrate size is important for juvenile salmon. Coarse substrates also provide shelter from high flow velocity, which can be utilised as feeding stations adjacent to faster drift food currents. In chalk streams where substrate size is generally smaller, macrophytes (particularly Ranunculus spp.) provide most of the visual barriers between territories and velocity shelters.

The composition and mean grain size of gravels used by salmon for spawning varies markedly, but typically consists of a mix of cobbles (grain size 22–256 mm), pebbles (2–22 mm) and finer material (< 2 mm).

Overhanging vegetation is important for providing cover for both adult and juvenile salmon. It is also a source of coarse woody debris, which provides habitat for the invertebrates on which salmon feed. The pools provide the deeper holding areas required by adults, the riffles provide the fry and parr habitats, and suitable spawning sites are provided at the point where pool shallows become a riffle and water velocity increases. In natural situations, pool/riffle sequences typically repeat at intervals of five to nine channel widths. However, many river channels have been extensively modified for land drainage and flood defence, and the characteristic pool/riffle sequence with its attendant habitat diversity has often been lost. River sections modified in this way might therefore be considered for restoration to a more natural habitat, thus enhancing production of juvenile salmon.

References

http://www.jncc.gov.uk/ProtectedSites/SACselection/species.asp?FeatureIntCode=S1106

Hendry K & Cragg-Hine D (2003). Ecology of the Atlantic Salmon. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough.

Conservation Status Assessment Report, Atlantic Salmon (Salmo salar L.) (1106); www.npws.ie

Otter (Lutra lutra)

The following species description is based on information on the Joint Nature Conservation Committee website www.jncc.gov.uk and the NPWS Conservation Status Assessment Report at www.npws.ie.

Distribution

The Eurasian otter population of Western Europe underwent a widespread decline during the 20th century. The decline, and subsequent recovery, has been well documented in the UK, although less historical information is available for most other countries.

The situation in Europe was reviewed during the period of decline, showing that otters were rare or extinct in much of central Europe in a broad band extending from Italy across to central Spain in the south up to Sweden and southern Norway. 'Widespread' populations existed mainly in western areas (Portugal, Ireland, Scotland, and parts of Spain, France, Wales and England) or eastern areas (from Finland through to Greece).

A recent review found evidence of a recovery. This showed that, although European populations were still considered healthy and widespread in only a third of the 37 countries for which data were available, the number where they were believed to be increasing had gone up from 28% to 38%. The proportion where otters were believed to be threatened, declining, very rare or extinct had gone down from 40% to 22%.

Since 1977, as a result of a series of national otter surveys, substantial parts of England, Wales and Scotland have been surveyed three times, Ireland once and parts of it twice. In England and Ireland alternate 50 km squares were searched, in Wales and Scotland the whole land area was covered. These surveys involved recording the presence or absence of otter signs (usually their faeces, known as spraints) according to a protocol which has been widely used in Europe. Spraint surveys only provide information on distribution, rather than estimates of the population.

Water Quality Requirements

Within the range of natural values, water chemistry has little impact on otters other than by affecting food supply. For example, moderate eutrophication may benefit otters by leading to an increase in the abundance of certain fish, although excessive eutrophication is detrimental when it leads to the reverse effect. Otters are not directly affected by pH values within normal ranges, but where acid rain leads to excessive acidity in watercourses, it can have an adverse effect on food supply.

Physical Habitat Requirements

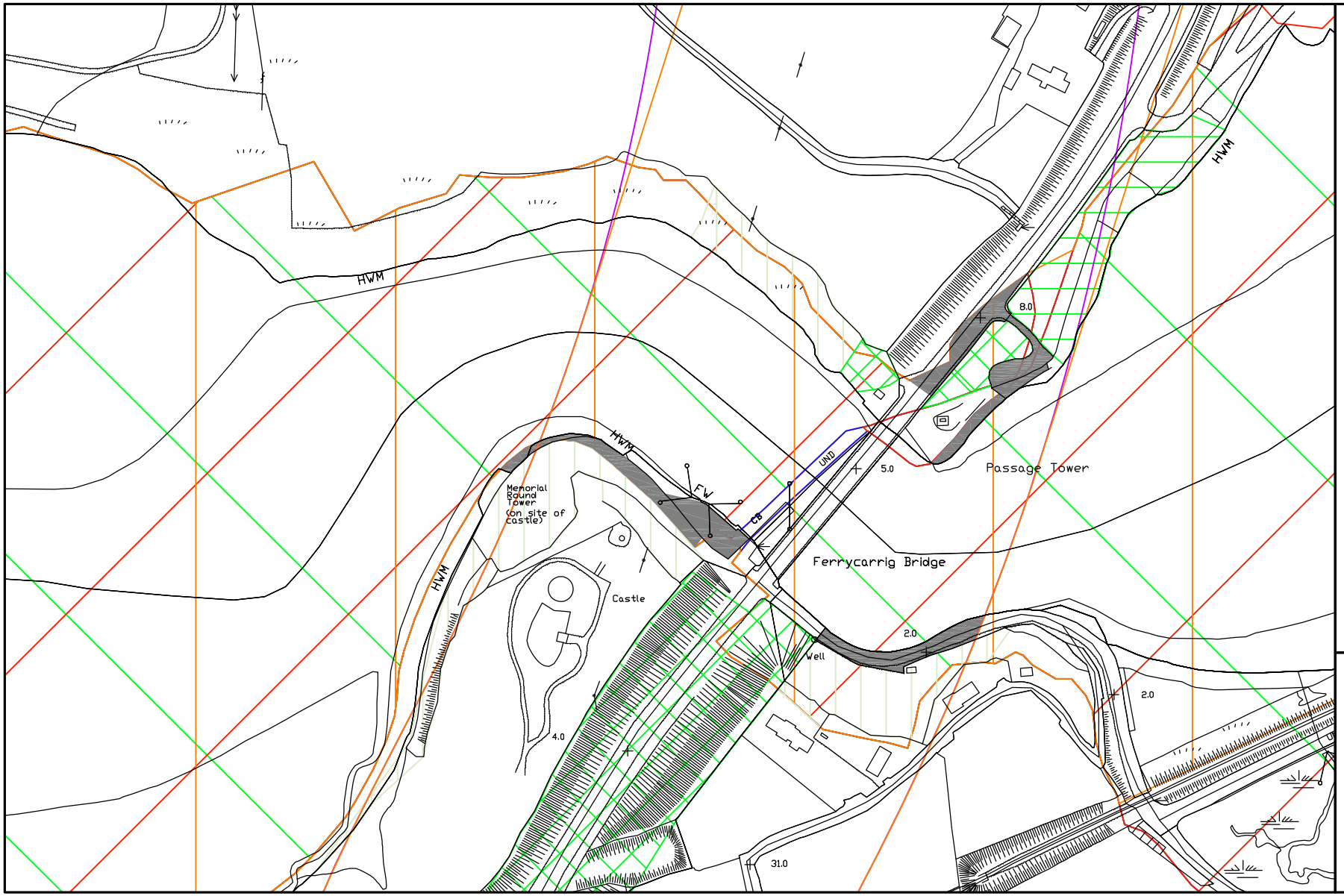
Otters have been recorded as exploiting virtually all types of water and waterway in the UK. Although populations in England and Wales are confined mainly to fresh water, they readily exploit suitable coastal habitats in Scotland. The importance of estuaries to otters is more difficult to ascertain. Otters have been recorded on still waters (canals, lakes, ponds and reservoirs) as well as rivers and streams of all sizes. Otters will use tiny streams and ditches including dry watercourses as regular routes.

References

JNCC (2009). 1355 Otter (Lutra lutra). www.jncc.gov.uk

NPWS, Lutra lutra (1355), Conservation Status Assessment Report.

Appendix C - Figures



LEGEND

- Buildings & Artificial Surfaces (BL3)
- Spoil & Bare Ground (ED2)
- Reservoir (FL7)
- Pond (FL8)
- Reed & Large Sedge Swamps (FS1)
- Tall Herb Swamps (FS2)
- Amenity Grassland (GA2)
- Wet Grassland (GS4)
- Dry Siliceous Heath (HH1)
- Wet Heath (HH3)
- Mixed Broadleaved Woodland (WD1)
- Mixed Broadleaved/Conifer Woodland (WD2)
- Conifer Plantation (WD4)
- Scattered Trees & Parkland (WD5)
- Oak-Birch-Holly Woodland (WN1)
- Oak-Ash-Hazel Woodland (WN2)
- Wet Pedunculate Oak-Ash Woodland (WN4)
- Riparian Woodland (WN5)
- Wet Willow-Alder-Ash Woodland (WN6)
- Scrub (WS1)
- Immature Woodland (WS2)
- Treeline (WL2)

EU Designated Sites

- Natural Heritage Area (NHA)
- Proposed Natural Heritage Area (pNHA)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

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Rev	Date	Drawn	Description	Ch'k'd	App'd

Title

Crossing Location C1

Figure 6.1

Drawn	D Gallagher
Checked	E Bennett
Approved	F McGivern
Scale at A3	1:2,500

Drawing Number: MMD-247517-N-FG-101

Status: INF

Rev: -

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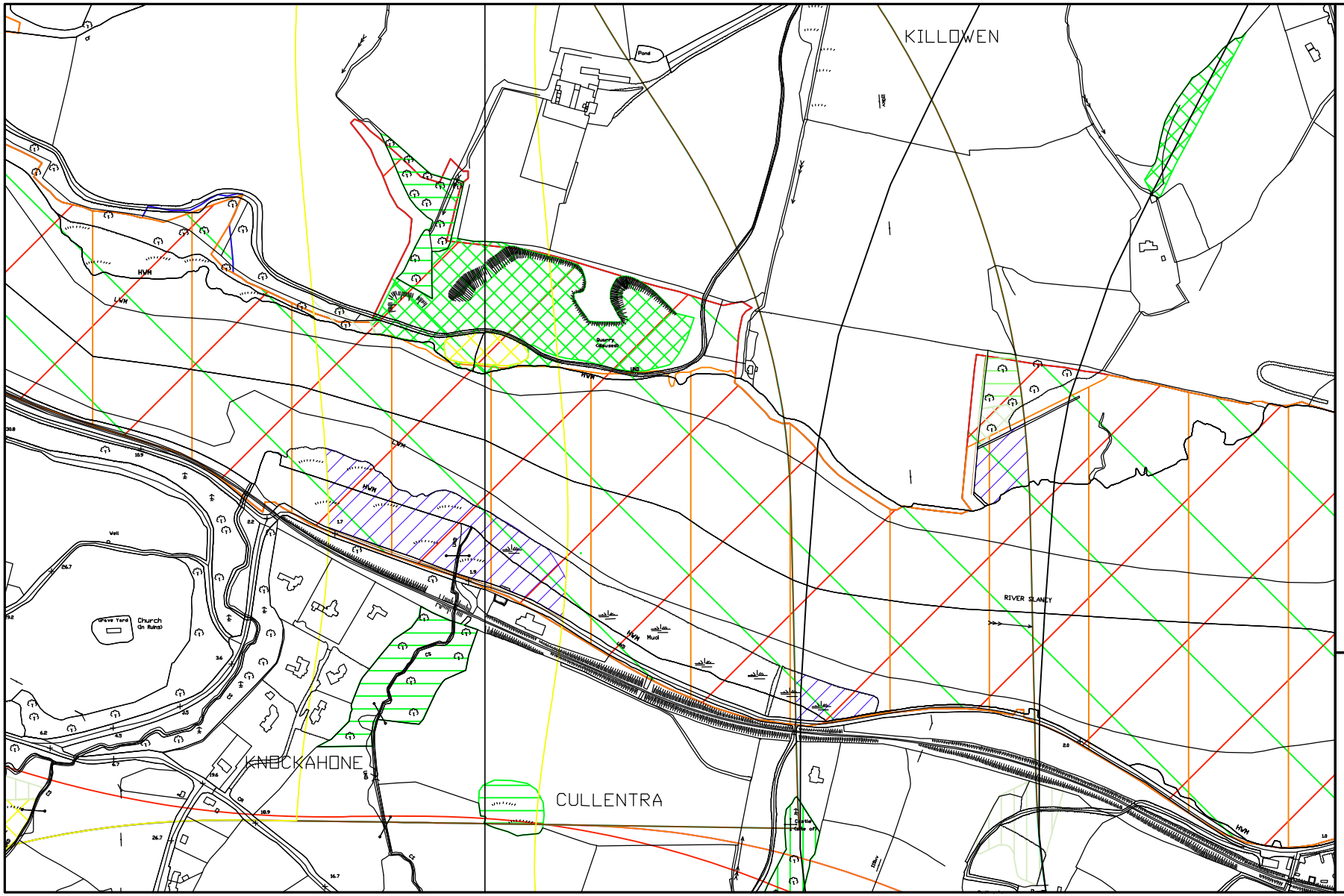
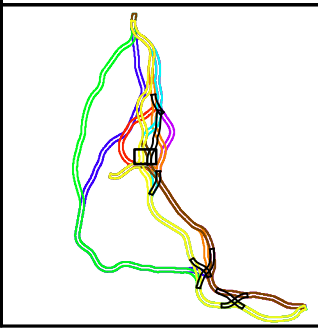


LEGEND

- Buildings & Artificial Surfaces (BL3)
- Spoil & Bare Ground (ED2)
- Reservoir (FL7)
- Pond (FL8)
- Reed & Large Sedge Swamps (FS1)
- Tall Herb Swamps (FS2)
- Amenity Grassland (GA2)
- Wet Grassland (GS4)
- Dry Siliceous Heath (HH1)
- Wet Heath (HH3)
- Mixed Broadleaved Woodland (WD1)
- Mixed Broadleaved/Conifer Woodland (WD2)
- Conifer Plantation (WD4)
- Scattered Trees & Parkland (WD5)
- Oak-Birch-Holly Woodland (WN1)
- Oak-Ash-Hazel Woodland (WN2)
- Wet Pedunculate Oak-Ash Woodland (WN4)
- Riparian Woodland (WN5)
- Wet Willow-Alder-Ash Woodland (WN6)
- Scrub (WS1)
- Immature Woodland (WS2)
- Treeline (WL2)

EU Designated Sites

- Natural Heritage Area (NHA)
- Proposed Natural Heritage Area (pNHA)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)



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Rev	Date	Drawn	Description	Ch'k'd	App'd

Title

Crossing Locations C2 and C3

Figure 6.2

Drawn	D Gallagher
Checked	E Bennett
Approved	F McGivern
Scale at A3	1:5,000
Drawing Number	MMD-247517-N-FG-102
Status	INF
Rev	-

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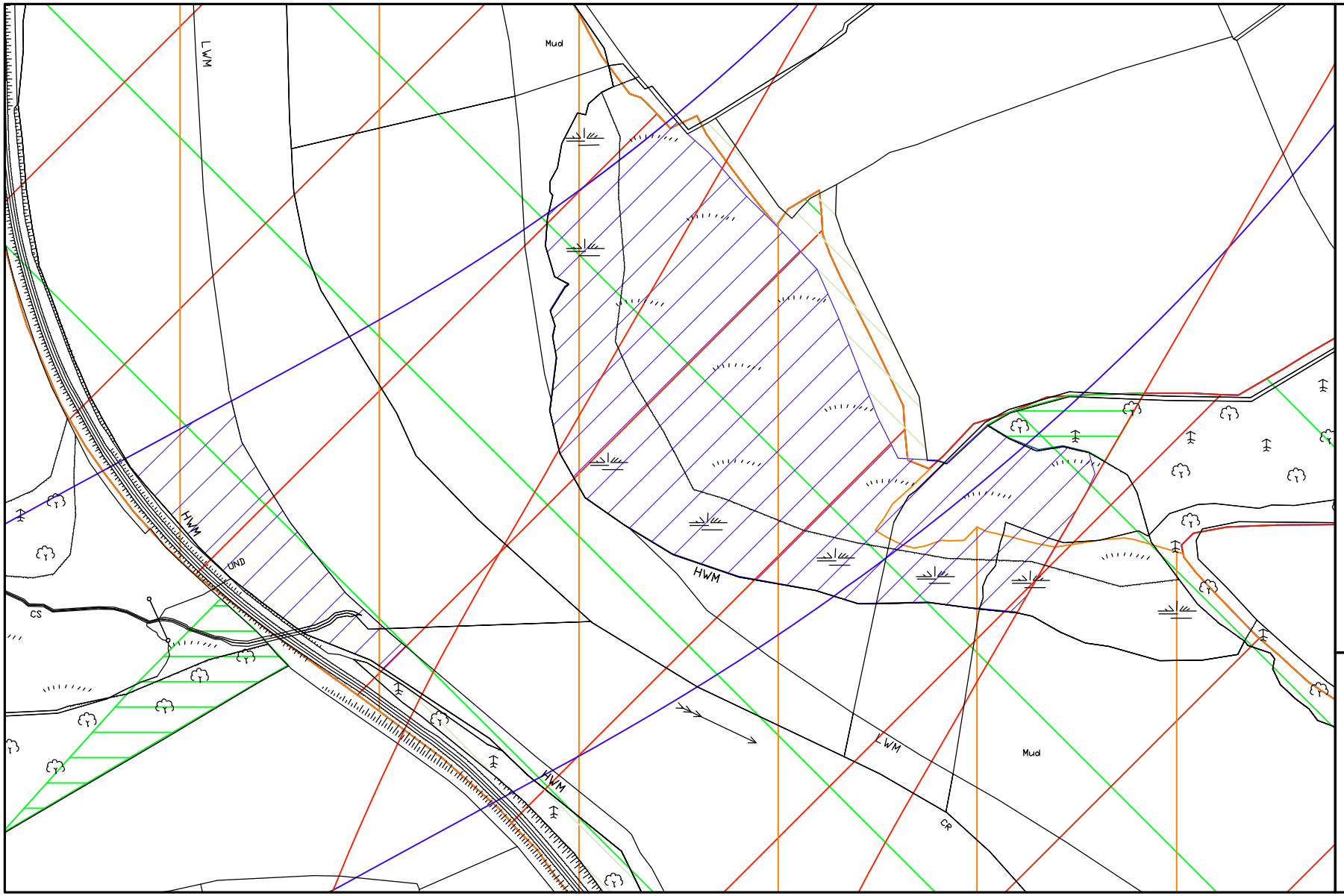

LEGEND

- Buildings & Artificial Surfaces (BL3)
- Spoil & Bare Ground (ED2)
- Reservoir (FL7)
- Pond (FL8)
- Reed & Large Sedge Swamps (FS1)
- Tall Herb Swamps (FS2)
- Amenity Grassland (GA2)
- Wet Grassland (GS4)
- Dry Siliceous Heath (HH1)
- Wet Heath (HH3)
- Mixed Broadleaved Woodland (WD1)
- Mixed Broadleaved/Conifer Woodland (WD2)
- Conifer Plantation (WD4)
- Scattered Trees & Parkland (WD5)
- Oak-Birch-Holly Woodland (WN1)
- Oak-Ash-Hazel Woodland (WN2)
- Wet Pedunculate Oak-Ash Woodland (WN4)
- Riparian Woodland (WN5)
- Wet Willow-Alder-Ash Woodland (WN6)
- Scrub (WS1)
- Immature Woodland (WS2)
- Treeline (WL2)

EU Designated Sites

- Natural Heritage Area (NHA)
- Proposed Natural Heritage Area (pNHA)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

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Crossing Location C4

Figure 6.3

Drawn	D Gallagher
Checked	E Bennett
Approved	F McGivern
Scale at A3	1:2,500
Drawing Number	MMD-247517-N-FG-103
Status	INF
Rev	-

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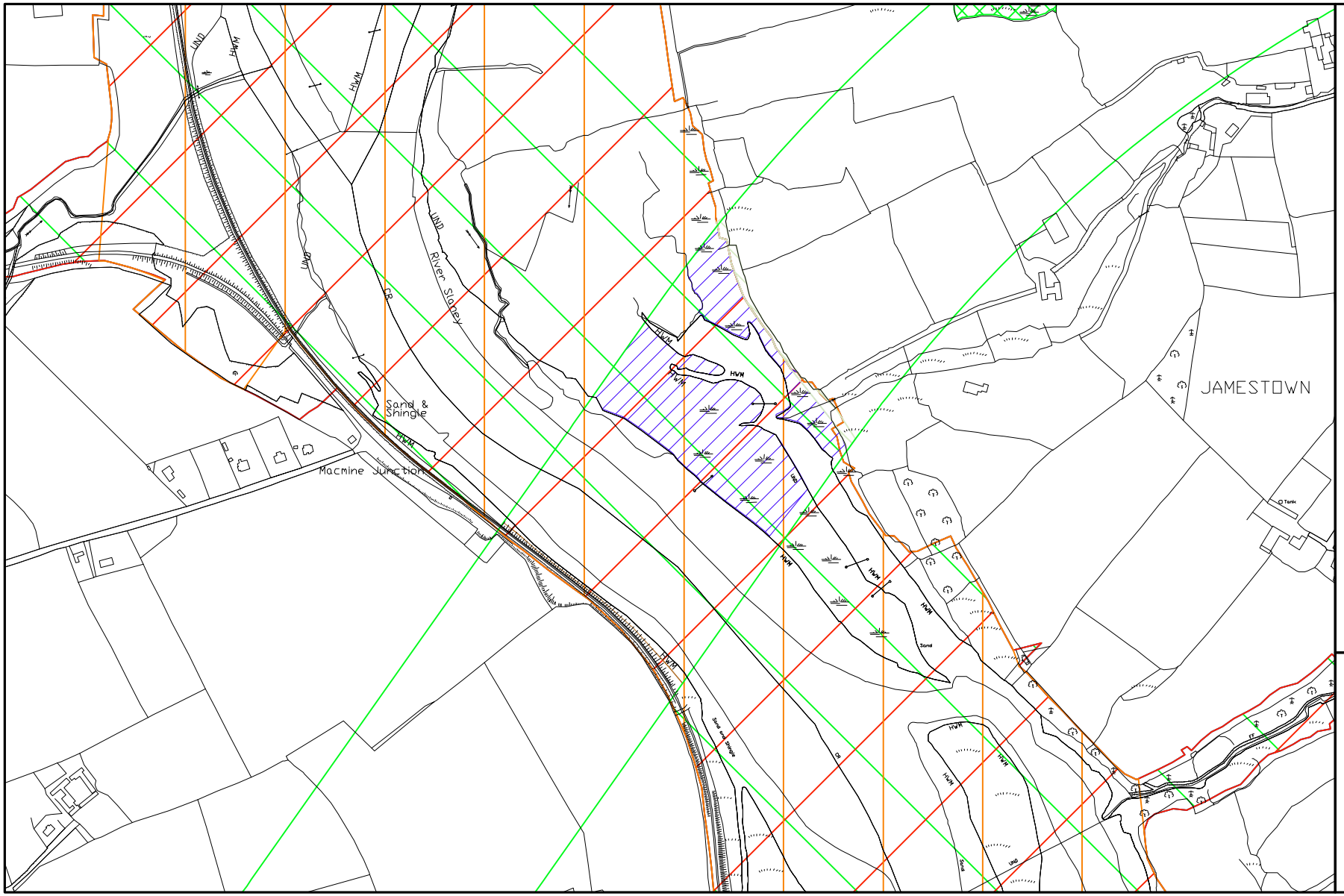
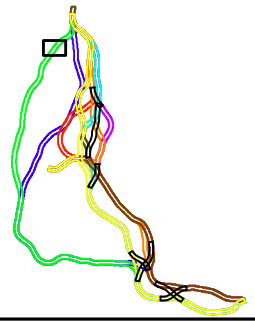


LEGEND

- Buildings & Artificial Surfaces (BL3)
- Spoil & Bare Ground (ED2)
- Reservoir (FL7)
- Pond (FL8)
- Reed & Large Sedge Swamps (FS1)
- Tall Herb Swamps (FS2)
- Amenity Grassland (GA2)
- Wet Grassland (GS4)
- Dry Siliceous Heath (HH1)
- Wet Heath (HH3)
- Mixed Broadleaved Woodland (WD1)
- Mixed Broadleaved/Conifer Woodland (WD2)
- Conifer Plantation (WD4)
- Scattered Trees & Parkland (WD5)
- Oak-Birch-Holly Woodland (WN1)
- Oak-Ash-Hazel Woodland (WN2)
- Wet Pedunculate Oak-Ash Woodland (WN4)
- Riparian Woodland (WN5)
- Wet Willow-Alder-Ash Woodland (WN6)
- Scrub (WS1)
- Immature Woodland (WS2)
- Treeline (WL2)

EU Designated Sites

- Natural Heritage Area (NHA)
- Proposed Natural Heritage Area (pNHA)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)



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Crossing Location C5

Figure 6.4

Drawn	D Gallagher
Checked	E Bennett
Approved	F McGivern
Scale at A3	1:5,000
Drawing Number	MMD-247517-N-FG-104
Status	INF
Rev	-

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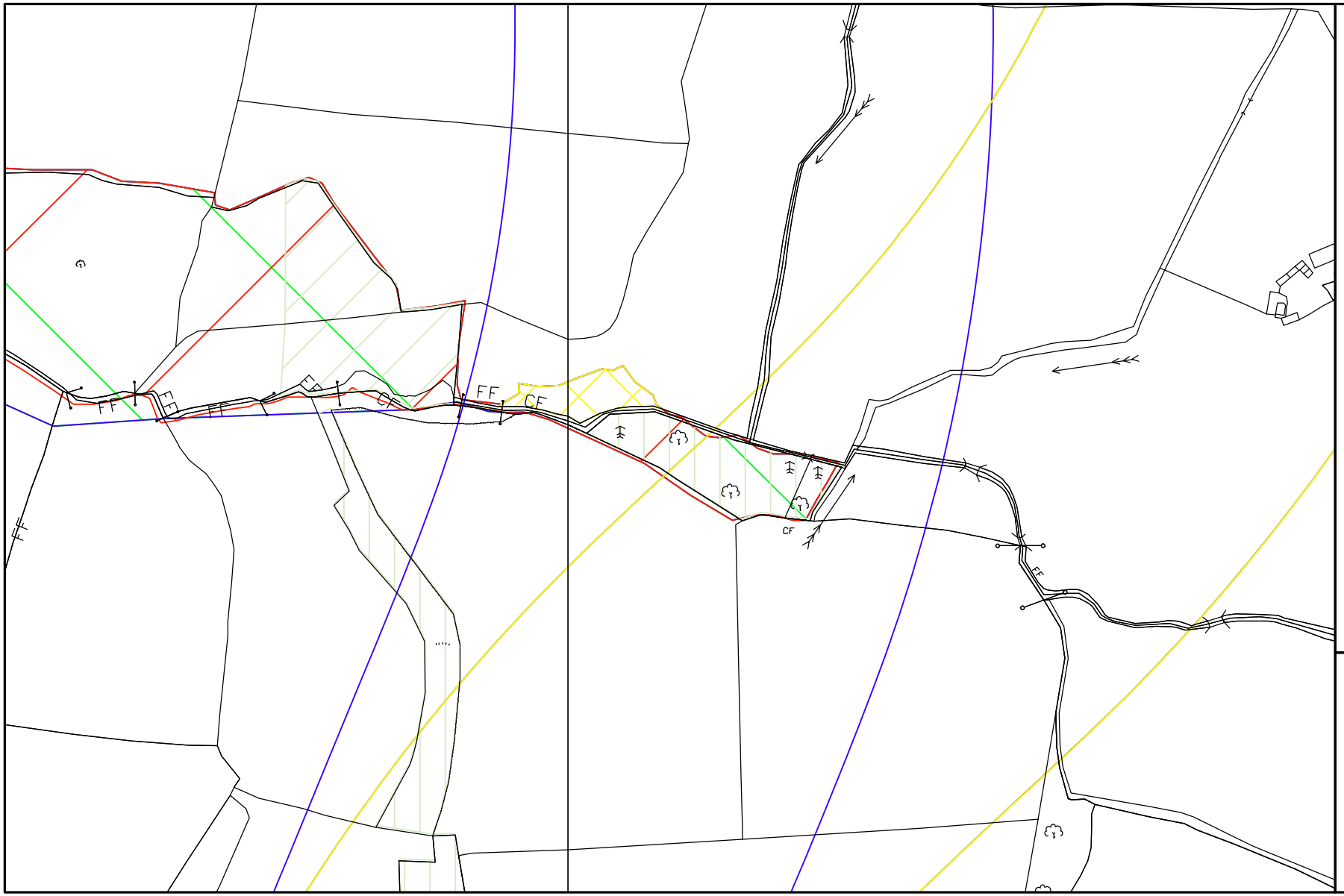

LEGEND

- Buildings & Artificial Surfaces (BL3)
- Spoil & Bare Ground (ED2)
- Reservoir (FL7)
- Pond (FL8)
- Reed & Large Sedge Swamps (FS1)
- Tall Herb Swamps (FS2)
- Amenity Grassland (GA2)
- Wet Grassland (GS4)
- Dry Siliceous Heath (HH1)
- Wet Heath (HH3)
- Mixed Broadleaved Woodland (WD1)
- Mixed Broadleaved/Conifer Woodland (WD2)
- Conifer Plantation (WD4)
- Scattered Trees & Parkland (WD5)
- Oak-Birch-Holly Woodland (WN1)
- Oak-Ash-Hazel Woodland (WN2)
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- Riparian Woodland (WN5)
- Wet Willow-Alder-Ash Woodland (WN6)
- Scrub (WS1)
- Immature Woodland (WS2)
- Treeline (WL2)

EU Designated Sites

- Natural Heritage Area (NHA)
- Proposed Natural Heritage Area (pNHA)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

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Title

Townland of Kyle

Figure 6.5

Drawing Number

MMD-247517-N-FG-105

Drawn	D Gallagher
Checked	E Bennett
Approved	F McGivern
Scale at A3	1:2,500
Status	INF
Rev	-

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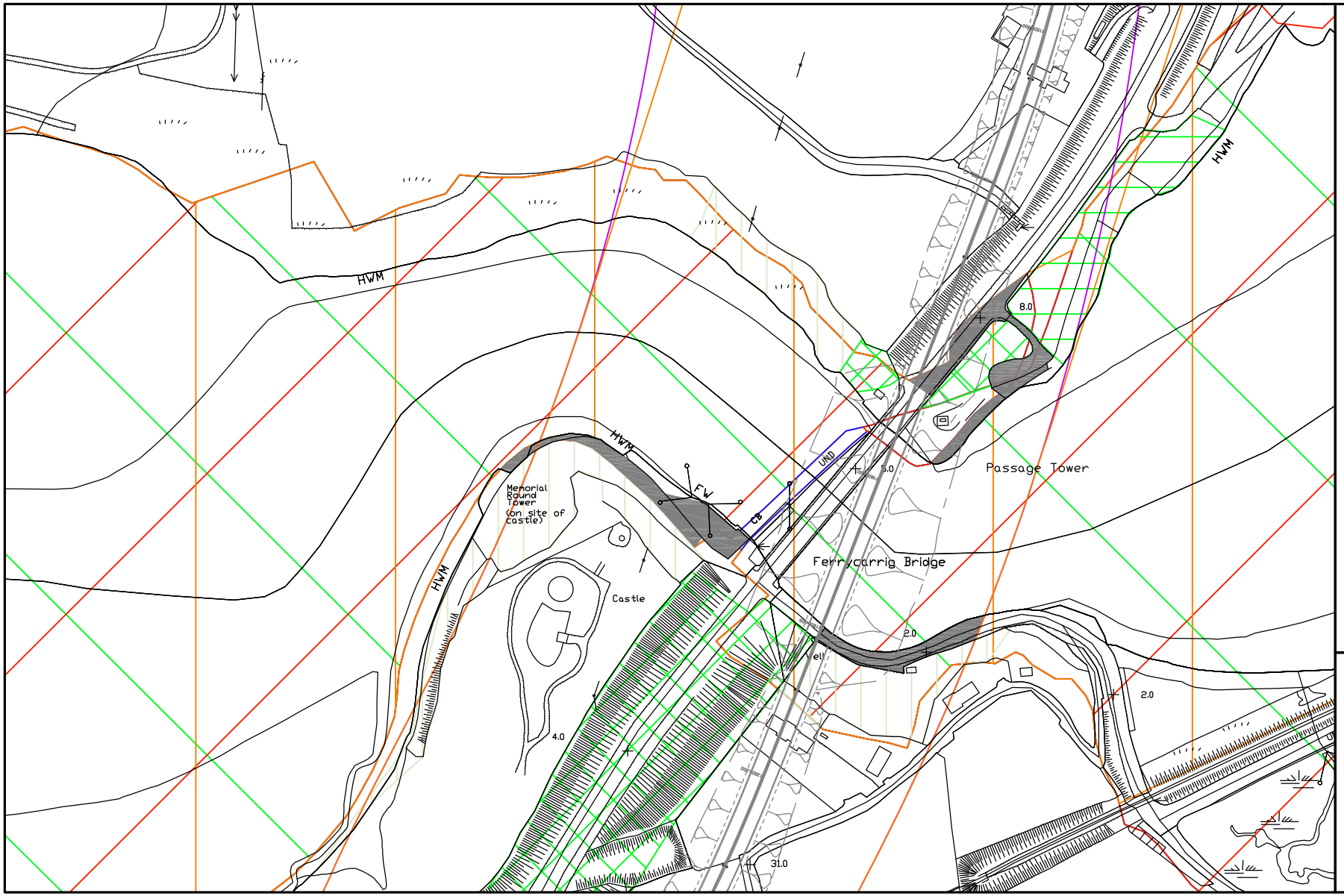

LEGEND

- Buildings & Artificial Surfaces (BL3)
- Spoil & Bare Ground (ED2)
- Reservoir (FL7)
- Pond (FL8)
- Reed & Large Sedge Swamps (FS1)
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- Riparian Woodland (WN5)
- Wet Willow-Alder-Ash Woodland (WN6)
- Scrub (WS1)
- Immature Woodland (WS2)
- Treeline (WL2)

EU Designated Sites

- Natural Heritage Area (NHA)
- Proposed Natural Heritage Area (pNHA)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

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Crossing Location C1
with Alignment

Figure 7.1

Drawn	D Gallagher
Checked	E Bennett
Approved	F McGivern
Scale at A3	1:2,500
Drawing Number	MMD-247517-N-FG-106
Status	INF
Rev	-

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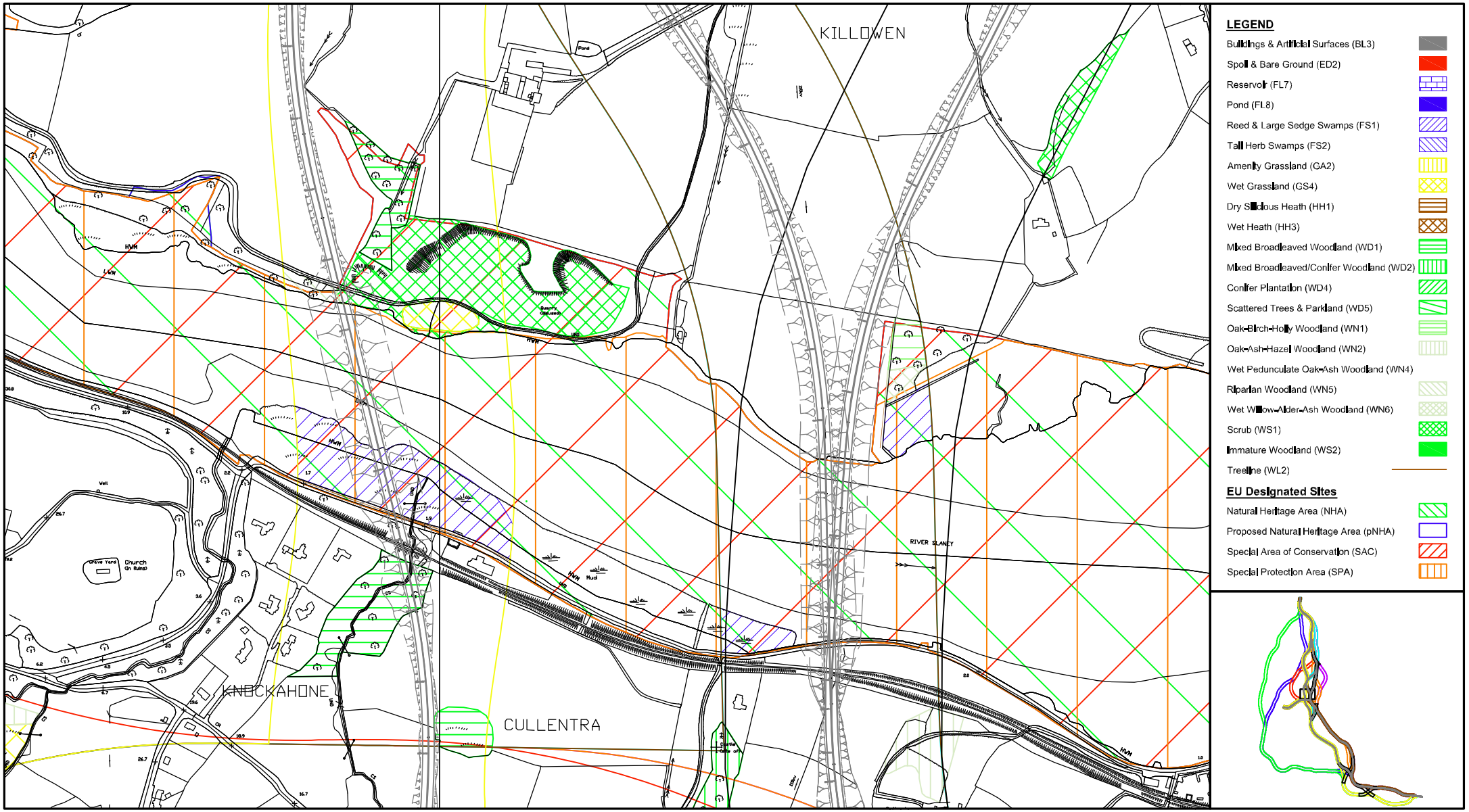

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Crossing Locations C1 and C2 with Alignments

Figure 7.2

Drawn	D Gallagher
Checked	E Bennett
Approved	F McGivern
Scale at A3	1:5,000
Drawing Number	MMD-247517-N-FG-107
Status	INF
Rev	-

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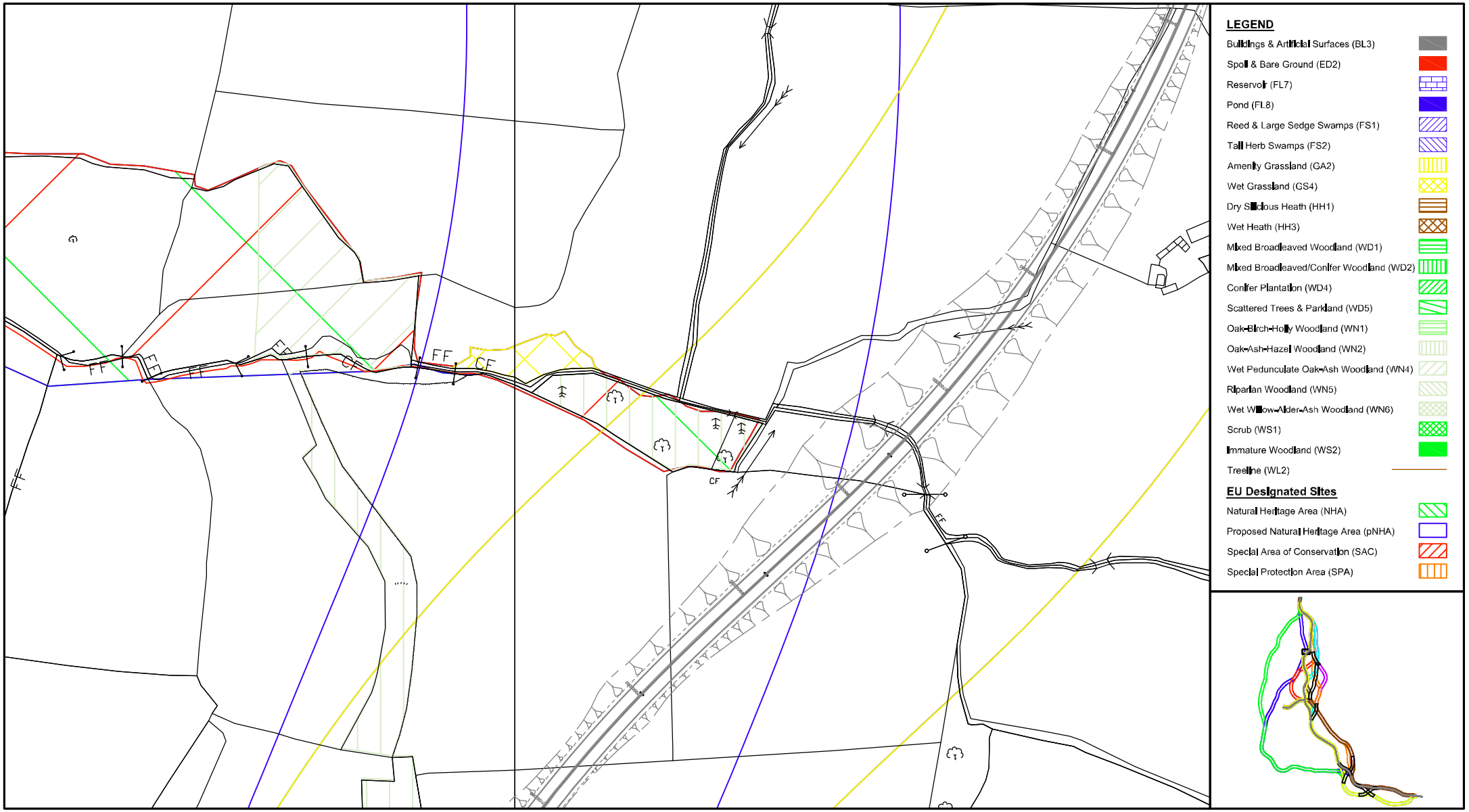

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Rev	Date	Drawn	Description	Ch'k'd	App'd

Title

Townland of Kyle with Alignment

Figure 7.3

Drawn	D Gallagher
Checked	E Bennett
Approved	F McGivern
Scale at A3	1:2,500
Drawing Number	MMD-247517-N-FG-108
Status	INF
Rev	-

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