Appendix E. Ecology Reports

E.1. Aquatic Ecology and Fisheries Report

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N11/N25 Oilgate to Rosslare Road Scheme

Route Selection Report

Aquatic Ecology and Fisheries

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EXECUTIVE SUMMARY

This chapter provides a water quality, fisheries and aquatic ecological assessment of water features potentially affected by the route options under consideration for the proposed N11 / N25 Oilgate to Rosslare Road scheme.

Water bodies in the study area were identified using OS mapping. Information on important aquatic ecological features, water quality and protected aquatic species was collated by desktop review including examination of websites (SERBD, EPA, NPWS, IFI). Field surveys including biological sampling, river corridor assessments and searches for protected species were carried out on representative watercourses. All watercourses down to 1st order streams indicated on 1:50,000 scale OSI maps were assessed and rated using NRA guidelines in terms of fisheries value and ecological value and also using the EPA's Envision mapping tool to identify rivers, lakes, catchment boundaries, and water quality.

The most significant watercourse within the study area is the River Slaney which is within the River Slaney Valley SAC, an internationally important site. 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*), Freshwater Pearl Mussel (*Margaritifera margaritifera*) and in the tidal stretches, Twaite Shad (*Alosa fallax*) and Allis Shad (*Alosa alosa*). The River Slaney is also designated Salmonid Water under the EU Freshwater Fish Directive. It is also considered a nationally important watercourse in terms of Atlantic salmon and sea trout angling. Furthermore, Wexford Harbour is a designated shellfish area. The River Slaney within the study area is also listed as RPA Nutrient Sensitive Area.

The other watercourses in the study area are not considered as significant in terms of aquatic ecology and fisheries resources as the Slaney itself. These included watercourses in the Sow, Corock, Bishop's Water and Bridgetown / Duncormick catchments. These aquatic areas ranged in value from High Value, Local Importance to Low Value, Local Importance, based on the NRA '*Guidelines for the Assessment of Ecological Impacts of National Road Schemes*' (Rev.2, NRA 2009) for rating the value of watercourses. Indeed, most of the watercourses in the study area were minor streams, many of which were degraded and considered of little fisheries and aquatic ecological value. These watercourses drain mainly agricultural lands but some contained Annex II listed species. The most important of these watercourses were the larger tributaries of the Slaney and the upper reaches of Mulmontry River, the latter a part of a separate catchment draining into the sea on the south coast of Wexford. These watercourses have been rated 'High Value, Locally Important (C)' due to the presence of protected aquatic species listed on Annex II of the EU Habitats Directive together with Good ecological status in some cases.

The proposed scheme has the potential to significantly impact on water quality and aquatic ecological resources in the absence of suitable and proportional mitigation. All route options cross the River Slaney and all cross a number of other watercourses. Any impacts on the River Slaney main channel would constitute impacts on the Slaney River Valley cSAC. Similarly, impacts on tributaries of the Slaney could indirectly impact on this river.

From an assessment of the proposed route options and an evaluation of the potential scale of impacts arising from the proposed watercourses crossings associated with each route, a preferred route option has emerged in terms of aquatic ecology and fisheries. This is the 'B' option, which would cross the River Slaney near/at the existing crossing. In order of preference, the route option choice is B, A, D, C, E, G, F and H. It is noted however that any of the proposed routes could be built with the provision and implementation of suitable mitigation. The crossing points C1 and C1a are rated the same in relation to impacts on the River Slaney.

It is emphasised that this assessment is based on the aquatic ecological and fisheries constraints posed by the proposed scheme. It is considered that the preferential ranking and benefits of the preferred route in this regard may be outweighed by engineering and terrestrial ecology constraints, with respect to a full environmental assessment of the route corridors.

TABLE OF CONTENTS

1 INTRODUCTION

This chapter provides a water quality, fisheries and aquatic ecological assessment of water features potentially affected by the route options for the proposed N11 / N25 Oilgate to Rosslare Road scheme. Although groundwater and surface water are often interrelated, impacts to groundwater have not been addressed here. This report draws on the earlier Constraints Study Report (Mott MacDonald Pettit, 2009) prepared for the scheme on behalf of Wexford County Council, which identified surface water features of high fisheries and/or aquatic ecology importance in the study area. In the current report, water bodies likely to be affected are identified and the potential impacts arising from the construction and operation of the various options are examined.

The principal constraint in relation to aquatic ecology and fisheries in the study area is the River Slaney catchment, in particular the River Slaney main channel and estuary. The River Slaney is an important sea trout and Atlantic salmon fishery and is designated as a candidate Special Area of Conservation (SAC) - Slaney River Valley SAC (Site code 00781). Other catchments in the study area, some of which have good salmonid nursery potential, include the Sow, the Duncormick/Bridgetown, the Corock and the Bishop's Water Coastal catchment. Maps of the study area showing proposed route options and watercourses are provided in Appendix 1; Figure A1.1 (northern extent of study area) to Figure A1.7 (southern extent of study area). Designated shellfish areas are shown in Figures A1.8 (inner Harbour) and A1.9 (outer Harbour).

The route selection stage compares the aquatic ecological and fisheries impacts of alternative routes in order to minimise impacts on fisheries, protected aquatic sites and species. This study was carried out with reference to the '*Guidelines for the Assessment of Ecological Impacts of National Road Schemes*' (Rev.2, NRA 2009); '*Environmental Impact Assessment of National Road Schemes – A practical guide*' (NRA 2008a); '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (NRA 2008b) and the Institute of Ecology and Environmental Management '*Guidelines for Ecological Impact Assessment*' (IEEM 2006). The NRA publication '*Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes*' (NRA 2008c) was also followed.

This report was prepared during the period April to June 2010 by ECOFACT Environmental Consultants Ltd., on behalf of Mott Mac Donald Ireland Ltd.

2 METHODOLOGY

2.1 Desk study

A desktop study was undertaken to identify the surface water features of the study area and assess the aquatic ecological and fisheries importance of the aquatic areas present. The survey area was examined with the aid of Ordnance Survey aerial photography and Discovery Series (1:50,000) Sheet 77.

A desktop study comprised a review of all relevant literature (i.e. journals, books, published reports) and the 'grey literature' (i.e. websites, unpublished reports, university theses etc.) for information on aquatic areas of interest within the study area. In particular the following websites and information sources were reviewed:

- National Parks and Wildlife Services (NPWS) website and database (www.npws.ie)
- Environmental Protection Agency (EPA) mapping (http://maps.epa.ie/)
- Central Fisheries Board website (www.cfb.ie)
- The website of the Eastern Regional Fisheries Board (www.erfb.ie)
- Wexford County Council's website (www.wexford.ie)
- South-eastern River Basin District Draft Management Plan (http://www.serbd.com)

2.2 Field Surveys

An aquatic habitat assessment of all potentially impacted watercourses was undertaken during April/May 2010. Each watercourse was given a Field Code for identification purposes. Water levels were normal-low at the time of the survey and this was considered to be an ideal time to undertake such an assessment. Watercourse assessment was carried out using the methodology given in the Environment Agency's *'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003'* (EA, 2003). Watercourses were evaluated and given an overall significance rating based on the following factors: (a) habitat quality, (b) water quality, (c) fishery value and (d) presence of, or suitability for, protected species. Surveyed sites were scaled on 5-point scale, from 'E' representing sites of low value, local importance, to 'A' sites representing sites of international importance.

Protected species surveys followed '*Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes*' (NRA 2008c). Searches for protected aquatic species were undertaken at locations where habitat was deemed suitable and at all the route option crossings of all the main watercourses.

General habitat quality for macroinvertebrate communities at each site was rated as being Optimal, Suboptimal, Marginal or Poor with reference to a scheme developed by Barbour & Stribling (1991). General habitat quality for fish populations at each site was also rated for suitability for use by the various life cycle stages (spawning, nursery, rearing and foraging) of fish and lampreys. Habitat considerations for juvenile salmonids in streams and rivers include stream size and flow (Hatfield & Bruce, 2000), depth and gradient (Kennedy & Strange, 1986), substrate (Greenberg & Dahl, 1998), canopy (O'Grady, 1993) and engineering history of the river (O'Grady and Curtin, 1993).

Biological sampling using methodology in Toner *et al*. (2005) was undertaken within the five catchments affected by the route options (Table 1). These catchments were the Bishops Water coastal catchment (Rathdowney Stream, Assaly River at Assaly Bridge and Finoge Bridge), Sow coastal catchment (Sow River at Kilmallock Bridge) the Slaney catchment (Tinnokilla Stream, Ballyvoleen River and Ballyvalloge River) and the Slaney/Corock catchment (Mulmontry River).

The Slaney Estuary was also assessed within the study area at five sites (Table 2). An intertidal macroinvertebrate survey was undertaken using standard JNCC methodology (Davies *et al*, 2001). Five replicate samples were taken at each station to a depth of 15 cm using a 0.01m^2 cylindrical core. Qualitative sampling using the kick sampling net was also conducted at three of the estuary sites. The invertebrates collected using both methods were pooled at each site. The macroinvertebrates were then identified to the lowest possible taxonomic level in the laboratory. The keys used can be seen in the reference section (Section 7).

Table 1 Location of the biological sampling sites within the five catchments affected by the route options.

	Rathdowney stream	Assaly River	Ballyfinoge stream	Tinnokilla stream	Bally-voleen River	Bally-valloge Stream	Mullinree stream	Sow River
Location	R470 Bridge approx. 0.5km south west of Rosslare town	Assaly Bridge on the N25, north of Killinick station	Finoge Bridge	North east of Tinnokilla	Approx. 1 km upstream of the Slaney	Muchwood Cross roads	Mullinree Bridge, 1.5km south east of Muchwood Cross roads	Immediately upstream of Killmallock Bridge
River section	Rathdowney stream	Assaly river	Assaly River	Tinnokilla stream	Ballyvoleen	Ballyvalloge stream	Mullinree stream	Sow River
Catchment	Bishops Water Coastal	Bishops Water Coastal	Bishops Water Coastal	River Slaney catchment	River Slaney catchment	River Slaney catchment	River Slaney catchment	Sow Coastal catchment
NOS Grid Reference	T09352, 13525	T05105, 13360	T04090, 14094	S97216, 29150	S96410, 25766	S98018, 23786	S99515, 22961	T03244, 31858

Table 2 Location of the biological sampling sites along the Slaney River Estuary.

	Site 1	Site 2	Site 3	Site 4	Site 5
Location	At the existing N25 crossing south side of Ferrycarrig Bridge	Opposite the Heritage Centre on the R730 regional road	At the junction of the R730 and the old railway line	West side of Deeps Bridge	Approximately 5km upstream of site 4 in the townland of Ballyhoge (ca. 1km downstream of king's Island.
River section	Slaney estuary	Slaney estuary	Slaney estuary	Slaney estuary	Slaney estuary
NOS Grid Reference	T01416, 23176	T00362,23048	T99687,23365	T97519,27005	S97632, 31112

2.3 Consultation

The National Parks and Wildlife Service was consulted both directly and through their website as part of the current assessment.

Consultations carried out during the Constraints Study (Mott MacDonald, 2009) included responses from the following:

- The Central Fisheries Board (CFB) highlighted their primary concerns in relation to the crossing of the River Slaney and the requirement for construction method statements for any crossings, taking account of the potential sensitivities of fish species and appropriate timing of works.
- The Development Applications Unit of the National Parks and Wildlife Service (NPWS) highlighted the presence of the designated sites in the study area including the River Slaney Valley SAC. The requirements of the Natural Habitats Regulations (1997) for an Appropriate Assessment of impacts affecting Natura 2000 sites were also addressed. Protected species within the study area were also listed but no aquatic flora or fauna were specified.
- The Eastern Regional Fisheries Board highlighted the importance of the River Slaney main channel and estuary, emphasising the SAC status of this waterbody. The Board made further comments in relation to design and construction requirements to mitigate impacts during watercourse crossings and general water quality.
- The Wexford Naturalists Field Club identified the importance of the study area in relation to bird species and protected mammals within the River Slaney valley. This organisation identified their preference for a route to pass to the east of Oilgate and to cross the Slaney north of Ferrycarrig.

2.4 Ecological Evaluation

Each of the routes was evaluated with respect to fisheries, aquatic species and habitats of ecological importance. The existing ecological conditions are described and evaluated according to the NRA '*Guidelines for the Assessment of Ecological Impacts of National Road Schemes*' (Rev.2, NRA 2009). The impact significance is a combined function of the value of the affected feature (its ecological importance), the type of impact and the magnitude of the impact. Watercourses were evaluated on

the basis of a number of characteristics and features as outlined below, as presented in Table 3. A best estimate on the number of watercourse that would be crossed or potentially affected by the proposed routes was made. The numbers of watercourses crossed was determined by examination of mapping of the proposed routes, examination of watercourses during the field survey and examination of maps of the proposed routes overlain on Discovery Series Ordnance survey mapping. For the purpose of a route selection report, watercourses rated lower than 'High Value, Locally Important (C)' are not significant/sensitive receptors as outlined in NRA (2009). Such watercourses however were documented during the current assessment. In any event, all watercourses will be subject to further assessment at EIS stage.

The characteristics are defined as follows:

- Aquatic habitat refers to the in-water conditions of any watercourse; including substrate and stream structure (i.e. proportion of riffles, runs and pools).
- The fisheries value of a watercourse refers to its suitability for fish, primarily salmonids (salmon and trout), and to the associated value for recreational angling purposes.
- Annex II species are those that are listed under the EU Habitats Directive (92/43/EEC).
- Annex I habitats are those that are listed under the EU Habitats Directive, including Priority Habitats.

Table 3 Site Evaluation Criteria.

Rating	Qualifying Criteria
A	Internationally Important Sites designated (or qualifying for designation) as an SAC* or SPA* under the EU Habitats or Birds Directives Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive Major salmon River fisheries Major Salmonid (salmon, trout or char) lake fisheries
B	Nationally Important Sites or waters designated or proposed as an NHA* or Statutory Nature Reserve. Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive) Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000 Major trout River fisheries Water bodies with major amenity fishery value Commercially important coarse fisheries
C	High Value, Locally Important Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species Sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive Large water bodies with some coarse fisheries
D	Moderate Value, Locally Important Sites containing some semi-natural habitat or locally important for wildlife Small water-bodies with some coarse fisheries value or some potential salmonid habitat Any water body with unpolluted water (Q-value 4-5)
E	Low Value, Locally Important Artificial or highly modified habitats with low species diversity and low wildlife value Water bodies with no current fisheries and no significant potential fisheries value

*SAC = Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area.

2.5 Legislative context

Under Part III, Section 33 of the European Communities Environmental Objectives (Surface Water) Regulations 2009, provisions have been outlined which can prevent a development that could stop waterbodies reaching their WFD status. This provision has been outlined as follows:

"Failure to achieve good ecological status, or where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water resulting from new modifications or alterations to the physical characteristics of a surface water body, or failure to prevent deterioration of a body of surface water from high status to good status resulting from new sustainable human development activities shall not be a breach of these Regulations when all the following conditions are met:

(1) All practicable steps are taken to mitigate the adverse impact on the status of the body of surface water.

(2) The reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 of the 2003 Regulations and the objectives are reviewed every six years.

(3) The reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives established by Article 28 of these Regulations are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and

(4) The beneficial objectives served by these modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are significantly better environmental option.

3 RECEIVING ENVIRONMENT

The largest watercourse in the study area is the River Slaney Estuary which has tributaries including the Tinnokilla Stream, Ballyvoleen River, Ballyvalloge Stream and the River Sow catchment, also within the study area. Other catchments in the study area are the Bishops Water, the Corock catchment (including the Mulmontry River) and the Bridgetown/Buncormick catchment. A full list and catchment classification of all the watercourses within the study area is provided in Appendix 2. Descriptions of the affected catchments are provided below. The Sow River and parts of the Bishops' Water Coastal catchment also flow into the River Slaney Estuary – these catchments are discussed under the respective sections.

The Water Framework Directive (WFD) requires that Member States prepare Programmes of Measures to address water quality issues within River Basin Management Plans. Having identified key morphology pressures and potential problem areas through risk assessment, then confirming that status has been impacted by these pressures, measures must be taken to address these problems. All watercourses within the study areas are within the South Eastern River Basin District (SERBD).

3.1 River Slaney catchment

3.1.1 Overview of Slaney catchment

3.1.1.1 Slaney Estuary main channel

The River Slaney (EPA code 12/S/02) rises at Lugnaquilla Mountain in the Glen of Imaal in Co. Wicklow and flows south south-east through Baltinglass, Rathvilly, Tullow and Bunclody before entering the 19 km long estuary at Enniscorthy. The Slaney River discharges into Wexford Harbour at Wexford Town. The total length of the main River from its source to Wexford Harbour is 117km. Wexford Harbour is an extensive, shallow estuary which dries out considerably at low tide exposing large expanses of mudflats and sandflats. There are expanses of intertidal mud and sandflats and shingly shore, often fringed with narrow bands of salt marsh and brackish vegetation at the southern end of the site. Narrow shingle beaches up to 10m wide occur in places along the River banks and are exposed at low tide. The River Slaney Estuary is divided into two sections; the upper River Slaney Estuary (WFD code IE_SE_040_0300) is from Enniscorthy Railway Bridge to Macmine while the lower River Slaney Estuary (WFD Code IE_SE_040_0200) is from Macmine to Drinagh / Big Island in Wexford Harbour.

The Slaney River is up to 100m wide in places and is noticeably tidal as far as Edermine Bridge but with tidal influence right up to Enniscorthy. The River Slaney Estuary is also crossed by the N11 at Ferrycarrig, Deeps Bridge (between Ferrycarrig and Edermine Bridge) and by Wexford Bridge at Wexford. The Slaney has a number of tributaries including the Carriggower, Deereen, Derry, Clody, Bann, Urrin, Clonmore, Ballyvoleen and the Boro which collectively drain a catchment of 1631 km^2 (O' Reilly, 2004). Other smaller tributaries include the Ballvalloge, Tinnokilla, Mullinree and Keeloges Streams.

Only the River Slaney Estuary from Oilgate to the Wexford Harbour is within the scope of this study.

3.1.1.2 Slaney Estuary tributaries

The largest watercourses feeding this part of the estuary are the '4^{th} order *Tinnokilla Stream,* 3^{rd} order Ballyvoleen River, 3^{rd} order Mullinree Stream and 3^{rd} order *'Ballyvalloge Stream'* (those italicised have been so called according to townland location). These watercourses along with other minor streams flow into the estuary from the west. Numerous other minor streams also flow in this reach of the estuary from the east. The physical characteristics of the largest streams are given in Table 4.

The Tinnokilla Stream (Field code S1/21) flows into the River Slaney from the west approximately 2.5 km south of Ballyhoge village. This stream was approximately 5m in wetted width, with a mean depth of 20 cm and a maximum depth of 40 cm where sampled downstream of the Bridge north east of Tinnokilla village. The bank cover was high (90%) and the riparian vegetation was typical of that of a semi-natural habitat, providing approximately 30% shade.

The Ballyvoleen River (Field code S1/22) flows into the River Slaney from the west and is located approximately 600m north of the village of Glynn. The average wetted width of this river in its lower reaches was 2.2 meters with a mean depth of 15cm and a maximum depth of 35cm. The flow was a mixture of riffle and pool. The substrate was mixed and consisted of rock (50%), cobble (20%), gravel (15%) and fine (15%). The bank cover was ca. 50% and the slope was ca. 90^{o}.

The Ballyvalloge River (Field code S1/23) flows into the Slaney River from the west and meets the Slaney approximately 800m downstream of Deep's Bridge. This stream would be crossed by the 'A' route at its headwaters, the proposed 'C' route in the middle reaches and the proposed 'F' route in the lower reach (approximately 0.5km before its confluence with the Slaney). The stream was sampled south west of the R730 at Muchwood Cross Roads / 400m east of the proposed 'G' route option. The stream had an average wetted width of 4.5 meters, had a mean depth of 25cm and a maximum depth of 50cm. The flow was mainly riffled (45%) and the substrate was predominantly fine (45%).

The Mullinree Stream (Field code S1/24) flows into the Slaney main channel in the townland of Mullinree. It generally flows in a west-east direction and some of its tributaries would be crossed by the 'F' route option. The Mullinree stream was sampled upstream of the Bridge at Mullinree (S99515, 22961) in its lower reaches. This stretch of river had a mean wetted width of approximately 3.5 meters. The flow was mainly riffled. The substrate was composed mostly of gravel (50%). No instream vegetation was present. The height of the bank averaged at 0.5 meters.

Table 4 Physical characteristics of the freshwater biological survey sites examined in the River Slaney catchment

Parameter	**Tinnokilla stream**	**Mullinree Stream**	**Ballyvalloge stream**	**Ballyvoleen River**
Location	NE of Tinnokilla	Mullinree	Muchwood Cross Roads	North of the village of Glynn
Wetted width (m)	5	3.5	4.5	2.2
Mean depth (cm)	20	20	25	15
Maximum depth (cm)	40	45	50	35
Riffle (%)	60	45	45	40
Glide (%)	30	40	15	20
Pool (%)	10	15	30	40
Rock (%)	20	10	15	50
Cobble (%)	30	15	15	20
Gravel (%)	40	50	25	15
Fine (%)	10	24	45	15
Siltation of substrate	Heavy	Light	Light	Light
Shade (%)	30	25	25	40
Instream vegetation (%)	10	0	0	0
Bank height (m)	0.8	0.5	1.25	0.5
Bank slope (º)	80	90	60	90
Bank cover (%)	90	90	40	50

3.1.2 Designated areas

Within the study area, the River Slaney Valley cSAC (Site Code 000781) has been identified as the most significant aquatic receptor in terms of habitat, flora and fauna. SACs are of international importance and are given legal status in Ireland under the European Communities (Natural Habitats) Regulations (S.I. No.94/1997). In addition to the River Slaney, the Wexford Harbour and Slobs SPA (Site Code 004076) is designated for its importance in relation to birds and their habitats. Wildfowl and waterfowl habitats within the SPA include the aquatic habitats of the Slaney Estuary and a network of land drains to the east of the study area (Hopeland and the South Slobs). The site synopsis for these designated areas can be seen in Appendix 3.

3.1.2.1 The River Slaney Valley cSAC

The River Slaney within the study area is part of the River Slaney Valley cSAC. 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 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*) and allis shad (*Alosa alosa*)

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.

Approximately the lower 1 km of the College Stream is within the River Slaney Valley SAC, downstream of the study area. There are some minor watercourses within the study area that flow into the River Slaney from the east also designated as part of the SAC. Only short reaches (generally 200-300 meters) of these watercourses immediately upstream of the River Slaney are part of the designated area.

3.1.2.2 Wexford Slobs and Harbour

The Wexford Harbour and Slobs Special Protection Area for Birds (SPA Code 004076) is one of the most important ornithological sites in the country. Wexford Harbour is the lowermost part of the estuary of the River Slaney. 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 up to Enniscorthy. The seaward boundary extends from the Rosslare peninsula in the south to the area just west of The Raven Point in the north.

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 (Drinagh intake), 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. The site is selected 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 (B) 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. The site is an important centre for research, education and tourism.

3.1.3 Water Quality

This section provides an account of the water quality of the Slaney Estuary and its tributaries (excluding the Sow and Bishop's Water coastal catchment). The Slaney Estuary and Wexford Harbour into which the Slaney discharges have many designations highlighting the importance of water quality in these waterbodies. Designations are discussed separately below. The status of the Slaney Estuary is WFD Moderate status. With the exception of the Ballyvoleen River catchment which is classed as having Good WFD status, the other catchments are classed WFD Moderate status. The risk assessment maps presented in the South Eastern River Basin District Project (SERBDP) '*Freshwater Morphology POMS Study – Final Report*' (2008) shows that the Tinnokilla Stream is 2b 'not at risk' and 'strongly expected to achieve good status' by 2015, and the Keeloges Stream and the Newtown Stream (a tributary of the Slaney) are 1a 'at risk of not achieving good status' and is 1a 'at risk' of not achieving good status.

3.1.3.1 Slaney Estuary

Chemical water quality

The concentration of nitrogen as Dissolved Inorganic Nitrogen (DIN) is monitored in winter by the EPA within estuarine and coastal waters. According to Lucey (2009) the Slaney Estuary breached the winter assessment criterion for DIN in 2008 with levels of 5mg N/l being found in the Upper Estuary and 4.3mg N/l being found in the Lower Estuary. The concentration of phosphorus as MRP (Molybdate Reactive Phosphorus) is also monitored by the EPA in winter and summer along estuarine and coastal waters. The Lower Slaney during the period 2007-2008 was found to have one of the highest concentrations of MRP at 0.055mg P/l (Lucey, 2009).

During the current assessment some on-site physico-chemical parameters were measured. At Deep's Bridge, the Dissolved Oxygen (D.O.) and conductivity were 109.4% (11.58ppm at 12.7^{o}C) and 270µS^{-1} respectively. Approximately 1.5 km downstream of King's Island D.O. was 103.2% (10.7ppm at 14.8^{o}C) and conductivity was 274µS^{-1}.

Biological water quality

The Slaney Estuary was sampled at five locations during the current assessment (for locations, see Table 2). Approximately 1 km downstream of King's Island (BMWP score=41.4) and at Deep's Bridge (BMWP score=68.2), the Biological Monitoring Working Party (BMWP) specific scores for sluggish rivers were indicative of moderately impacted conditions. In terms of Average Score per Taxon (ASPT) however, both sites had a high ecological status, this index is known to be appropriate when diversity is low. The macroinvertebrate compositions at sampling stations below Deep's Bridge were typical of brackish waters and the BMWP scoring system or other biotic indices were not applicable.

3.1.3.2 Freshwater

Freshwater reaches of the River Slaney

Biological water quality records from the Slaney catchment includes EPA monitoring data and results from the on-site assessments. Some minor watercourses within the study area are not monitored by the EPA and therefore historical biological data for these watercourses is not available. A total of 14 sites on the River Slaney (EPA code 12/S/02) were monitored by the EPA during 2007. All these sites are upstream of the study area, with the lowest site 1 km downstream of Enniscorthy Bridge. Biological water quality was rated Unpolluted, class 'A' equivalent to Water Framework Directive (WFD) 'Good status' at all but three sites. At these three sites, all on the lower reaches of the river, biological water quality was rated slightly polluted, class 'B'.

The station located 1km downstream of Enniscorthy Bridge was rated Q3-4, corresponding to WFD Moderate status in 2007. According to the EPA, ecological conditions on the River Slaney remained satisfactory in 2007. Over enrichment downstream of Rathvilly and downstream of Tullow and Kilcarry Bridge was noted but these locations are upstream of the study area. The macroinvertebrate biota recorded by the EPA in 2007 indicated unsatisfactory ecological conditions with slight pollution noted downstream of Clohamon (2000) and at Ballycarney Bridge (2100). Satisfactory ecological conditions were observed in the lower reaches at Scarawalsh Bridge (2200) approximately 6 km upstream of Enniscorthy; however signs of enrichment were evident, with enhanced instream plant and filamentous algal growth observed. Agriculture and sewage were the suspected cause of this pollution (EPA website).

Slaney Estuary tributaries

The Tinnokilla Stream (EPA Code 12T02) would be crossed by the 'H' route option in its lower reaches. Biological water quality at WFD monitoring station 0700 (bridge north east of Tinnokilla) was rated Q3-4, Moderate status by the EPA in 2007, a deterioration in water quality compared to station (0200) upstream at Spring Bridge (Good status). According to the EPA, the Tinnokilla Stream was in an unsatisfactory ecological condition in 2007. The biota in the upper reaches (0200) indicated just about satisfactory conditions and heavy siltation was noted. A paucity of sensitive macroinvertebrate fauna occurred at the lower station (0700) indicating ecological disruption with very heavy siltation and highly turbid orange coloured flowing water was observed in June 2007. Excavation works in the area were suspected (EPA website).

During the current assessment, the Tinnokilla Stream, Mullinree Stream, Ballyvoleen River and were rated 'Unpolluted (Q4)', equivalent to WFD Good status. The Ballyvalloge Stream was rated 'Unpolluted (Q4-5)', equivalent to WFD High status. The chemical and biological results can be seen in Tables 5 and 6 below. It can be seen from the chemical water quality results that Dissolved Oxygen concentrations coincide with good water quality conditions i.e. close to 100%. Biological water quality results in the streams assessed are indicative of unpolluted conditions i.e. 'Q4 and Q4-5, equivalent to WFD High status.

Table 5 Selected chemical characteristics of the freshwater biological survey sites examined in the River Slaney catchment.

Parameter	Tinnokilla stream	Mullinree Stream	Ballyvalloge stream	Ballyvoleen River
Temperature (^{o}C)	12.3	12.4	12.2	15
Dissolved Oxygen (%)	99.1	100.1	102.2	99.4
Dissolved Oxygen (mg O_2l^{-1})	10.6	10.5	10.73	9.96
Conductivity (µS cm^{-1})	266	320	366	301

Table 6 Biotic indices of the survey sites examined in the Slaney catchment as part of the N11/N25 Oilgate route selection scheme.

Biotic index	Ballyvoleen River	Mullinree Stream	Ballyvalloge Stream	Tinnokilla stream
Q-value	4	4	4-5	4
Q-rating	Unpolluted	Unpolluted	Unpolluted	Unpolluted
WFD Status	High	Good	High	Good
Small Streams Risk Score (SSRS)	10.4	7.2	9.6	8
SSRS category	Probably not at risk	Probably at risk	Probably not at risk	Probably At risk
Family richness	19	11	15	11
BMWP	92.7	60.8	75.6	78.6
BMWP category	Good	Moderate	Good	Good
BMWP Interpretation	Clean but slightly impacted	Moderately impacted	Clean but slightly impacted	Clean but slightly impacted
ASPT	7.13	6.75	6.87	7.86
ASPT interpretation	High ecological status	High ecological status	High ecological status	High ecological status

3.1.3.4 Slaney Estuary status and designations

The ecological status of both the Upper (Code IE_SE_040_0200) and Lower (IE_SE_040_0200) Slaney Estuary and Wexford Harbour (IE_SE_040_0000) are classed as Moderate (WFD WaterMaps). The Upper and Lower Slaney Estuary waterbodies are in the 1a 'at risk' category while Wexford Harbour is in the 1b 'probably at risk' category. The objective is to restore these waterbodies to Good status by 2015.

The River Slaney (main channel) is a designated Salmonid Water under S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations, 1988. It is also considered to be a nationally important watercourse for salmon and sea trout.

The Wexford Harbour Inner Shellfish Area (Figure A1.8) is comprised of an area of 1.02km^2 and is located in the Slaney Estuary approximately 1km upstream of the harbour. The catchment area shellfish area in the Inner Wexford Harbour is 1,993.45km^2 in area. The designated shellfish area lies within Wexford Harbour cSAC. Mussel cultivation is predominant in the area. The overall quality of this shellfish area was found to be non-compliant with shellfish guideline values for faecal coliforms in biota outlined in Annex I of the Shellfish Waters Directive (2006/113/EC) and Schedule 4 of the

Quality of Shellfish Waters Regulations (S.I. No. 268 of 2006). The licensed area within Wexford Harbour inner is classified as Class C indicating faecal contamination in this shellfish area.

The Inner and Outer Wexford Harbour is a designated shellfish area under the European Communities (Quality of Shellfish Waters) (Amendment) Regulations, 2009 (S.I. No. 55 of 2009). The inner and Outer Wexford Harbour designated shellfish areas are indicated on maps in Appendix 1. The designated shellfish area of the outer Wexford Harbour (Figure A1.9) comprises an area of 16.5km^2 and is located immediately downstream of the Slaney Estuary. Mussel cultivation is predominant in the area. The licensed area within Wexford Harbour outer is classified as Class B indicating faecal contamination in this shellfish area (Shellfish Pollution Reduction Programme, 2009).

The trophic status assessment of the Slaney estuary in 2008 was intermediate for the upper Slaney Estuary and eutrophic for the lower Slaney Estuary (Lucey, 2009). The results of the WFD monitoring programme indicate that there are water quality issues within the area and in some of the waters discharging in the vicinity of this shellfish area.

Nutrient Sensitive waters include nitrate vulnerable zones and areas designated as sensitive areas under the Urban Waste Water Treatment Directive (91/271/EEC). The body of water from downstream of Enniscorthy on the River Slaney Estuary (Slaney Estuary Upper; WFD Code SE_040_0300 and Slaney Estuary Lower; WFD Code SE_040_0200) to Wexford Harbour (WFD Code SE_040_0000) are listed as RPA Nutrient Sensitive Area in Ireland's Urban Waste Water Treatment Regulations (S.I. 254/2001).

3.1.4 Habitats and flora

Habitats and flora of the River Slaney Estuary and tributaries are discussed in this section. The Slaney Estuary is an Estuarine habitat [Fossitt (2000) Code: MW4] while most tributaries are eroding/upland Rivers (FW1).

3.1.4.1 Slaney Estuary

The River Slaney Valley cSAC within the study area contains habitats including estuaries, tidal mudflats and old oak woodlands, all habitats listed on Annex I of the E.U. Habitats Directive. In addition 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.

According to the site synopsis for the cSAC good examples of wet woodland are found 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, as recorded from within the study area. The other is flushed or spring-fed subject to waterlogging but not to flooding and is dominated by Alder and Ash.

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*).

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*).

Furthermore, Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Short-leaved Water-starwort (*Callitriche truncata*), both protected, Red Data Book species have been recorded from within the Wexford Harbour and Slobs SPA and may occur in suitable habitats within the study area, however, were not recorded during the present survey.

Shallow marine water is a principal habitat of the SPA, 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.

During the on-site assessment, the Slaney was examined at five locations. The River Slaney Estuary is an estuarine waterbody (habitat code MW4). In the vicinity of the existing N11 crossing of the River Slaney Estuary on the south side of the Ferrycarrig Bridge, a location strongly influenced by the tide, *Fucoids* were growing on hard substrate amongst patches of silt and sand - corresponding to Mixed Substrata Shore (LR4).

On the intertidal mudflat between the "C/D" and "A/B" crossing options (opposite the heritage centre) off the R730 regional road, the intertidal habitat was classified as Mud shore (LS4). On the River Slaney Estuary near the junction of the R730 and the old railway line, west of the proposed E crossing, the main channel is categorised as a Tidal River (CW2) / Estuary (MW4) with a mixed sediment shore (LS5). Upstream of Deep's Bridge, the Slaney was found to be dominated by a freshwater macroinvertebrate community typical of a lowland depositing watercourse (FW2), potentially influenced by tidal influx, i.e. Tidal River (CW2); where the substrate was predominantly of gravel corresponding to mixed sediment shore (LS5). Approximately 800 meters downstream of the proposed H crossing, the substrate comprised gravel and silt and the margins had dense stands of common reed *Phragmites australis* (FS1).

3.1.4.2 Slaney Estuary tributaries

In the Tinnokilla Stream, floating river vegetation consisted of water crowfoot *Ranunculus sp.* and rooted fool's water cress. Moss was also present on large boulders and algae were present. The substrate was mainly composed of gravel and cobble and the flow was mainly riffled (60%). The stream was heavily silted at the time of sampling, presumably due to riparian / instream activities further up the in the catchment. It appeared as though this was a regular recent occurrence given the amount of silt deposited on the floating river vegetation and substrate. The quantity of silt covering floating River vegetation was deemed sufficient to block out light necessary for growth and survival of the plant. This watercourse corresponds to eroding upland river habitat (FW2).

The Ballyvoleen River has fairly high gradient and is also classed as an eroding/upland River (FW2). The riparian habitat of the Ballyvoleen River (and broadly similar for other rivers in this section with the exception of the Mullinree) was semi-natural and consisted mainly of ash (*Fraxinus excelsior*), gorse (*Ulex europaeus*), lesser celandine (*Ranunculus ficaria*), dandelion (*Taraxacum officinale agg.*), dock (*Rumex spp*), bramble (*Rubus fructicosus agg.*) and cow parsley (*Anthriscus sylvestris*), creeping buttercup (*Ranunculus repens*) and Yorkshire fog (*Holcus lanatus*). This River had a layer of filamentous algae and moss was present on stones. No instream vegetation was present.

The surveyed stretch of the Ballyvalloge Stream was generally depositing and siltation of the substrate was deemed to be light. There was considerable filamentous algal growth on the rocks at this site. This watercourse is classed as a depositing/lowland River (FW1).

The Mullinree Stream was also categorised as an eroding/upland river due to the eroding banks despite its relatively low gradient. The riparian vegetation of the Mullinree Stream was semi-natural and was dominated by wild garlic *Allium ursinum* and deciduous woodland. Invasive Rhododendron was also present along the bank of this watercourse upstream of the sampling site in the townland of Cullentra. Small amounts of dead algae were present on stones and a light coating of silt and algal growth was recorded on the substrate.

3.1.5 Aquatic ecology

This section gives information on protected aquatic species in the Slaney Estuary component of the study area (including tributaries). The fisheries value of watercourses and macroinvertebrate results of biological sampling are also discussed in this section. The full list of macroinvertebrates at each sampling site is given in Appendix 4.

3.1.5.1 Protected species

Pearl mussel

The Pearl Mussel is listed under Annex II and V of the Habitats Directive (92:43: EEC). It is legally protected in Ireland under Schedule 1 of the Wildlife Act (1976 (Protection of Wild Animals) (Statutory Instrument No. 112, 1990) and the European Communities (Natural Habitats) Regulations (Statutory Instrument No. 94, 1997). This species is listed as one of the conservation interests of the Slaney Valley SAC; however, it occurs a significant distance upstream of the study area within the Derreen River, a tributary of the Slaney, and would not be affected by the proposed development. This species was not recorded in any watercourse examined during the current field work.

Swan Mussels

The Freshwater duck mussel *A. anatina* is typically a lowland species (Kerney, 1999). This species was recorded in the River Slaney during the current study approximately 1.5 km downstream of King's Island. Over the last ten years this species has suffered from the spread of the zebra mussel *Dreissena polymorpha*, whose spat settles on hard surfaces, including living *Anodonta*. The RBD status of *A. anatina* is 'Vulnerable' (Moorkens, 2006). This species has a preference for slow flowing waters and was not recorded in any of the Slaney Estuary tributaries during the current assessment. These rivers (Ballyvalloge, Mullinree and Tinnokilla watercourses) are deemed too fast-flowing for swan mussels.

Brook, River and Sea 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 SAC.

River/brook lamprey were recorded in the Slaney main channel at Deep's Bridge during the current field survey work. Juvenile river/brook lamprey were recorded in the Ballyvalloge River and the Ballyvoleen River during the current assessment.

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 are listed as a key conservation interest of the Slaney River Valley cSAC. 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. Directly upstream of the study area tributaries of the River Slaney such as the Boro River which are identified as being of importance for salmon and trout spawning. It is considered that the minor tributaries of the River Slaney within the study area are of some importance for salmon i.e. Ballyvoleen, Ballyvalloge, Mullinree and Tinnokilla watercourses.

Otter

The otter *Lutra lutra* 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. This species is listed as one of the qualifying interests of the Slaney Valley SAC designation. Otters can be expected to utilise watercourses containing *Salmo sp.* within the catchment and are expected to occur along the Ballyvoleen, Ballyvalloge, and Mullinree and Tinnokilla watercourses.

3.1.5.2 Fish and fisheries

Slaney Estuary

The River Slaney is a designated Salmonid Water under S.I. No. 293/1988 – European Communities (Quality of Salmonid Waters) Regulations, 1988. This River has been closed to angling for the 2010 fishing season for all salmon and for seatrout over 40cm, with a bag limit of 2 seatrout per day.

The Slaney has a number of well recognised salmon and trout fisheries upstream of the current study area in the freshwater stretches of the River. According to McGinnity (2003) the minor tributaries of the River Slaney within the Slaney Estuary (between Ferrycarrig and Oilgate) are not considered to be significant producers of salmonids. It is expected that populations of brown trout are present where water quality and habitat provides suitable conditions.

The Central Fisheries Board has been sampling fish in estuaries for the past few years. The Water Framework Directive has led to a requirement to have knowledge on composition and abundance of fish communities in estuaries (or transitional waters). Transitional water (estuarine) surveys were carried out at sites on the Upper Slaney Estuary and Lower Slaney Estuary as part of the programme of surveillance monitoring for the Water Framework Directive, between the 10th and 25th of September, 2009. The Upper Slaney water body begins in Enniscorthy town and extends downstream to the southern tip of King's Island where it meets the Lower Slaney Estuary (current study area). The following fish were recorded by the CFB during the September 2009 survey of the lower Slaney; Thick lipped grey mullet *Chelon labrosus,* Flounder *Platichthys flesus,* Sprat *Sprattus sprattus,* Plaice *Pleuronectes platessa,* Eel *Anguilla anguilla,* Long-spined sea-scorpion *Taurulus bubalis,* Sand goby *Pomatoschistus minutes,* 5-bearded rockling *Ciliata mustela,* Brown trout *Salmo trutta,* Salmon *Salmo salar,* 3-spined stickleback *Gasterosteus aculeatus,* Whiting *Merlangus merlangus,* Cod *Gadus morhua,* Pollack *Pollachius pollachius,* Herring *Clupea harengus,* Bib *Trisopterus luscus* and Rock Goby *Gobius paganellus* (CFB, 2009). The most abundant fish species was sand goby (513) followed by flounder (447) and 3-spined stickleback (347).

The European eel *Anguilla anguilla* is worthy of note in this section due to the catastrophic decline of the international population of this species that has occurred over the past 20 years. This species is now considered to be outside safe biological limits and measures for protecting eels and establishing measures for the recovery of the stock of European eel have been introduced by the EU (Council Regulation EC No 1100/2007 of 18 September 2007).

The South Eastern River Basin District Eel Management Plan (SERBDEMP) has been prepared in accordance with Council Regulation (EC) No. 1100/2007 to describe measures to be carried out within Ireland's South Eastern River Basin District for the recovery of the stock of European eel. Important catchments identified in the SERBDEMP include the Slaney (639 ha), the Owenavorragh (51 ha) and the Sow (25 ha) where areas in parenthesis are fluvial channel areas.

The most important transitional water for eel in the Wexford District is the Lower Slaney Estuary (1,800 ha). Wexford Harbour, the large and partly enclosed estuary of the Slaney, has supported a fyke net fishery since the 1970's .The Wexford District is almost exclusively siliceous however and its freshwaters are therefore of poor productivity for eels (SERBDEMP). Both the lower and upper sections of the proposed scheme are considered important for eel.

Other important transitional waters include the lagoons Tacumshin Lake (300 ha) and Lady's Island Lake (300 ha). An unexploited stock exists in the South Slob lands Channel. Data within the Eastern

River basin District as a whole is not sufficient for any firm conclusions regarding the status of the stock to be drawn at this time (SERBDEMP).

Twaite Shad *Alosa fallax* and Allis Shad *Alosa alosa* 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). Both species are also listed in Appendix III of the Bern Convention. Shad have an anadromous life cycle and both species have been recorded from the Slaney Estuary.

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.

In the course of an investigation of the Wexford net fishery in 1977 and 1978, approximately 20 specimens of shad were examined and confirmed as Twaite Shad. During this investigation, more than 300 shad were handled and all bore the external markings of twaite shad. It was therefore suggested that twaite shad constituted the greater part, if not all, of the commercial shad catch (Fahy, 1982).

During a study of lamprey and shad in the Slaney and Blackwater SAC Rivers (King and Linnane, 2004), no shad were captured in netting operations on the Slaney during the scientific survey, which took place during the summer of 2003. Twenty-five separate operations took place over this time period. Various types of netting procedures were adopted included fixed and floating drift nets, draft nets and fyke nets. Commercial netsmen operating draft nets in the Slaney Estuary supplied what were identified as 2 Twaite Shad and one Allis Shad. The Twaite Shad were taken near Ferrycarrig in the lower reaches (near the existing N25 crossing) and the Allis Shad was taken at Macmine in the middle reaches (near Kings Island, upstream of the study area). No juvenile shad were taken during surveys in the Slaney Estuary. Both species are likely therefore 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 Valley cSAC.

During the current assessment, a shoal of thick-lipped grey mullet *Chelon labrosus* along with some juvenile flounder *Pleuronectes flesus* were recorded in the Lower Slaney Estuary opposite the Heritage Centre. *C. labrosus* is the commonest grey mullet in the British Isles occurring on all coasts. Living offshore in winter, they come into coastal and estuarine waters during spring and summer forming shoals. Flounder, a common fish of all coasts in North-western Europe are an inshore fish found particularly in estuaries. Common goby *Pomatoschistus microps,* a fish whose habitat includes tide-pools, estuaries salt marshes and brackish waters was recorded at Ferrycarrig Bridge. This abundant species is found on all coasts of north-west Europe.

River Slaney tributaries

There are a number of tributaries in the study area considered to be of importance for fish. These watercourses enter the River Slaney from the west. From north to south these are the 4th order Tinnokilla Stream, 3rd order Ballyvoleen River and the 3rd order Ballyvalloge River. These streams generally have good gradient and good riffle pools sequences. There are also some depositing areas with juvenile lamprey habitat, especially in the Ballyvalloge River.

In O'Reilly's exhaustive angling guide to the river's of Ireland (O'Reilly, 2004) none of the River Slaney Estuary tributaries (Tinnokilla, Ballyvoleen, Mullinree, Ballyvalloge watercourses etc.) are mentioned.

The combination of riffle, glide and pools and good water quality in the Tinnokilla Stream provide good salmonid spawning, nursery and rearing habitat. No lamprey nursery habitat was present along the surveyed stretch of river.

In the Ballyvoleen River, juvenile lamprey juvenile habitat was present but lampreys were not recorded at this site during the current assessment. This stream contained good salmonid rearing; foraging and spawning habitat and numerous brown trout *Salmo trutta* were recorded.
The Ballyvalloge River had good juvenile lamprey habitat and a juvenile brook/river lamprey was recorded on-site. The Ballyvalloge River is likely to contain juvenile trout and salmon, the latter

especially in the lower reaches. The stretch of the stream sampled contained satisfactory spawning and rearing habitat.

The Mullinree Stream contained good trout nursing and rearing habitat and good potential brook/river lamprey spawning habitat and nursery habitats. The lower reaches of this watercourse were deemed only marginally large enough for spawning salmon. No lampreys or salmonids were recorded during the on-site assessment but there was evidence that river/brook lamprey had spawned recently (redds). A three-spined stickle back was recorded at the kick sampling site.

3.1.5.3 Macroinvertebrates

Slaney Estuary

The macroinvertebrate compositions at sampling stations on the Lower Slaney Estuary at Ferrycarrig Bridge, the Heritage Centre and Mullinree were typical of brackish waters. At Deep's Bridge and at Ballyhoge (ca. 1 km downstream of King's Island) the macroinvertebrate fauna was representative of freshwater habitat.

In the vicinity of the existing N25 crossing of the River Slaney Estuary on the south side of the Ferrycarrig Bridge, intertidal species typically associated with coastal conditions were recorded; the mysid *Neomysis integer* and the shrimps *Palaemon sp.* and *Gammarus zaddachi,* the latter known to occur in both brackish and marine waters. The ragworm *Hediste diversicolor* was also recorded (c. 50 per m^2). *Hediste diversicolor,* another species of ragworm was also recorded at anoxic level in the substrate. Also recorded was the inter-tidally ubiquitous and abundant green shore core *Carcinus maenas*.

On the inter mudflat upstream of the A/B crossing (opposite the heritage centre) off the R730 regional road (T00362, 23048), intertidal invertebrate species recorded were Lugworm *Arenicola marina* and *Cyathura carinata.* Both of these species usually live in mud, the latter occurring in brackish water habitats. *A. marina* is found on lower shore clean to muddy sand, exposed or sheltered and its range is from north-west European coasts from the Arctic to the Mediterranean. *C. Carinata* is found on southern coasts southwards to the Mediterranean. *Corophium volutator*, an intertidal amphipod and also an inhabitant of mud, usually in estuaries was also recorded. The reductive layer was 2.5cm deep at this site. Ragworm *Hediste diversicolor* was also recorded (c. 30 per m^2).

On the River Slaney Estuary at Mullinree near the junction of the R730 and the old railway line, species were collected from the net sampling and core sampling. Ragworms (*Hediste diverscolor*) were particularly dominant at this site (60/m^2), the freshwater shrimp (*Gammarus deubeni*), *C. carinata* and *P. flesus* were also recorded on site. The reductive layer at this site was at a depth of 4cm.

On the west side of Deep's Bridge, a total of 11 different macroinvertebrate families were recorded. Four species of mayfly were present at larval stage; pollution sensitive *Ecdyonurus venosus* and *Rhithrogena semicolorata* as well as pollution tolerant *Ephemerella notata* and *Baetis rhodani*. Pollution sensitive stonefly larvae of *Isoperla grammatica* and *Chloroperla torrentium* were both present. *Gammarus zaddachi,* a shrimp associated with brackish conditions was numerous while the freshwater shrimp *G. deubeni* was present. Fair numbers of *Potamopyrgus jenkinsi* were recorded and *Valvata piscinalis* was present. The leech *Haemopis sanguisuga* which is not truly aquatic was also recorded at this site. This site had a high biological diversity and was subject to a freshwater influence. Therefore biotics indices such as BMWP and ASPT were applied to this site. The BMWP score at this site was 41.4 indicative of a moderately impacted watercourse and the ASPT was high (6.9) which is indicative of high ecological status (Table 7).

On the west bank of the Slaney approximately 180 meters upstream of the proposed C6 crossing – 'H' route (S97632, 31112), in the townland of Ballyhoge, a rich macroinvertebrate assemblage was recorded. A family diversity of 20 was recorded including the freshwater duck mussel *Anodonta anatina.* Pollution tolerant larvae of *Ecdyonurus venosus* (mayfly) and *Isoperla grammatica* (stonefly) were scarce. Less sensitive Group B cased caddisfly larvae were well represented with the following species occurring; *Anabolia nervosa, Lepidostoma hirtum, Mystacides azurea* and *Goera pilosa* all present) and *Halesus digitatus* scarce. Pollution tolerant Group C snails were also plentiful with

Lymnaea peregra, Planorbis carinatus, *P. contortus* and *Bithynia tentaculata* recorded. Among the other organisms recorded at this site were alderfly larvae *Sialis sp.,* Lumbriculidae and *Gammarus deubeni*. The diving beetles *Potamonectes depressus elegans* and *Stictotarsus duodecimpustulatus* of subfamily Hydroporinae were scarce and present correspondingly. The habitat type at this site was deemed suboptimal for aquatic macroinvertebrate production. This site also had a high biological diversity and was also subject to a freshwater influence. Therefore biotic indices such as BMWP and ASPT were applied to this site. The BMWP score was at this site was 68.2 and the ASPT score was 6.2 both indicative of high ecological status (Table 7).

Slaney Estuary tributaries

Tinnokilla stream (Field code S1/15)

Despite the silted conditions at this site, pollution sensitive mayfly larvae of *Rhithrogena semicolorata* were numerous while pollution sensitive stonefly larvae of *Amphinemoura sulcicollis* and *Chloroperla torrentium* were present. Less sensitive cased caddisfly larvae of *Halesus radiatus* and *Odontocerum albicorne* and pollution tolerant caseless caddisfly larvae of *Rhyacophila dorsalis* and riffle beetles were all present at this site. Pollution tolerant *Hydropsyche pellucidula* and *Gammarus deubeni* were both common. Taking account of the various features of this site, biological water quality was given an overall rating of Q4, corresponding to WFD Good status. This rating would be expected to drop with continuation of elevated of suspended solids in the stream.

Ballyvoleen River (Field code S1/16)

This stream had a high family diversity of 19 and tentatively rated Q4 due to siltation levels (moderate) and mild algal growth. Group A pollution sensitive species included mayfly larvae of *Rhithrogena semicolorata* (common) and *Rhithrogena semicolorata* (present) and stonefly larvae of *Isoperla grammatica* (scarce) and *Chloroperla torrentium* (scarce). The Trichopterans (caddisfly larvae) were well represented at this site with six species occurring; *Halesus radiatus, Potamophylax sp.* and *Plectronemia conspersa* all present. Gastropods recorded at this site were *Ancylus fluviatilis* (scarce) and the introduced *Potamopyrgus jenkinsi* (present).

Ballyvalloge River (Field code S1/17)

The kick sample was carried out in a riffled section that provided optimal macroinvertebrate habitat and a family richness of 15 was recorded. It is noteworthy that 5 Group 'A' pollution sensitive indicators were recorded at this site; mayfly larvae of *Rhithrogena semicolorata* (common) and *Ecdyonurus venosus* (present), and stonefly larvae of *Isoperla grammatica* (small numbers), *Amphinemoura sulcicollis* (present) and *Chloroperla torrentium* (scarce). Such relative abundance of pollution sensitive indicators would normally imply a rating of Q5 but due to siltation and algae, it has been rated Q4-5, Equivalent to WFD High status.

Mullinree Stream (Field Code S1/24)

A rich macroinvertebrate community was recorded at this site. *Ecdyonurus venosus, Rhithrogena semicolorata* and *Baetis rhodani* all occurred at this site and were generally common. Pollution sensitive stonefly larvae of *Chloroperla torrentium* was present. Group C pollution tolerant species and included larvae of *Hydropsyche siltali,* true fly larvae of blackfly, *Dicrnota* sp. and green chironomids as well as diving beetles in sub-family Colymbetinae. The most abundant macroinvertebrate at this location was *Gammarus deubeni.* This site was rated Q4 unpolluted, equivalent tot WFD Good status.

3.1.6 Additional observations

Various sites on the Slaney River catchment were also subject to searches for lamprey, freshwater mussels and crayfish. The Kavanaghspark Stream was examined at Galbally Bridge. The proposed B and C routes would cross this stream. This stream referred was approximately 2.5 meters in width and had good physical variation. This stream was rated good/ excellent in terms of salmonid habitat.

The Jamestown stream, north of Oilgate which would be crossed by the proposed G route in its upper reaches had little fisheries value but it was considered that trout may be present. Thick filamentous algal growth was present indicating moderate pollution. The Reddina stream, south of Ballyhoge village, which would be crossed by the H route at it headwaters was of little/no fisheries value. This stream was drained with little or no flow and was practically dried up during the on-site assessment. The Ballyvalloge stream, a tributary of the main Slaney channel, averaged 1 meter in wetted width and 35cm maximum depth. This stream would be crossed by the proposed H route in its middle reaches and appeared to have good water quality. This stream had good physical diversity and provides optimal macroinvertebrate habitat. Habitat for salmonids was rated good. The above named sites were searched for Annex II River/brook lamprey, crayfish and mussels. None were recorded within the Slaney River catchment during the on-site assessment.

The Coolteen stream which is a tributary of the Mullinree Stream would be crossed by the H route option and also by the G route option. This stream had a mainly fine substrate, with an eroding bankside. Filamentous algae was present on the substrate of this stream. This stream contained optimal juvenile lamprey habitat and a juvenile river/brook lamprey was recorded at this site. This stretch of river was deemed poor / satisfactory for lamprey and salmonid spawning and for all other life stages of salmonids.

3.2 Sow Coastal catchment

3.2.1 Catchment overview

The River Sow (EPA code 12/S/03) drains a catchment of 88 square kilometers. This river flows into Wexford Harbour from the north at Castlebridge, due north of Wexford Town. One 1st order tributary of the River Sow in the townland of Martingale would be affected by the F route and the E route options.

A site on the Rover Sow was investigated immediately upstream of Kilmallock Bridge (T03244, 31858). The wetted width of the Sow River at this location was approximately 3 meters. The river had a mean depth of 30 cm and a maximum depth of 90 cm. The substrate was mainly a mixture of gravel and fine materials. Some tributaries of this river in the western part of the catchment would be crossed by the proposed F and E route options.

3.2.2 Designated areas

Immediately south of this catchment is the River Slaney Valley SAC and the Wexford Harbour and Slobs SPA and pNHA. These designated areas have been discussed in section 3.1.2 and the site synopses for these sites are given in Appendix 3.

3.2.3 Water quality

The overall SERBD objective for the River Sow (WFD code IE_SE_12_2504) is to restore at least 'good status' by 2015. The risk assessment maps presented in the South Eastern River Basin District Project (SERBDP) '*Freshwater Morphology POMS Study – Final Report*' (2008) show that the River Sow has an overall risk of 1a 'at risk of not achieving good status'.

3.2.3.1 Chemical water quality

The River Sow is monitored by the EPA at two sites, the Ballinkeel Bridge (EPA code 0100) and the Kilmallock Bridge (0200). The overall results of the 2008 monitoring programme showed that the River Sow had depressed levels of DO (% sat) on all sampling locations at the Ballinkeel Bridge. At this location, the levels ranged from 63-91%. In the EC (Surface Water) Regulations, the Dissolved Oxygen lower limit is 80% at 95%ile flow. The mean DO (% sat) level of 88.4% at Kilmallock Bridge was within the 95%ile dissolved oxygen lower limit but was below this limit on one occasion at 77%.

The mean BOD levels at Ballinkeel Bridge on the River Sow was 1.42mg/l O_2 – within the 'good status' limit at mean flow and the High status limit at 95%ile flow. There was a general reduction in BOD levels downstream at Kilmallock Bridge with the mean level at 1.2mg/l O_2. Nitrite levels at

Ballinkeel Bridge were elevated on one occasion in July 2008 at 0.068mg/l. Mean levels of ammonia at Ballinkeel Bridge (0.02mg/l) were within the limits of the European Communities Environmental Objectives (Surface Waters) Regulations 2009 but the mean Ammonia level at Kilmallock Bridge (0.142mg/l) exceeded all limit values.

Nitrite levels above 0.05mg/l N are an indication of pollution. Nitrate levels were elevated on three occasions at the Ballinkeel Bridge and with levels of 6.5mg/l, 5.8mg/l and 5.1mg/l being recorded and on two occasions at the Kilmallock Bridge (5.8mg/l and 5.3mg/l).

3.2.3.2 Biological water quality

Biological water quality in the Sow River (12S04) is monitored by the EPA. The Sow River was rated Q3-4* 'moderately polluted' at Ballinkeel Bridge (WFD station 0100) in 2007. Water quality improved downstream to Q4 'good status' at Kilmallock bridge (WFD station 0200) and remained at Q4 at the three other sites downstream. According to the EPA, the Sow River was in a generally satisfactory ecological condition in 2007. Unsatisfactory ecological conditions were noted in the upper reaches at Ballinkeel Bridge (0100) with excessive plant growth and siltation of substratum noted. Although the macroinvertebrate fauna indicated satisfactory ecological conditions downstream of Ballinkeel bridge (0200 – Kilmallock bridge, 0250 – Aughgarr bridge, 0300 – Coolamain bridge), there were clear signs of nutrient enrichment with abundant macrophyte growth. At Randalsmill Bridge (0370) in particular, there was a decline in the abundance of sensitive macroinvertebrate fauna in comparison to the 2004 results and heavy siltation of substratum was noted.

At the site surveyed at Kilmallock Bridge on the River Sow water quality was rated 'Q4, Unpolluted', equivalent to WFD Good Status. The BMWP score for this site was 58.1, indicative of Moderate water quality.

3.2.4 Habitats and flora

At the site surveyed on the River Sow, the river was classed as an eroding/upland river (FW1). At this location, there was no instream vegetation and the flow was predominantly glide (80%). This stretch of River was heavily shaded (80%) by mature trees. The riparian vegetation was typical of a semi-natural habitat and included cow parsley *Anthriscus sylvestris*, dock *Rumex spp*., bramble, gorse, lesser celandine, dandelion, scaly male fern *Dryopteris affinis*, ivy *Hedera helix* and ash *Fraxinus excelsior*.

The flow in the surveyed stretch of the Rathdowney stream was sluggish and the substrate was heavily silted. Instream vegetation consisted mainly of emergent reeds. The banks were dominated by gorse (*Ulex europaeus*) Yorkshire fog (*Holcus lanatus*) and willow (*Salix spp.*). This stream is on a low lying catchment which flows into the Drinagh intake. This stream was classed as a depositing watercourse (FW2) containing no riffled habitat.

3.2.5 Aquatic ecology

This section gives information on protected aquatic species in the study area of the Sow coastal catchment (including tributaries). The fisheries value of watercourses and macroinvertebrate results of biological sampling are also discussed in this section. The full list of macroinvertebrates at each sampling site is given in Appendix 4.

3.2.5.1 Protected species

No rare or protected species were recorded in this watercourse. Otter is likely to occur along this watercourse.

3.2.5.2 Fish and fisheries

According to O'Reilly (2004) the Sow River has historically had a good run of seatrout annually and is recognised as a salmonid watercourse. However, McGinnity (2003) highlights an impassable barrier

on the River which would prevent the upstream migration of salmonids into this small catchment. The surveyed stretch of the River Sow contained only minimal juvenile lamprey habitat. Brown trout are likely to occur in the middle and lower reaches of this River due to the presence of suitable spawning and nursery habitats.

3.2.5.3 Macroinvertebrates

At Killmallock Bridge, the low macroinvertebrate family richness of 13 was considered to be a reflection of the degraded morphological character of this river; drained with a trapezoidal cross section and having poor instream diversity. The only Group 'A' pollution sensitive species recorded at this site was mayfly larvae of *Heptagenia sulphurea,* which was common. Mayfly larvae of *Baetis muticus* (Group B) and *B. rhodani* (Group C) were recorded in small numbers and present respectively. Larvae of the Group C caseless caddisfly *Hydropsyche pellucidula* and the Group B cased *Sericostoma personatum* were common and present in that order.

3.2.6 Other observations

In the River Sow catchment, the following watercourses were assessed; the Martingale Stream which would be crossed by the proposed E and F route options and the Garrycleary stream which would be crossed by the proposed F route option. The Garrycleary stream was examined at two sites; in the townland of Garrycleary and at Aghnanure Bridge. Both of these sites were slightly silted, had a mixed substrate with some fines at the end of pools, filamentous algae was present at Aghnanure Bridge and both sites had good salmonid potential in terms of spawning and nursery habitats. The Coolaknick stream appeared silted, filamentous algae was present and the substrate was silted. The Martingale stream was channelised, approximately 1.5 m in width and had a mean depth of <5cm. This watercourse had low physical diversity and the substrate was mainly gravel and silt. No lampreys, crayfish or other notable aquatic species were recorded at any of these sites.

3.3 Corock catchment

3.3.1 Catchment overview

The Corock catchment is at the south-western end of the study area. The headwaters of the Corock River (EPA code 13/C/01) include the Templeshelin Stream and the Tomgarrow River, both crossed by the existing N25. The Corock River flows southerly towards the sea for approximately 13km and meets the tide as a 5th order river upstream of Wellington Bridge at Bannow Bay on the southern coast of Wexford.

The Mulmontry River is a 4th order tributary of the Corock River. It confluences with the Corock River downstream of Hares Mead Bridge approximately 2 km south of Foulkesmill. The head waters of the Mulmontry River within the Corock catchment would be affected by the proposed G and H route options. These route options cross the 1st order 'Coolstuff Stream' (so called for the purpose of this report) and the 'Coolteen Stream' north west of Taghmon.

The geology of the Corock catchment is mainly acidic surface water gleys/ground water gleys (AminPD) and acid brown earths/brown podzolics (AminDW).

3.3.2 Designated areas

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.

3.3.3 Water quality

The overall SERBD/WFD objective for the Mulmontry River (WFD code IE_SE_13_394) is restoration to at least 'good status' by 2015. The WFD objective for the Corock River (WFD code IE_SE_13_397) is to protection of its current 'good status' until 2015. The risk assessment maps presented in the South Eastern River Basin District Project (SERBDP) '*Freshwater Morphology POMS Study – Final Report*' (2008) shows that the Mulmontry River is 2b 'not at risk' and 'strongly expected to achieve good status by 2015.

3.3.3.1 Chemical water quality

The River Corock (EPA Code 13/C/01) at Aughaloe Bridge (EPA code 0020) had elevated nitrate levels during the 2008 sampling period, concentrations ranging from 5.3mg/l to 6.7mg/l. The EPA notes that orthophosphate, BOD and ammonia were also elevated in this watercourse, possibly due to agricultural pollution. High nitrate levels persist in the river; however dilution was noted by the EPA at the downstream sampling station at Foulkesmills (station 0100).

3.3.3.2 Biological water quality

The Corock River (EPA Code 13C01) was most recently monitored by the EPA in 2007. The uppermost station (0020, Aughaloe Bridge) and station 0080 in the middle reaches were rated Q4, Good status. There was a decline in water quality in the lower reaches with station 0150 rated Q3-4, Moderate status. According to the EPA, the Corock River was in a satisfactory condition in 2007; however the faunal community indicated an enriched status at the lower WFD station (0150).

The Mulmontry River (13M01) would be crossed by the F route in its lower reaches and the G and H route in the middle reaches. According to the EPA, this watercourse was unsatisfactory at all three locations (0200; Aughnagroagh bridge, 0400; Mulmontry bridge and 0700; Goff's bridge) when examined in 2007. Deterioration at the final location (Goff's Bridge) since previous survey marked the first time since 1987 that conditions there were less than satisfactory. The uppermost location (Aughnagroagh Bridge) is immediately upstream of the intake point for a public water supply.

The Mulmontry River at Aughnagrough Bridge in the Corock catchment appeared to be slightly polluted due to siltation. This site was dominated by floating river vegetation and substrate was mainly gravel.

3.3.4 Habitats and flora

The watercourses in the Mulmontry catchment are generally slow flowing as they drain low gradient lands. These watercourses are classed as lowland/depositing rivers (FW2). The Coolteen Stream and Mulmontry River contained floating river vegetation *Ranunculus* spp.

3.3.5 Aquatic ecology

This section gives information on protected aquatic species in the study area of the Corock catchment (including tributaries). The fisheries value of watercourses and macroinvertebrate results of biological sampling are also discussed in this section. The full list of macroinvertebrates at each sampling site is given in Appendix 4.

3.3.5.1 Protected species

The larger watercourses contain lampreys and are also likely to support salmon and otter.

3.3.5.2 Macroinvertebrates

Macroinvertebrate species likely to occur in the Corock catchment are likely to be those associated with lowland rivers.

3.3.5.3 Fish and fisheries

The Corock River discharges to the sea at Bannow Bay. It is recognised as a salmon and seatrout producing watercourses (McGinnity *et al.,* 2003). There are no significant private fisheries on these Rivers within the study area. The Mulmontry River at Aughnagrough Bridge in the Corock catchment was generally rated satisfactory in terms of salmonid and lamprey spawning.

3.4 Bishops water coastal catchment

3.4.1 Catchment overview

The south eastern part of the study area comprises those watercourses that flow into Wexford Harbour from the south – the Bishop's water Coastal catchment. This catchment consists of the watercourses that drain into Wexford Harbour from the south. The largest watercourse in this catchment is the Assaly River (Field code C1/1/8) which flows into the Drinagh intake. The Assaly River drains a lowland area to the west of Rosslare. Drainage is generally north-easterly towards the Drinagh intake. In the lower reaches, it is crossed by Assaly Bridge on the N25 before flowing to the Drinagh intake; here it constitutes part of a network of channels. The Assaly River is crossed at by the proposed G, F and H routes.

First order tributaries of the River Assaly / Drinagh intake system extend east to Murntown and south to Tagoat. Several of these first order tributaries of the Assaly River would be affected by the proposed scheme. The proposed H and G routes run along the same line in this area and crosses streams south of Murntown and south of Knockangall. The H and F route options would cross the Assaly River downstream of Finoge Bridge as well as streams immediately south of Orristown and west of Ballyfinoge Little. The F, B and D route options would cross the Assaly River north of Killinick station. At the south eastern end of the study area, some 1st order streams to the west of Tagoat would be crossed by all route options – the F and H route crossing these streams to the south of the existing N25 and the other routes crossing these streams to the north of same. These watercourses resemble drains due to their degraded physical character and sluggish flow. To the south west of Rosslare town, in the townland of Rathdowney (on the R740), the flow in the surveyed stretch of stream was sluggish and the substrate was heavily silted. The wetted width of this stream was approximately 1.4 m and the mean depth was approximately 35 cm. The substrate was mainly of fine and gravel material.

A number of first order tributaries which drain into the Wexford harbour would be crossed by the, F, E, B and D route options. These include the Latimerstown Stream (field code BW-C1/2/1), Kellystown Stream (field code BW-C2) and the Hayestown Stream (field code BW-C3/1/1) and Newbay Stream (field code BW-C3/1) would be affected by the B and D and A route options.

This Ballyfinnoge great stream is a tributary of the Assaly River. It was examined approximately 10 meters downstream of the Finoge Bridge, north of Rathmacknee (T04090, 14094). It would be crossed by the proposed E,G,C and A proposed route options. The wetted width of this stream was approximately 1 meter and had a mean and max depth of 5 cm and a 30 cm correspondingly.

The lakes at the Johnstown Research Centre are in this catchment but do not appear to have overland connectivity with surface waters in the catchment and were therefore not sampled.

3.4.2 Designated areas

Immediately north of this catchment is the River Slaney Valley cSAC and the Wexford Harbour and Slobs SPA and pNHA. These designated areas have been discussed in section 3.1.2 and the site synopses for these sites are given in Appendix 3.

Approximately the lower 1 km of the College Stream is within the Slaney River Valley cSAC, downstream of the study area. There are some minor watercourses within the study area that flow into the River Slaney from the east also designated as part of the SAC. Only short reaches (generally 200-300 meters) of these watercourses immediately upstream of the River Slaney are part of the designated area.

3.4.3 Water quality

The overall WFD objective for Bishops Water (WFD code IE_SE_12_2289) is to at least 'good status' by 2015. The risk assessment maps presented in the South Eastern River Basin District Project (SERBDP) '*Freshwater Morphology POMS Study – Final Report*' (2008) indicates that the Bishops Coastal Water is 1a 'at risk of not achieving good status' by 2015.

3.4.3.1 Chemical water quality

The EPA maintains a chemical water quality monitoring programme on the Assaly River (12/A/02) in conjunction with a biological monitoring programme. Chemical water quality data from the EPA during 2008 was available for two stations on the Assaly River, Finoge Bridge (EPA station code 0100) which is downstream of Piercetown on the R739 and Assaly Bridge on the N25.

The 2008 monitoring results for the Assaly River show that the orthophosphate levels at the Finoge Bridge were consistently elevated at between 0.11mg/l and 0.28mg/l, with a mean of 0.19mg/l over 4 sampling periods. The mean orthophosphate level (0.19mg/l) was below the threshold value of 0.075 mg/l limit at 95%ile flows required for Good status, a value set in the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. 272 of 2009).

BOD levels were elevated on two sampling occasions in the Assaly River. The maximum concentration recorded at Finoge Bridge at Assaly Bridge was 6.8 mg/l O_2 and 8 mg/l O_2 respectively. The mean level of BOD for the Assaly River over the sampling period was 3.6mg/l O_2 which exceeded the European Communities Environmental Objectives (Surface Water) Regulations, 2009 at high and good status levels.

Ammonia was also found to be elevated during December 2008 at 0.31mg/l on the Finoge Bridge and 0.53mg/l on the Assaly Bridge; this was significantly higher than the threshold limit for 'good status' (0.14mg/l at 95%ile flow) as in the EC Environmental Objectives (Surface Water) Regulations, 2009.

The December sampling period for the Assaly River found that BOD, Ammonia, Orthophosphate and Colour in the watercourse at Finoge Bridge and Assaly Bridge were all elevated, indicating a significant pollution event in the Assaly River on this occasion.

3.4.3.2 Biological water quality

The Assaly River is monitored at two locations by the EPA. The upstream site at Finoge Bridge (WFD station 0200) was rated Q4, Good status in 2007 and the downstream site at Assaly Bridge (WFD station 0300) was rated Q3-4 Moderate status in 2007. According to the EPA, the macroinvertebrate fauna at Finoge Bridge (0200) on the west branch of the Assaly River indicated satisfactory ecological conditions. Excessive siltation however and the presence of *Cladophora sp*., a filamentous algae indicative of enrichment were noted. An unsatisfactory decline in ecological quality was noted downstream of the confluence between the north and west branches at Assaly Bridge (0300) with excessive siltation and algal growth also observed.

A number of streams which drain the south east section of the study area, south of Wexford town are also within the Bishops water coastal catchment and would be crossed by the proposed route selection options. These streams are Kellystown Stream, Latimerstown Stream, Hayestown Stream, Newbay Stream, Coolree Stream and College Stream. These streams have been named according to townland and are not monitored by the EPA. According to Clabby *et al.* (2008), Wexford Harbour was classed as eutrophic during the period 2002-2006 but according to Lucey, (2009) status improved to intermediate in 2007-2008.

The site surveyed on the Assaly River downstream of the existing N25 was rated Q3-4, Slightly Polluted corresponding to WFD Moderate Status. This rating has been raised due to the depositing nature of this part of the river. The EPA (Toner *et al.,* 2005) note that other relevant factors can

contribute to a Q-rating and that kick sampling should take place on riffled stretches. No such riffles were found on the Assaly River during the course of the current assessment.

Water quality in the surveyed section of the Ballyfinoge great stream appeared good. This site was rated Q4, Good Status. This stream was deemed too small for the Q-rating system and the rating given has been raised accordingly.

The site surveyed on the Rathdowney Stream at the R740 was unsuited for rating using the EPA freshwater biological monitoring system due to its sluggish nature but water quality was deemed to be Q3-4 Slightly Polluted using Criteria in Toner *et al.* 2005), equivalent to Water Framework Directive (WFD) Moderate status.

3.4.4 Habitats and flora

Instream vegetation in the Assaly River downstream of the existing N25 consisted of fool's water cress *Apium nodiflorum* and common reed *Phragmites australis*. The wetted width of this stream was approximately 1.4 m and the mean depth was approximately 35 cm. This stretch of the Assaly River is classed as a lowland/depositing river and typifies the character of this sluggish river.

On the Ballyfinoge great stream, the substrate was predominantly gravel based, slightly silted and free of filamentous algae. The riparian vegetation consisted of cow parsley *Anthriscus sylvestris*, dock *Rumex spp.*, white willow *Salix spp*., red dead nettle *Lamium purpureum*, bramble *Rubus fructicosus agg.*, gorse *Ulex europaeus*, lesser celandine and dandelion. Downstream of the Bridge on the Right Hand Side, the bank was well maintained and slightly eroding with a mean height of 0.7m. This part of the stream was classed as an eroding/upland river (FW1).

3.4.5 Aquatic ecology

This section gives information on protected aquatic species in the study area of Bishops Water Coastal catchment. The fisheries value of watercourses and macroinvertebrate results of biological sampling are also discussed in this section. The full list of macroinvertebrates at each sampling site is given in Appendix 4.

3.4.5.1 Protected species

No protected aquatic species were recorded in this catchment during the on-site assessment. The Assaly River had no potential salmonid spawning habitat and was considered marginal for other life stages of salmonids. This stretch of river could potentially be used by lampreys for nursery purposes, but it had little available habitat that could be utilised by lampreys for spawning. The Ballyfinoge great stream had no suitable juvenile lamprey habitat and it was considered unlikely that lampreys occurred in the surveyed stretch of stream.

3.4.5.2 Macroinvertebrates

In the Assaly River downstream of the existing N25, the macroinvertebrate assemblage was restricted to organisms other than pollution sensitive taxa. A total of 10 different macroinvertebrate families were recorded. Less sensitive cased caddisfly larvae of *Halesus radiatus* was common while *H. digitatus* was present. Very tolerant Group D *Asellus aquaticus* and most tolerant Group E bloodworms *Chironomous sp*. were recorded in small numbers and fair numbers respectively. Among the other organisms recorded at this site were bugs (Notonectidae and Veliidae) and mites (Hydracarina).

In the Rathdowney Stream, a total of 8 macroinvertebrate species were recorded in pollution sensitivity groups ranging from Group 'B' less sensitive to Group 'E' most tolerant. The best represented group were the cased caddisflies (Group 'B') with larvae of *Halesus radiatus* and *Limnephilus sp.* scarce and *Limnephilus flavicornis* common. Bloodworms *Chironomous sp.* occurred in small numbers while Group 'D' mussels *Pisidium sp.* and *Asellus aquaticus* both occurred in fair numbers. Bugs, mites and aquatic earthworms were generally scarce at this site.

In the Ballyfinoge great stream which flows into the Assaly river, pollution sensitive larvae of the mayfly *Rhithrogena semicolorata* was scarce with pollution tolerant larvae of *Baetis rhodani* numerous. The Trichopterans were well represented with the following species occurring; *Halesus radiatus* and *Micropterna sp.* (present), and *Agapetus fuscipes* and *Hydropsyche pellucidula* (common). Pollution tolerant *Gammarus duebeni* (common), True fly larvae of Simulidae (small numbers) and green chironomids (scarce) were also recorded.

3.4.5.3 Fish and fisheries

Water is pumped out from the Drinagh intake to the sea and there is no passage into the Drinagh intake for migratory fish, precluding the presence of salmon / sea trout in the watercourse feeding into the Drinagh intake.

The small size of the watercourses coupled with the low-land geography of the Bishop's Water catchment yields in watercourses of generally unsuitable for salmonids. Indeed, watercourses in this catchment are not considered significant producers of salmonids (McGinnity *et al.*, 2003). Of all the watercourses in this catchment, the College Stream was considered to offer the best salmonid habitat, containing riffle and pool features. In the stretch of approximately 1km upstream of the confluence with the River Slaney, the College Stream is within the River Slaney Valley SAC so this part of the watercourse is internationally important.

This stretch of the Assaly River downstream of the existing N25 had no potential salmonid spawning habitat and was considered marginal for other life stages of salmonids. This stretch of river could potentially be used by lampreys for nursery purposes, but it had little available habitat that could be utilised by lampreys for spawning. Three spined-sticklebacks were the only fish species recorded at this site.

The Ballyfinoge great stream was considered to be suitable for brown trout nursery and rearing of sub-adult trout. There was no suitable juvenile lamprey habitat recorded and it was considered unlikely that lampreys occurred in the surveyed stretch of stream.

3.5 Bridgetown/Duncormick coastal catchment

3.5.1 Catchment overview

The Bridgetown Duncormick coastal catchment is located in the southern most section of the study area, in Hydrometric Area 13. This catchment drains into the sea at Duncormick on the southern coast of Wexford. The main watercourses in this catchment that would be affected by the proposed routes are the Cleristown Stream (EPA code 13/C/04), the Bridgetown Stream (EPA code 13/B/01) and the Duncormick River (EPA code 13/D/01). Soils in this catchment are mainly acidic surface water gleys / ground water gleys in the middles reaches and peaty podzols in the upper headwaters. The underlying geology of the catchment is Cambrian greywacke, slate and quartzite.

The Cleristown Stream rises in the townland of Durra, north of Cleristown village. This stream flows south for approximately 7km before its confluence with the Bridgetown River. The headwaters of this stream are crossed by the G and H route options at several locations including the Coolsallagh Stream (Code B-DC2/2).

The Knockbrack stream, a tributary of the Cleristown Stream would also be crossed by the proposed G and H route options. This stream averaged approximately 0.5 meters in width, had a low flow and variable substrate. The Knockbrack stream was maintained and had an eroding bank. This stream would be considered poor to satisfactory in terms of salmonid and lamprey potential. The headwaters of the Cleristown stream at Gainstown Bridge. This stream was heavily modified and was surrounded by agricultural grassland on both banks and heavily impacted by cattle. The stream averaged 0.7m in width and appeared to be maintained.

The Duncormick River flows into the sea at Ballyteige Bay and flows into the Bridgetown-Duncormick main channel in the townland of Pembrokestown. The headwaters of this river are made up of numerous 1st and 2nd order streams. One of these streams – the Siginshaggard Stream (Field code B-

DC1/1) would be crossed by the proposed G and H route options. A 2nd order stream in the upper catchment of this river referred to as the Siginshaggard Stream (Field code B-DC1/1) would also be crossed by these route options. The Bridgetown Stream flows into the sea at Ballyteige Bay after meeting the Duncormick River Estuary. The upper reaches of the Bridgetown Stream are crossed by the G and H route options.

3.5.2 Designated areas

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 SP (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.

3.5.3 Water quality

The WFD objective for the Cleristown Stream (WFD code IE_SE_13_145) is restoration to 'good status' by 2021. The WFD objective for the Bridgetown Stream (WFD code IE_SE_13_692) is to protect the existing 'high and good status' of this watercourse until 2021.

The risk assessment maps presented in the South Eastern River Basin District Project (SERBDP) '*Freshwater Morphology POMS Study – Final Report*' (2008) indicates that the Bridgetown Stream is 1a 'at risk of not achieving good status', the Cleristown Stream is 2b 'not at risk' and 'strongly expected to achieve good status'. The Bridgetown Stream (EPA Code 13B01), Duncormick River (EPA Code 13B01) and Cleristown Stream (13C04) are monitored by the EPA.

3.5.3.1 Chemical water quality

The Bridgetown Stream (EPA Code 13/B/01) is monitored at the bridge east of Common (EPA code 0080). Orthophosphate at this station was elevated on the final sampling date in December 2008 (0.19mg/l). BOD levels were also elevated on the same sampling occasion (3.9mg/l). However the overall water quality at this station is satisfactory. It is the only freshwater station on this watercourse and is located approximately 4km downstream of the study area where the Gaynestown Stream (Field code B-DC3/2) is crossed by the G route. Further downstream in the tidal/brackish stations (EPA codes 0220 and 0400) the water quality of the Bridgetown Stream deteriorates significantly with elevated BOD and orthophosphates levels. The Bridgestown Stream is eutrophic in the lower reaches as indicated by high DO levels occasionally.

3.5.3.2 Biological water quality

When most recently monitored in 2007, the WFD stations monitored on the upper reaches (0200) and lower reaches (0080) of the Bridgestown Stream were rated Q4, Good status. According to the EPA, there was an improvement in the lower freshwater reach since previous survey. The Cleristown Stream was monitored at only one WFD monitoring station when surveyed in 2007 - station 0400, Castle Bridge upstream of Bridgetown River confluence. Water quality at this station was rated Q4 Good status. Based on 2007 results the EPA concluded that the Cleristown Stream was satisfactory with significant improvement since previous surveys. The Duncormick River was monitored at three locations in 2007. The uppermost station (0200, bridge east of Ballynagale) was rated Q3, Poor status while the middle and lower reaches of the watercourse were rated Q4 'good status'. According to the EPA, the Duncormick River was satisfactory except downstream of Taghmon (0200) where again it remained moderately polluted as in previous years.

3.5.3 Aquatic ecology

This section gives information on protected aquatic species in the study area of the Bridgetown Duncormick Coastal catchment. The fisheries value of watercourses and macroinvertebrate results of biological sampling are also discussed in this section. The full list of macroinvertebrates at each sampling site is given in Appendix 4.

3.5.3.1 Protected species

The Siginshaggard stream, a tributary of the Duncormick River was assessed at Aughwilliam Bridge where the proposed A and C route options would be crossing. This stream, a sub-tributary of the Duncormick River which would be crossed by the proposed A and C route options and was assessed 600 meters downstream of the Trinity Cross Roads. The headwaters of the Cleristown stream at Gainstown Bridge were assessed immediately upstream of the proposed A and C route option crossing. No protected aquatic species or potential spawning or rearing habitat was recorded within this catchment during the on-site assessment.

No protected aquatic species or potential spawning or rearing habitat was recorded within the Cleristown stream or the Knockbrack stream during the on-site assessment.

3.5.3.2 Macroinvertebrates

The Siginshaggard stream was assessed at Aughwilliam Bridge was found to be maintained and had little instream diversity. The Ballyshelin stream was assessed 600m downstream of the Trinity Cross roads and had a low flow, variable substrate and algae was present on rock and cobbles. This site was also very heavily impacted by cattle. The headwaters of the Cleristown stream at Gainstown Bridge was assessed immediately upstream of the proposed A and C route option crossing. This stream was heavily impacted by cattle and appeared to be maintained. The macroinvertebrate assemblages within these watercourses was similar to that of the Ballyfinoge Great stream where pollution sensitive species such as the heptagenid mayflies were scarce and the pollution tolerant species such as *Baetis rhodani* and *Gammarus duebeni* were common. Similarly, simulidae and green chironomids would also be present as these sites due to the slightly impacted nature of the watercourses within this catchment.

3.5.3.3 Fish and fisheries

According to O'Reilly (2004) the Bridgetown River which discharges to the sea close to Kilmore Quay at Cullenstown produces a number of sea trout every year. McGinnity *et al.* (2003) notes that the Duncormick River is a producer of seatrout but not salmon. The potential for the presence of lamprey or salmonids dependent habitat was deemed low in the Siginshaggard stream. The Knockbrack stream was considered to be poor to satisfactory in terms of salmonid and lamprey potential. Both the headwaters of the Cleristown stream and the Ballyshelin stream were also considered to be of low in terms of salmonid and lamprey potential. Near the watershed of the Bridgetown-Duncormick coastal catchment and the Bishops water coastal catchment there is a 1st order stream to the north west of Kate's Cross roads. This stream was dried up during the on-site assessment and was considered to be of no fisheries value.

3.6 Evaluation summary

A summary description and evaluation of watercourses in the Slaney, Corock, Bishop's Water, Bridgestown-Duncormick and Sow Catchments affected by the route options under consideration is provided in Appendix 5.

Table 7 Biotic indices of the survey sites examined as part of the N11/N25 Oilgate route selection scheme*.

Biotic Index	Ballyvoleen River	Sow River	Mullinree Stream	Ballyvalloge Stream	Tinnokilla stream	Ballyfinoge stream	Assaly River	Slaney at Deep's Bridge (Site 5)	Slaney at Ballyhoge (site 6)	Rathdowney Stream
Q-value	4	4	4	4-5	4	4	3-4	N/A	N/A	N/A
Q-rating	Unpolluted	Unpolluted	Unpolluted	Unpolluted	Unpolluted	Unpolluted	Slightly Polluted	N/A	N/A	N/A
WFD Status	High	Good	Good	High	Good	Good	Moderate	N/A	N/A	N/A
Small Streams Risk Score (SSRS)	10.4	5.6	7.2	9.6	8	6.4	1.6	8.8	N/A	2.4
SSRS category	Probably not at risk	At risk	Probably at risk	Probably not at risk	Probably At risk	At risk	At risk	Probably not at risk	At risk	At risk
Family richness	19	13	11	15	11	11	10	N/A	N/A	9
BMWP	92.7	59.1	60.8	75.6	78.6	44.6	33.5	41.4	68.2	15.4
BMWP category	Good	Moderate	Moderate	Good	Good	Moderate	Poor	Moderate	Moderate	Poor
BMWP Interpretation	Clean but slightly impacted	Moderately impacted	Moderately impacted	Clean but slightly impacted	Clean but slightly impacted	Moderately impacted	Polluted or impacted	Moderately impacted	Moderately impacted	Polluted or impacted
ASPT	7.13	5.81	6.75	6.87	7.86	6.37	4.7	6.9	6.2	3.85
ASPT interpretation	High ecological status	High ecological status	High ecological status	High ecological status	High ecological status	High ecological status	Bad/degraded Ecological status	High ecological status	High ecological status	Bad/degraded Ecological status

*Indices could not be derived for the marine / intertidal sites on the Slaney C1, C1a, C2 and C3.

4 POTENTIAL IMPACTS

4.1 Impact assessment methodology

Localised impacts on rivers are loosely defined as impacts measurable no more than 250m from the impact source. Extensive impacts on rivers are defined as impacts measurable more than 250m from the impact source. Any impact on salmonid spawning habitat, or nursery habitat where it is in short supply, would be regarded as an extensive impact as it is likely to have an impact on the salmonid population beyond the immediate vicinity of the impact source. Criteria for assessing impact type and magnitude are presented in Tables 8 and 9 respectively. There is potential for impacts on watercourses adjacent to the proposed new road and watercourses draining sub-catchments through which the road would cross. Though the exact number of watercourses potentially affected is difficult to determine, a best estimate for the number of watercourses potentially affected has been made, for the purposes of the current RCR. The estimation draws on both field observations and mapping. The evaluation of potential impacts on watercourses will be more precise at EIS stage when the final designs have been decided.

Table 8 Criteria for assessing impact significance on aquatic sites.

A Sites

	Temporary	**Short-term**	**Medium-term**	**Long-term**
Extensive	Major	Severe	Severe	Severe
Localised	Major	Major	Severe	Severe

B Sites

	Temporary	Short-term	Medium-term	Long-term
Extensive	Major	Major	Severe	Severe
Localised	Moderate	Moderate	Major	Major

C Sites

	Temporary	Short-term	Medium-term	Long-term
Extensive	Moderate	Moderate	Major	Major
Localised	Minor	Moderate	Moderate	Moderate

D Sites

	Temporary	Short-term	Medium-term	Long-term
Extensive	Minor	Minor	Moderate	Moderate
Localised	Not significant	Minor	Minor	Minor

E Sites

	Temporary	Short-term	Medium-term	Long-term
Extensive	Not significant	Not significant	Minor	Minor
Localised	Not significant	Not significant	Not significant	Not significant

In line with the NRA (2009) '*Guidelines for assessment of ecological impacts of national road schemes*', the following terms are defined when quantifying duration:

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

Table 9 Criteria for assessing impact type.

Impact type	**Criteria**
Positive impact	A change to the ecology of the affected feature which improves its conservation status.
Negative impact	A change to the ecology of the affected feature which reduces its conservation status.

The health and functionality of aquatic ecosystems are inextricably linked with water quality. Under the Water Framework Directive (2000), Ireland has committed to ensure that there is no deterioration in water quality at a national level, with a further commitment to ensure all surface water achieves a *'good ecological status*' by the year 2015.

It is therefore imperative to ensure that there is no deterioration in water quality which would preclude any waterbody reaching the target water quality by 2015 due to the chosen option.

4.2 Impact assessment for proposed routes

The proposed route corridors for the N11 / N25 road scheme will affect watercourses within the River Slaney, Corock River, Bridgetown / Duncormick Coastal, Bishop's Water Coastal and Sow River catchments. Furthermore a number of smaller tributaries and drainage channels within these catchments could also be affected. In the following description of the various river crossings, the overall evaluation of the watercourse is given in parenthesis after the watercourse is named. Appendix 5 gives the various route crossings of watercourses evaluated in the form of a matrix for comparing the different options.

4.2.1 River Slaney catchment

The H route would cross the River Slaney (internationally important - A) approximately 1.5 km downstream of King's Island, the Tinnokilla River (High value locally important - C), the Ballyvoleen River (C) and the Ballyvalloge River (C). The G option would cross a number of 1st order watercourses (mainly E) draining into the River Slaney from the east before crossing the River Slaney approximately 4km upstream of Ferrycarrig Bridge. South of the River Slaney, the F option would cross the Ballyvalloge River (C).

Table 10 Number of watercourse crossings in the River Slaney catchment by each proposed route option.

Route Options	No. of watercourses crossed	No. of Transitional Waterbodies
G	9	1
H	11	1
A	8	1
E	8	1
F	12	1
B	7	1
C	7	1
D	8	1

The G route would cross the River Slaney (A) ca. 4 km upstream of Ferrycarrig Bridge. The G route would also cross the upper reaches of the Ballyvalloge River (C). The C and D routes would cross the River Slaney at the same location; ca. 1km upstream of Ferrycarrig Bridge. The F route option would cross the lower reaches of the Mullinree Stream (C). A number of minor 1st and 2nd order streams would be affected by all route options on the east of the Slaney main channel but these watercourses are generally of low value, local importance (E).

4.2.2 Corock River catchment

The headwaters of the Corock River would be affected by two of the proposed G and H route options. The proposed G and H routes would cross the Coolstuff Stream (D) and the H route would cross the Coolteen Stream (C); both tributaries of the Mulmontry River (C).

Table 11 Number of watercourse crossings in the Corock catchment by each proposed route option.

Route Options	No. of watercourses crossed	No. of Transitional Waterbodies
G	4	0
H	6	0
A	0	0
E	0	0
F	0	0
B	0	0
C	0	0
D	0	0

4.2.3 Bridgetown / Duncormick Coastal catchment

This catchment would only be affected by two route options; the G and H routes which would both cross 13 watercourses within this catchment. The main watercourses are the Cleristown Stream Stream (E) Bridgestown Stream (C). Other watercourses crossed in this catchment are minor 1st and 2nd order streams (generally rated E).

Table 12 Number of watercourse crossings in the Bridgetown / Duncormick catchment by each proposed route option.

Route Options	No. of watercourses crossed	No. of Transitional Waterbodies
G	11	0
H	11	0
A	0	0
E	0	0
F	0	0
B	0	0
C	0	0
D	0	0

4.2.4 Bishop's Water Coastal catchment

The main watercourse that would be affected by the proposed scheme in this catchment is the Asally River (E). The G, B and D route options cross the Assaly River main channel less than 1km east of Killinick station. The A and F route options cross the Assaly River main channel ca. 1km west of Killinick station. The College Stream and Newbay Streams (both rated high value, locally important, C) are considered the most sensitive receptors in this catchment.

Table 13 Number of watercourse crossings in the Bishop's coastal catchment by each proposed route option.

Route Options	No. of watercourses crossed	No. of Transitional Waterbodies
G	13	0
H	11	0
A	17	0
E	24	0
F	24	0
B	17	0
C	24	0
D	18	0

4.2.5 Sow River catchment

The Sow River (rated C) to the east of the Slaney main channel is only affected by the proposed scheme at its headwaters. The A, F, E, B, D and C routes cross the upper reaches of the Martingale Stream (Code S-C1/1), a tributary of the Sow River at the northern extremity of the study area. This watercourse is rated low value, locally important (C).

Table 14 Number of watercourse crossings in the Sow catchment by each proposed route option.

Route Options	No. of watercourses crossed	No. of Transitional Waterbodies
G	0	0
H	0	0
A	1	0
E	1	0
F	1	0
B	1	0
C	1	0
D	1	0

4.2.6 Evaluation of impacts

There are slight differences in the magnitude and significance of potential impacts from each of the proposed route options with respect to aquatic ecological conservation and fisheries interests. All options would involve crossing the River Slaney Estuary, the most important aquatic ecological feature in the study area. The bulk of the watercourses are minor 1st or 2nd order streams of low ecological value. A summary of impacts of the various options is provided in Table 7.

The magnitude of impact is dependent on the duration of impact and ecological significance. For example, the River Slaney Estuary, being an internationally important site could be severely impacted if impacts were long term but reduced to major with temporary impacts – the latter scenario being more probable with mitigation. The River Slaney is crossed by all routes so overall impacts by the various route options are dependent on the ecological significance of other watercourses. The various route options are compared below in relation to the numbers of watercourses crossed and the importance of these aquatic elements. A full list of potentially affected watercourses and number of

crossings of each can be seen in Appendix 6 which gives the numbers of watercourse crossings of each proposed route.

4.2.6.1 G route

The G route would involve 39 crossings of watercourses, including the River Slaney approximately 3.5 km upstream of Ferrycarrig Bridge (crossing 5). 23 of the watercourses were rated low value, locally important (E) – 14 were rated Moderate value, 1 watercourse of High value, local importance and the River Slaney which is rated as Internationally Important.

4.2.6.2 H route

The H route would involve 37 watercourse crossings including the River Slaney Estuary approximately 1 km downstream of King's Island (crossing 6). 16 of these watercourses were rated low value, locally important (E), 13 were rated Moderate value, locally important (D) and 7 were rated High value, locally important (C), the most 'C' rated watercourse of any proposed crossing, given this rating mainly due to the presence of protected aquatic species and good water quality.

4.2.6.3 A route

The A route option would cross the River Slaney at Ferrycarrig (crossing 1), adjacent to the existing N25 Bridge. This route option is closest to the existing N11 and N25, located no more than 1.5 km away at any point. This option would involve 28 watercourse crossings. Most of these watercourses (19) however were rated 'E'. This route would cross only 1 watercourse of High value, local importance (C). 7 watercourses potentially affected by this route were rated Moderate value, locally important (D).

4.2.6.4 E route

This route option would cross the River Slaney approximately 1.5 km upstream of Ferrycarrig Bridge (crossing 3). This option would involve 38 watercourse crossings; 21 rated 'E'. 5 'C' rated watercourses would be crossed while 11 watercourses rated Moderate value, locally important (D) would be crossed.

4.2.6.5 F route

This route would cross the River Slaney approximately 3.5 km upstream of Ferrycarrig Bridge. This route option would involve 38 watercourse crossings. To the south of the River Slaney, the F option coincides with the E and G route options. The F route would involve the crossing of 5 rated 'C', 15 rated 'D' and 17 rated 'E' watercourses.

4.2.6.6 B route

The River Slaney would be crossed by the B option adjacent to Ferrycarrig Bridge (at the same location as the A route). This option would involve 25 watercourse, mostly 'E' rated minor streams (19) as well as 'D' rated (4) and 'C' rated (1) watercourses. The B route runs online with the N11 north of the River Slaney and the N25 south of the River Slaney for most of its length.

4.2.6.7 C route

The C route option would cross the River Slaney (rated 'A') approximately 1 km upstream of Ferrycarrig Bridge. This option would involve 31 other watercourse crossings; 2 rated High value, locally important (C), 11 rated Moderate value, locally important (D) and 17 rated Low value, locally important (E).

4.2.6.8 D route

The D option would cross the River Slaney approximately 1km upstream of Ferrycarrig Bridge. This option would involve 23 crossings of watercourses; 1 rated High value, locally important (C), 2 rated

Moderate value, locally important (D) and 20 rated low value locally important (C). The Doption runs online with the existing N25 to the south of the Slaney for approximately 7km.

Table 15 Summary of the potential impacts of the various route options. The numbers of 'A', 'C', 'D' and 'E' rated watercourses crossed by each route option is given together with the potential impacts on watercourses. C=Construction, O=Operational.

	G	H	A	E	F	B	C	D
Internationally important (A) watercourses	1	1	1	1	1	1	1	1
Potential Impact	Major (C) Severe (O)	Major (C) Severe (O)	Major (C) Severe (O)	Major (C) Severe (O)	Major (C) Severe (O)	Major (C) Severe (O)	Major (C) Severe (O)	Major (C) Severe (O)
High value, local importance (C) watercourses	1	7	1	5	5	1	2	1
Potential Impact	Moderate (C) Major (O)	Moderate (C) Major (O)	Moderate (C) Major (O)	Moderate (C) Major (O)	Moderate (C) Major (O)	Moderate (C) Major (O)	Moderate (C) Major (O)	Moderate (C) Major (O)
Moderate value, local importance (D) watercourses	14	13	7	11	15	4	11	2
Potential Impact	Minor(C) Moderate (O)	Minor(C) Moderate (O)	Minor(C) Moderate (O)	Minor(C) Moderate (O)	Minor(C) Moderate (O)	Minor(C) Moderate (O)	Minor(C) Moderate (O)	Minor(C) Moderate (O)
Low value, local importance (E) watercourses	23	16	19	21	17	19	17	20
Potential Impact	Not significant (C) to Minor (O)	Not significant (C) to Minor (O)	Not significant (C) to Minor (O)	Not significant (C) to Minor (O)	Not significant (C) to Minor (O)	Not significant (C) to Minor (O)	Not significant (C) to Minor (O)	Not significant (C) to Minor (O)
Total crossings	39	37	28	38	38	25	31	23

4.3 General potential impacts

River crossings have the potential to impact on fisheries and aquatic ecological resources during both construction and operation phases. According to the National Roads Authority (NRA 2008b) common impacts on watercourses as a result of the construction and operation of road schemes include:

- interference with fish migration and spawning, mammal movement, rare plants and their habitats and with riparian and linear wildlife corridors;
- loss of aquatic and riparian habitat;
- alteration of flow regime/hydrology;
- harmful discharges during construction and operation including surface water run-off, spillages and pollutant releases;
- Interference with angling or obstruction of angler's movement along a channel.

Increased road runoff has the potential to change the water classification of a waterbody, while the intrusion of a Bridge and potential impacts on watercourse hydrology could cause permanent impacts on angling areas in the vicinity of a crossing. Impacts on flood conveyance can also occur when roads are built on floodplains, and the potential dewatering effect of cuts can impact on the water supply to a stream. In accordance with the '*Guidelines for Assessment of Ecological Impacts of National Road Schemes*' (NRA 2009), these impacts can be minimised by applying sound design principles to the structures and by following good work practices during their construction.

4.3.1 Construction Phase

During the construction process a number of sources of pollution from construction sites adjoining (or crossing) Rivers exist. The principal sources and origins of pollution are identified as follows:

- The discharge or entry into waters of contaminated site run-off or pumped contaminated surface/ground waters;
- Direct disturbance of the beds of Rivers and streams by excavation or fording;
- Loss of oil from machinery or storage areas;

- Cement and cement wash from batching plants, storage areas and other areas where cement grout or concrete is being applied.

In relation to the protection of fish stocks and fisheries habitats during construction works, publications by the Eastern Regional Fisheries Board (Murphy (2004) and the Southern Regional Fisheries Board (Kilfeather, 2007) provide guidelines for sound construction practices when working adjacent to or crossing watercourses. The primary concerns in relation to fisheries impacts are in relation to:-

- The destruction of fish habitat;
- Interference with fish migration;
- Interference with angling, and;
- That construction could give rise to harmful discharges; e.g. cement washing & fine solids.

Destruction of fish habitat and shellfish habitat downstream could occur during Bridge construction or other instream works in the absence of appropriate mitigation measures. The permanent loss of some stream and riparian habitat would occur where new crossings over streams/Rivers are required. This loss could be compensated with the creation of new habitats immediately upstream and downstream of the crossings. Also, in the absence of ameliorative measures, temporary obstructions to fish (and macroinvertebrate) migrations could occur and angling could be interfered with. Angling could be affected both directly as a result of reduced access, and indirectly by suspended solids impacting on angling waters downstream of River crossings.

With regard to the largest watercourse crossing, the River Slaney, there is a preference for a clear span option if feasible as it would potentially minimise the impact on the river and riparian habitats on the river bank. It is likely that the final chosen route option will need to include a provision for bridges of this type. It is also noted that the piers of the bridge should be located at least 5 meters back from the water's edge at each side of the River to maintain the integrity of the riparian habitats.

It is important that good quality water be maintained during both the construction and operational phases and specific mitigation measures will be required for the final proposed route to protect water quality, aquatic ecological interests and designated shellfish areas. The most common pollutant released during road construction works is suspended solids. Suspended solids or sediment in a river can have serious negative impacts on invertebrate and plant life and on all life stages of trout, salmon and other fish species. A pollution event of this nature may increase the likelihood of a long-term change in water quality, such that it cannot support the functions (whether amenity or ecological) that it currently maintains.

Suspended solids in even quite small quantities can have a serious effect on the spawning sites of salmonids (O'Connor & Andrew, 1998; Turnpenny & Williams 1980; Shackle *et al*, 1999). Other pollutants such as raw concrete, wash water, fuels, lubricants etc. would also have deleterious effects on fish if allowed to enter watercourses. Liquid cement, due to its highly alkaline and corrosive nature, can and has given rise to major fish kills in Ireland. However, with proper planning and project management it would be possible to prevent significant releases of suspended solids and other pollutants into the River. Mitigation measures to protect water quality during construction will also protect aquatic habitats. Although it is generally appreciated that suspended solids is less of an issue in estuaries this would not be the case for upper Slaney estuary within the study area which visibly had a relatively low level of naturally occurring suspended solids during the current survey.

The Slaney estuary is also sensitive in relation to protected species such as juvenile Twaite Shad and Allis Shad that may be vulnerable to suspended solids pollution. Downstream of the Slaney estuary, both the inner and outer Wexford Harbour is also sensitive in relation to protected Shellfish areas which may also be vulnerable to suspended solid pollution.

4.3.2 Operational Phase

The sensitivity of the receiving watercourses will determine the significance of the operational impacts. Where road run-off is discharged to a river, the greatest impacts could be expected to occur in the smallest watercourses, depending on the length of road discharging to the watercourse. However, the Slaney estuary would also be vulnerable in this context due to the presence of

endangered juvenile fish (i.e. Shad). Particularly sensitive receptors that have been identified within the study area include:-

- The River Slaney main channel (cSAC and salmonid River);
- Unpolluted tributaries of the Slaney including the Ballyvoleen, Ballyvalloge Rivers all likely to contain Annex II species);
- River Sow (Q4 and likely to contain salmon);
- College Stream (Good physical diversity and may contain salmon);
- Mulmontry River which contains floating river vegetation and lampreys.

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.

Accidental spills of substances could also occur and these would end up in storm water. It would be expected following a prolonged dry period that the first significant rainfall discharging from the road surface could contain elevated levels of contaminants, especially particulate matter. In such a case, in the absence of mitigation, local contamination of the receiving watercourse could result. Furthermore, without adequate mitigation, due to the delay time between actual discharge and the increase in flow of the receiving waters during a rising flood, water quality in these circumstances may also deteriorate until the flow rises. All options are likely to produce an increase in runoff from the road surface that would contribute to an overall increase in flow rate in the traversed catchments as a whole. However, the impact is likely to constitute only a small proportion of major flows. It is expected the new road would be subject to higher traffic volumes and therefore the amount of runoff on the old road would be expected to decrease. This would act as a positive impact as the existing road network is currently untreated.

Fish of economic and/or conservation importance occur in, and migrate through, the study area. These include Atlantic salmon, river lamprey, sea lamprey, brook lamprey, European eel, Allis shad and twaite shad. Most of the potential impacts on fisheries and aquatic ecology would be temporary in nature and significant scope for mitigating these potential problems exists. Provided appropriate mitigation measures are taken to prevent excessive contaminants from entering these Rivers, it is not expected that the current water quality status or fisheries value of the River catchments affected by the proposed scheme would change as a result of the construction and operation of any of the proposed routes. Any impacts on receiving waters should not preclude these watercourses from reaching their WFD targets provided that suitable mitigation measures are taken to protect and /or improve the current status of the affected watercourses.

4.4 General mitigation measures

Detailed, site-specific mitigation measures will be designed for effective implementation as part of the Environmental Impact Assessment (EIA/EIS) for the preferred route selected. General measures for the mitigation of impacts on water quality and aquatic ecology are provided for the current route selection stage. All mitigation measures to protect aquatic ecology and fisheries will also allow for the protection of the designated shellfish areas in both the Inner and Outer Wexford Harbour, located downstream of existing N11/N25 road.

4.4.1 Watercourse crossings

All watercourses would need to be crossed in such a way that the proposed construction would not damage fish habitat (e.g. fish spawning and nursery areas) and would not obstruct the passage of fish or macroinvertebrates. 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.

Impacts to aquatic habitats, protected aquatic species and recreational use of the River should be considered with the incorporation of either a pier in the Slaney River or else embankments built up from the River. The natural bed of all rivers should be left intact and the original width of these watercourses would be maintained and not widened. Bridge aprons or any central abutment would not be used where possible on other watercourses within the study area. As no works would be conducted within these river channels, this would mitigate any permanent impacts.

Where culverts are used, these structures would be designed in such a way that natural stream channel characteristics (channel dimensions, slope, flow regime and substrate) are conserved, and the passage of fish and macroinvertebrates would be facilitated in all but extreme flow conditions.

4.4.2 Timing of works

In the case of watercourses that contain stocks of salmonids, no instream works should be carried out during the period between spawning and the emergence of fry (October-April inclusive). Where lampreys are present further limitations on the timing of in-stream works would be required, e.g. in the River Slaney catchments. Detailed mitigation measures in relation to the timing of works for the protection of lampreys will need to be designed in association with NPWS and the Regional Fisheries Boards during the EIA stage.

4.4.3 Construction phase mitigations

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 regional fisheries boards i.e. Murphy (2004) and Kilfeather (2007). 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 use of interceptors, settlement tanks, ponds or filters.

Further mitigations will be required in relation to the introduction or spread of invasive plant species and also non-native aquatic species.

4.4.4 Operational phase mitigations

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 would be installed, particularly close to sensitive receptors e.g. oil/water separators, gully pots, catch pits, sedimentation tanks, and lined storage ponds, as necessary.

5 PREFERRED ROUTE OPTION

The current assessment considers the proposed route corridor options for the N11 / N25 Oilgate to Rosslare scheme. For the purpose of assessment and selection, the proposed route corridors have been assessed based on the numbers of crossings within the River catchments affected, taking account of the evaluation of the importance of the watercourses within each catchment. An overall assessment of the proposed routes and identification of the preferred route corridor is presented in Table 16. Table 17 presents the aquatic ecological constraints associated with the proposed route crossings of the River Slaney Estuary; allowing for the identification of a preferred crossing of this internationally important site with respect to the aquatic ecological conservation interests present at each crossing point.

Table 16 Proposed route options in relation to the estimated number of watercourse crossings and their respective evaluation.

Watercourse evaluation	**G**	**H**	**A**	**E**	**F**	**B**	**C**	**D**
Number of Slaney Estuary - Internationally important (A) watercourse crossings	1	1	1	1	1	1	1	
Number of High value, locally important (C) watercourse crossings	1	7	1	5	5	1	2	1
Number of Moderate value, locally important (D) watercourse crossings	14	13	7	11	15	4	11	2
Number of Low value, locally important (E) watercourse crossings	23	16	19	21	17	19	17	20
Total Crossings	39	37	28	38	38	25	31	23
Order of preference	**6th**	**8th**	**2nd**	**5th**	**7th**	**1st**	**4th**	**3rd**

Table 17 Aquatic ecological constraints at each of the proposed route crossings of the River Slaney Estuary main channel. The preferred crossing point is derived from the relative importance of each proposed crossing point in relation to aquatic ecological interests. Proposed crossings of the river Slaney are as follows: A/B route crossing; C/D route crossing; E route crossing; F/G route crossing and H route crossing.

Aquatic ecological constraints	**Extent/Evaluation of each crossing point in relation to the aquatic ecological interests present**					**Comments**
	A/B	**C/D**	**E**	**F/G**	**H**	
Designated watercourses (Habitats Directive)	Present	Present	Present	Present	Present	The River Slaney which is crossed at each point is an Internationally Important watercourse.
River channel width (potential habitat loss)	Minor significance	Minor Significance	Slightly Significant	Slightly Significant	Slightly Significant	Due to the existing N11 directly downstream, impacts at this crossing point would be minimised
Water quality	Significant	Significant	Significant	Significant	Significant	However site-specific mitigation measures for impacts on water quality will be designed for the preferred route selected.
Macroinvertebrate diversity	Moderately important - low species diversity	Minor important – low species diversity	Minor importance – low species diversity	Moderately important– marginal species diversity	Moderately important- marginal species diversity	
Riparian habitat diversity	Minor importance	Minor importance	Minor importance	Slight importance	Slight importance	
Salmonid spawning habitats	Not present	Not present	Not present	Not present	Not present	
Lamprey spawning	Not	Not	Not	Not	Not	

Aquatic ecological constraints	Extent/Evaluation of each crossing point in relation to the aquatic ecological interests present					Comments
	A/B	C/D	E	F/G	H	
habitats	present	present	present	present	present	
Salmonid nursery areas	Not present	Not present	Not present	Not present	Not present	
Lamprey nursery habitats	Not present	Not present	Not present	Not present	Not present	
Shad spawning habitats	Not present	Not present	Not present	Not present	Not present	
Shad nursery habitats	Minor importance	Minor importance	Minor importance	Moderately important	Moderately important	Limited suitable habitat available for nursery areas in the upper section of the scheme.
Sea trout angling	Not present	Not present	Not present	Not present	Not present	
Salmon angling	Not present	Not present	Not present	Not present	Not present	
Eel habitats	Slight significance	Minor significance	Minor significance	Minor significance	Slight importance	Both the lower and upper end of the scheme are more important for this species
Habitats for other estuarine fish (flounder, mullet etc)	Slight importance	Slight importance	Minor importance	Not present	Not present	
Designated Shellfish areas	Slightly significant	Slightly significant	Not Significant	Not Significant	Not Significant	Crossing points C1, C1a and 2 are located in close proximity to the Inner and Outer Wexford Harbour designated shellfish areas.
Nutrient sensitive estuary	Not significant	Not significant	Not significant	Not significant	Not significant	
Ranking (order of preference)	**1**	**2**	**2**	**3**	**4**	

5.1 B route – Preferred Route Option

The orange route like all other options crosses the 'Internationally important (A)' River Slaney. Both the A and B routes would cross the River Slaney directly north of the existing N11 crossing point at Ferrycarrig, where the river channel narrows. At this point the River Slaney is narrow relative to other crossing points and there is significant scope for works in line with, or within the impact area of the existing N11 road bridge. The B route was chosen in preference to the A route since this option would broadly run online with the existing N11 and N25 routes, thereby reducing potential impacts on the other watercourses affected.

5.2 A Route – 2nd Preference

The A route option has been chosen as the 2nd preference due to the potential for limitation of impacts affecting the River Slaney main channel, due to its crossing point at Ferrycarrig, directly north and adjacent to the existing N11 road crossing. As outlined above, impacts on this internationally important river would therefore be expected to be minimised, with respect to the potential impacts arising from the proposed crossing points to the north. Furthermore, only one 'High value, locally important (C)' watercourses would be crossed by this route.

5.3 D Route – 3rd Preference

The D route option would cross the River Slaney approximately 1km upstream of Ferrycarrig Bridge. This crossing is similar to the C / E route crossing at the River Slaney but overall, this route option would involve significantly fewer watercourse crossings.

5.4 C Route – 4th Preference

The C and D route options would cross the River Slaney approximately 1.5 km upstream of Ferrycarrig Bridge. At this crossing location of the Slaney, potential for impacts are evaluated as being identical to those identified for the D/E route to the east but this routes involve less crossing of High value, locally important watercourses than the E route option.

5.5 E Route – 5th Preference

The E route option would cross the River Slaney approximately 1.5 km upstream of Ferrycarrig Bridge. At this crossing location, potential for impacts are evaluated as being identical as those identified for the C / D crossing route to the east but the E routes involve two more high value locally important watercourse crossings.

5.6 G Route – 6th Preference

The F and G routes would cross the River Slaney at approximately the same location i.e. approximately 3.5 km upstream of Ferrycarrig Bridge (Crossing 5). This option would involve the most crossings of any route but 23 of these were 'E' rated watercourses. Compared to the F route, the G route option has 4 more crossings of a high value locally important watercourse however the so is rated as 6th preference.

5.7 F Route – 7th Preference

The F route would involve the crossing of 38 watercourses including the River Slaney. This option was 7th preference for the overall route extent as it would involve 5 high value, locally important watercourses (C) and 15 watercourses of Moderate value local importance (D).

5.8 H Route – 8th Preference

This is the least preferable option with respect to aquatic ecology and fisheries. Choosing this option would involve the crossing of the River Slaney approximately 12 km upstream of Ferrycarrig Bridge due south of King's Island. Therefore, impacts on aquatic ecology would be greater than for other River Slaney crossings downstream. This area is likely to be of importance as a nursery area for shad. Additionally, this stretch of the river contains duck mussels, a freshwater species whose status is vulnerable. Furthermore, this route option would involve 7 'High value locally important (C)' crossings and therefore is least preferable in this respect.

6 CONCLUSION

The most significant watercourse affected within the study area would be the River Slaney, an internationally important (A) watercourse. The other watercourses in the study area are not considered as significant in terms of aquatic ecology and fisheries resources. Indeed, the remainder are watercourses rated 'C' to 'E'; most being minor streams rated 'Low value, locally important (E). They are considered important in a local context and some of the watercourses contain good salmonid populations and a number of protected species.

To the east of the River Slaney, and to the south of Wexford Town, most of the watercourses within the study area are degraded and flow through agricultural lands. Besides the River Slaney, the most important rivers are:

- tributaries of the Slaney that feed the river from the west (Ballyvalloge, Tinnokilla and Ballyvoleen);
- River Sow which flows into the Slaney from the north;
- College Steam which flows into the Slaney from the south;
- Upper reaches of Mulmontry River, part of a separate catchment draining into the sea on the south coast of Wexford.

These watercourses have been rated 'High value, locally important (C)' due to the presence of protected aquatic species listed on Annex II of the EU Habitats Directive together with Good ecological status in some cases.

The proposed scheme has the potential to significantly impact on water quality and aquatic ecological resources in the absence of suitable and proportional mitigation. Any impacts on the River Slaney main channel would constitute impacts on the Slaney River Valley cSAC. From an assessment of the proposed routes and an evaluation of the scale of impacts arising from the proposed watercourses crossings associated with each route, a preferred route option has emerged in terms of aquatic ecology and fisheries. This is the B option which would cross the most sensitive receptor near the existing crossing and represents (along with the A option) the furthest downstream crossing point of the River Slaney.

This route along with other routes that would cross the River Slaney upstream of Ferrycarrig Bridge near the existing N11 crossing are preferred to lessen the potential impacts on the River Slaney. In order of preference, the route option choice is B, A, E, C, D, G, F and H. It is noted however that any of the proposed routes could be built with the provision and implementation of suitable mitigation.

It is emphasised that this assessment is based on the aquatic ecological and fisheries constraints posed by the proposed scheme. It is considered that the preferential ranking and benefits of the preferred route in this regard may be outweighed by engineering and terrestrial ecology constraints, with respect to a full environmental assessment of the route corridors.

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Plates – Biological sampling sites

Plate 1 Biological sampling site one at Rathdowney Bridge on the Assaly River located south west of Rosslare town.

Plate 2 Kick sampling site at Assaly Bridge. This River is maintained and the flow was predominantly pool.

Plate 3 Kick sampling site on the Assaly River at Finoge Bridge upstream of the proposed crossing of the 'E', 'F' and 'G' routes at the south eastern end of the route selection scheme.

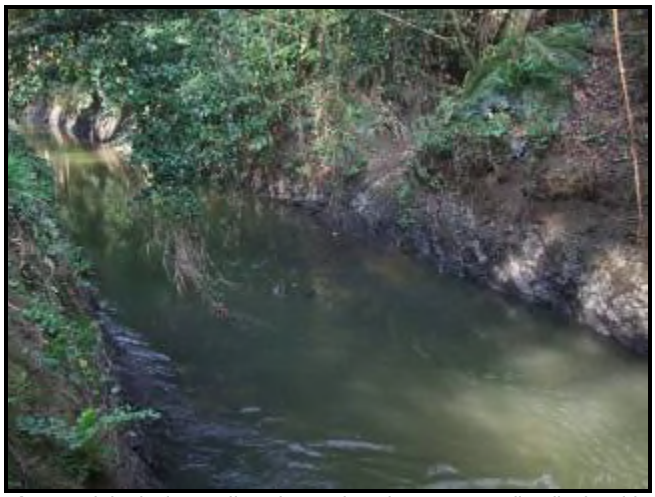


Plate 4 Biological sampling site on the River Sow at Kilmallock Bridge. This was a drained channel and heavily silted.

Plate 5 Kick sampling site on the Tinnokilla stream which would be crossed by the proposed 'A' route. This stream was heavily silted.

Plate 6 Kick sampling site on the Ballyvoleen River which would be crossed by the proposed 'A' route. Trout were recorded in this River which flows into the River Slaney approximately 800m south of Deep's Bridge.

Plate 7 Biological sampling on the Ballyvalloge River which would be crossed by the proposed 'A', 'C' and 'F' route options. This river contained suitable salmonid and lamprey habitat and was predominantly of fine substrate.

Plate 8 Kick sampling site on the Mullinree stream upstream of Mullinree Bridge. This watercourse would be crossed by the proposed 'A', 'C' and 'F' route selection options. The semi-natural riparian vegetation was dominated by wild garlic and deciduous woodland.

Plate 9 Ferrycarrig Bridge at the proposed crossing points C1 and C1A on the Slaney estuary during low tide.

Plate 10 Sample site 2 on the Slaney estuary, located immediately downstream of the proposed 'G' route crossing C2, directly across from the National Heritage Centre.

Plate 11 Biological sampling site on the Slaney Estuary, upstream of the proposed 'E' route crossing point C3.

Plate 12 Site access on the Slaney estuary was facilitated using a small RIB.

Other watercourses

Plate 13 Assaly River at Ballybrennan Bridge where three spined stickle back was recorded.

Plate 14 Coolaknick Stream in the River Sow catchment which would be crossed by the proposed 'H' and 'B' route selection options.

Plate 15 Martingale Stream (Sow catchment) had poor physical diversity and was channelised.

Plate 16 Garrycleary Stream at Aghnanure Bridge (Sow catchment). This site had a mixed substrate and good habitat for the early life stages of trout.

Plate 17 Galbally stream at Galbally Bridge downstream of the Kyle, Ballywater, Kavanaghspark and Mountanna Streams.

Plate 17 Jamestown stream, north of Oilgate. This stream had little or no fisheries value.

Plate 18 Blackhall Stream, a sub-tributary of the Slaney main channel which would be crossed by the proposed 'A' route option.

Plate 19 The Coolteen Stream at Crandonnell Bridge (tributary of the Mulmontry River) contained lampreys.

Plate 20 The Mulmontry River at Aughnagroagh Bridge contained significant amounts of floating river vegetation.

Plate 21 The Siginshaggard stream at Aughwilliam Bridge in the Duncormick catchment. This stream had little physical diversity.

Plate 22 Ballyshelin Stream, a tributary of the Duncormick River which would be crossed by the proposed 'C' and 'A' route selection options.

Plate 23 The Cleristown Stream at Gainstown Bridge which would be crossed by the proposed 'C' and 'A' route selection options.

Fauna

Plate 24 Duck mussels (*Anodonta anatina*) recorded upstream of the proposed 'A' route crossing point C6.

Plate 25 Annex II listed River/brook lamprey (*Lampetra sp.*) recorded in the Ballyvalloge River, Slaney Estuary and the Mulmontry catchment.

Plate 26 River/brook lamprey spawning redd in the Mullinree Stream.

Plate 27 Three-spined stickle back (*Gasterosteus aculeatus L.*) was the only fish recorded in the Bishop's water coastal catchment.

Plate 28 Shrimp recorded from the River Slaney Estuary; *Palaemon sp.* (top) and *Gammarus Zaddachi* (below).

Plate 29 Ragworm *Hediste diversicolor* was recorded at the brackish sites investigated on the River Slaney.

Plate 30 Larvae of the mayfly *Rhithrogena semicolorata* was the most abundant pollution sensitive organism recorded in the kick sampling surveys.

Plate 31 Larvae of the pollution sensitive stonefly *Amphinemura sulcicollis* – the above specimen was taken from the Tinnokilla Stream and had been coated with a layer of silt.

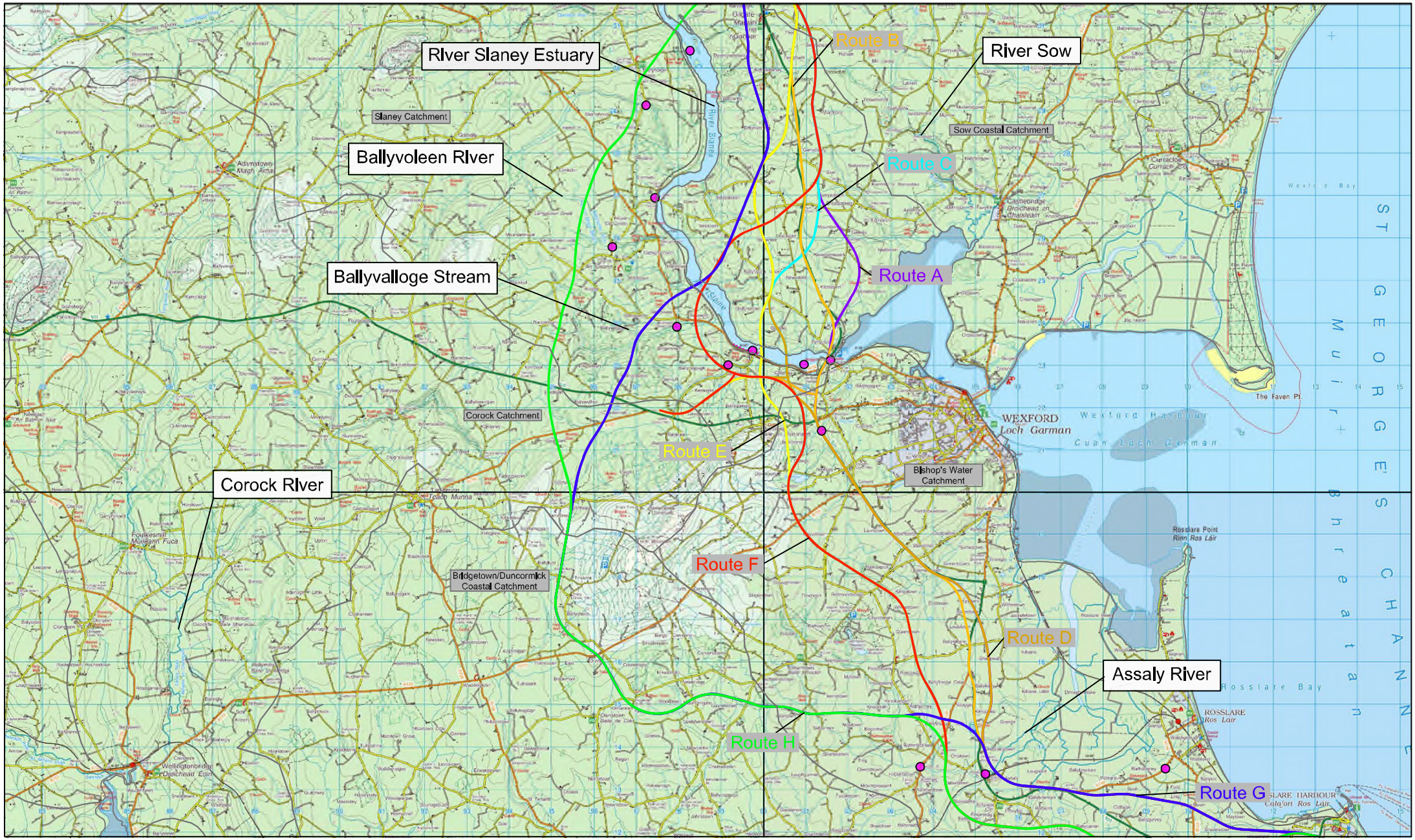
Plate 32 Larvae of the long-horned cased caddisfly *Mystacides azurea* was recorded near crossing option 6 on the River Slaney estuary.

Plate 33 Pollution tolerant diving beetle *Stictotarsus duodecimpustulatus* was recorded among the diverse macroinvertebrate community in the River Slaney.

APPENDIX 1 Maps showing proposed routes, aquatic ecological features and sampling sites in the study area

Figure A1.1 Map of the entire study area indicating catchments and route options and sampling locations.

Figure A1.1: Map of the entire study area indicating catchments, route options and sampling locations



Legend

- River catchments
- Route A
- Route B
- Route C
- Route D
- Route E
- Route F
- Route G
- Route H
- Sampling locations

N11/N25 Oilgate to Rosslare Road Scheme

Date: 01/12/2010

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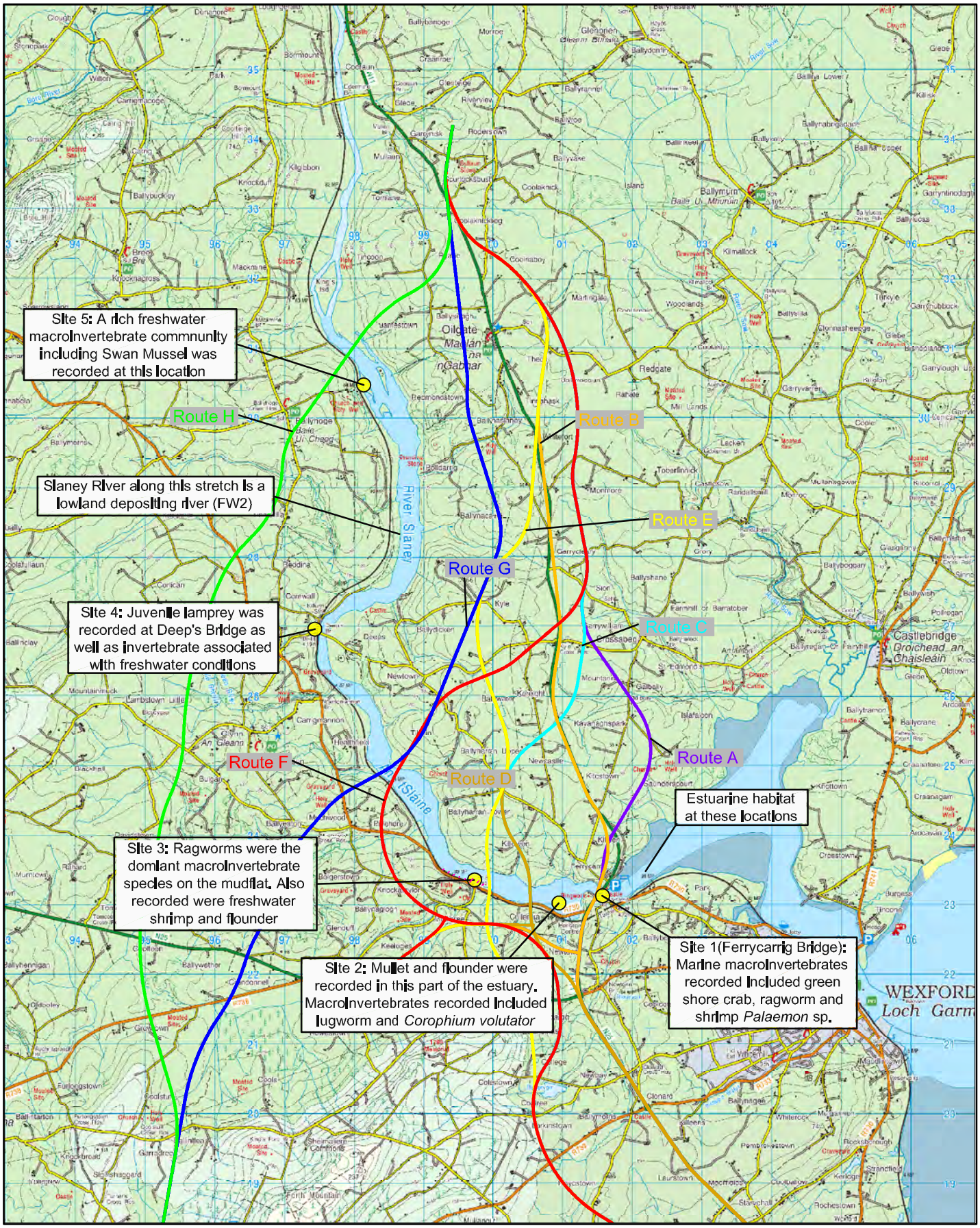
Figure A1.2 Map of the River Slaney Estuary showing sampling sites and ecological features.

Figure A1.2: Map of the River Slaney Estuary showing sampling sites and ecological features



Legend

- River catchments
- Route A
- Route B
- Route C
- Route D
- Route E
- Route F
- Route G
- Route H
- River Slaney sampling sites

N11/N25 Oilgate to Rosslare Road Scheme

Date: 01/12/2010

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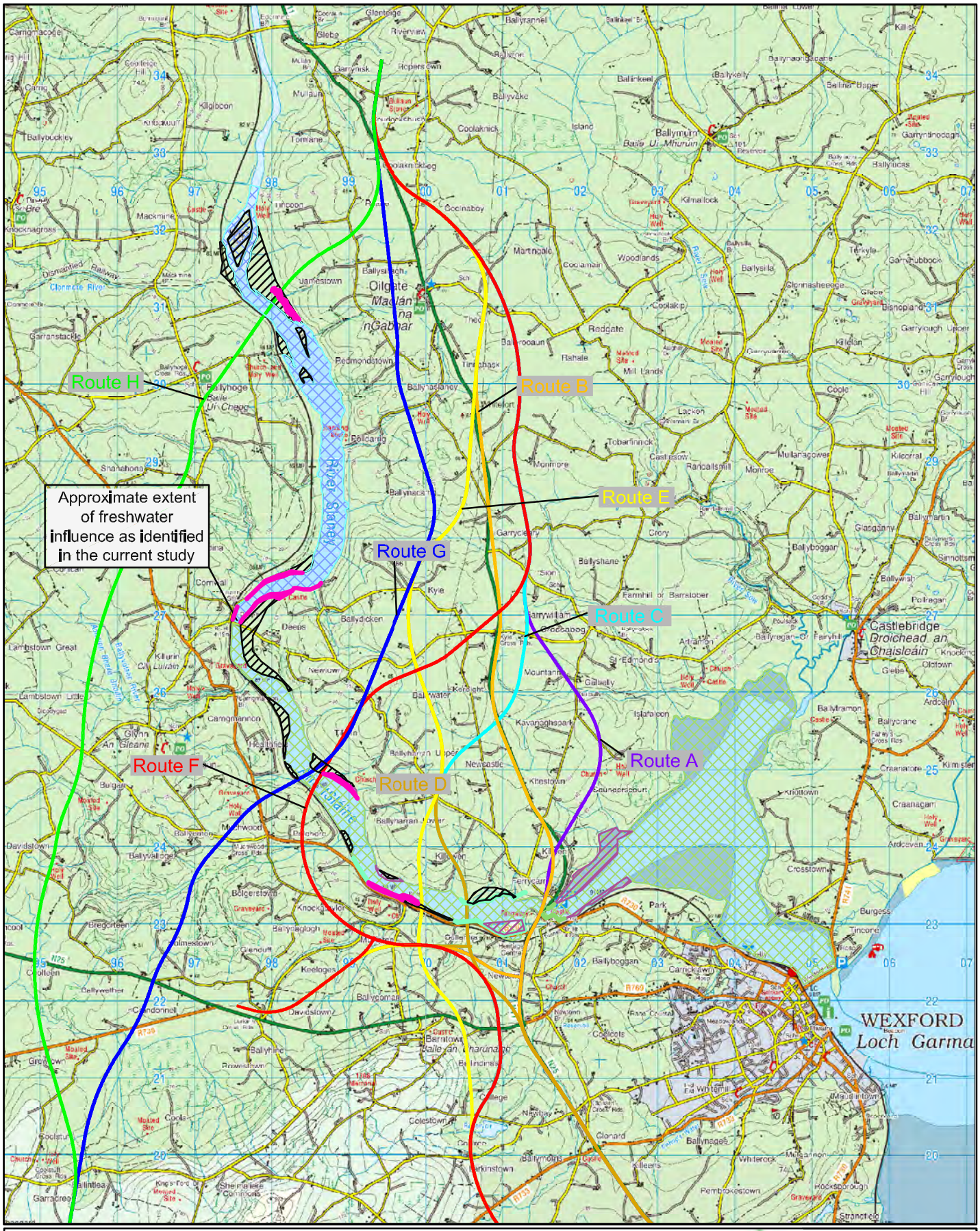
Figure A1.3 Northern end of the River Slaney study area showing dominant aquatic habitats within the Lower River Slaney corridor.

Figure A1.3: Map of the study area showing dominant aquatic habitats within the Lower River Slaney



Legend

- River catchments
- Route A
- Route B
- Route C
- Route D
- Route E
- Route F
- Route G
- Route H
- Tall reed swamp (FS2)
- Mud shores (LS4)
- Upper saltmarsh (CM2)
- Depositing lowland river/ tidal river (FW2/CW2)
- Tidal river/Estuary (CW2/MW4)
- Mixed sediment shore (LS5)
- Mixed substrata shore (LR4)

N11/N25 Oilgate to Rosslare Road Scheme

Date: 01/12/2010

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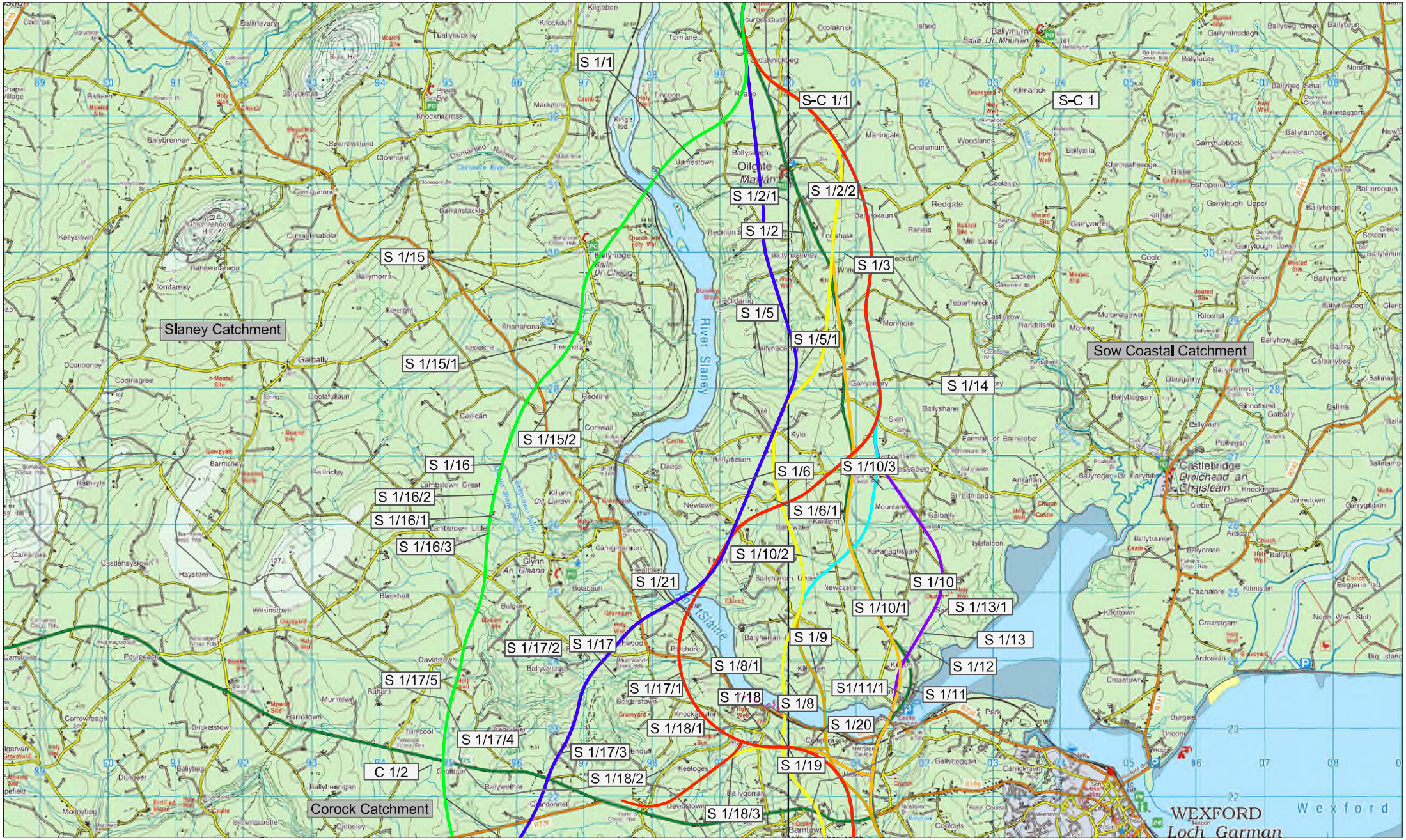
Figure A1.4 Map of the study area showing affected watercourses in the northern end of the study area.

Figure A1.4: Map identifying affected watercourses in the northern end of the study area



Legend

- River catchments
- Route A
- Route B
- Route C
- Route D
- Route E
- Route F
- Route G
- Route H

N11/N25 Oilgate to Rosslare Road Scheme

Date: 01/12/2010

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Figure A1.5 Map of the study area showing affected watercourses in the southern end of the study area.

Figure A1.5: Map identifying affected watercourses in the southern end of the study area

Legend

- River catchments
- Route A
- Route B
- Route C
- Route D
- Route E
- Route F
- Route G
- Route H

N11/N25 Oilgate to Rosslare Road Scheme

Date: 01/12/2010

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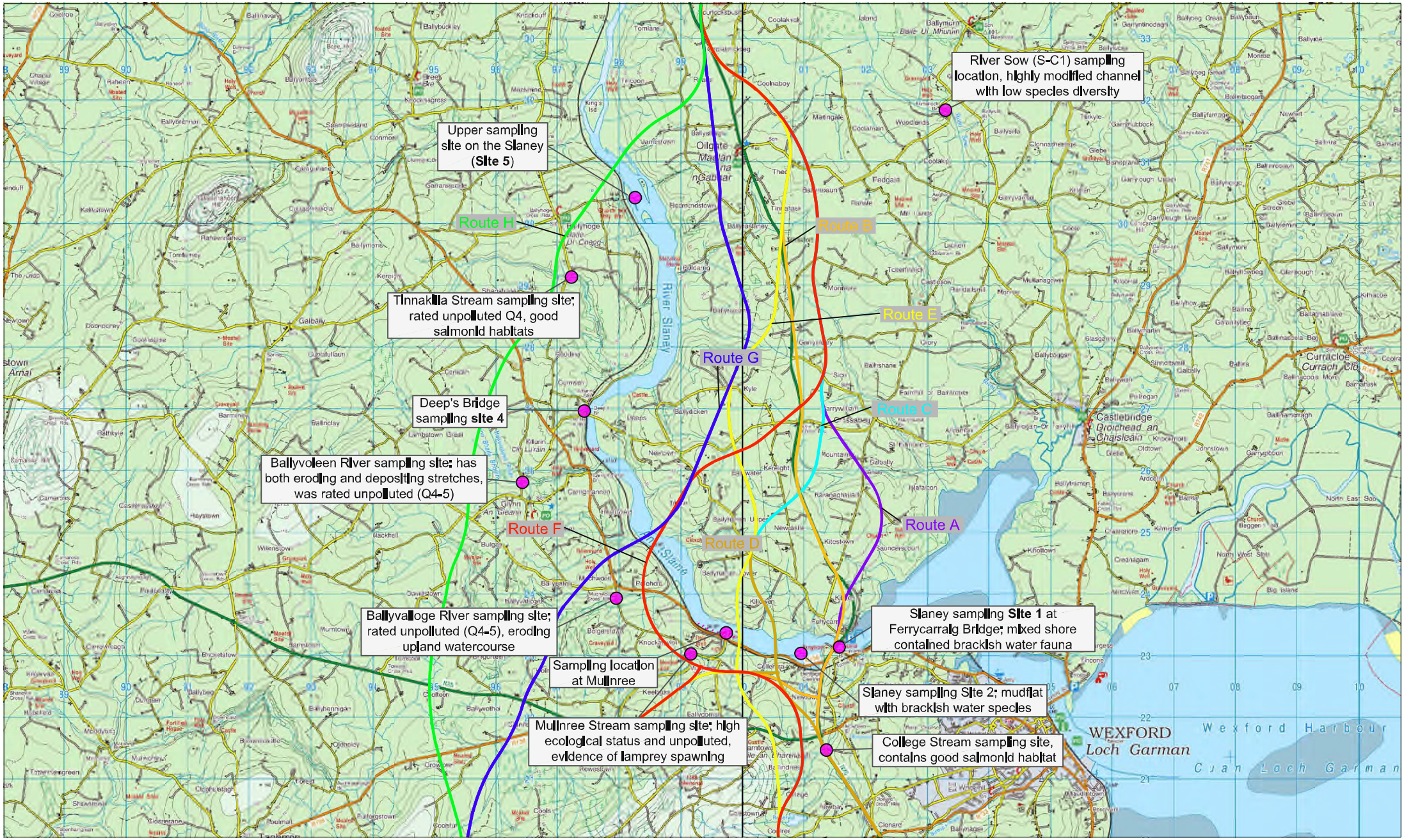
Figure A1.6 Northern end of the study area showing route options and sampling sites.

Figure A1.6: Northern end of the study area showing route options and sampling sites



Legend

- River catchments
- Route A
- Route B
- Route C
- Route D
- Route E
- Route F
- Route G
- Route H
- Sampling locations

N11/N25 Oilgate to Rosslare Road Scheme

Date: 01/12/2010

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Figure A1.7 Southern end of the study area showing route options and sampling sites.

Figure A1.7: Southern end of the study area showing route options and sampling sites

Legend

- River catchments
- Route A
- Route B
- Route C
- Route D
- Route E
- Route F
- Route G
- Route H
- Sampling locations

N11/N25 Oilgate to Rosslare Road Scheme

Date: 01/12/2010

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Figure A1.8 Boundary of the Inner Wexford Harbour designated shellfish area (Shellfish Pollution Reduction Programme, 2009).

Figure A1.9 Boundary of the Outer Wexford Harbour designated shellfish area (Shellfish Pollution Reduction Programme, 2009).

APPENDIX 2 Classification of watercourses within the study area

Table A2.1 The classification of the watercourses within the study area.

Hydrometric Area	EPA Code	OS Map Number	Catchment	Survey reference	River	Tributary	Sub-tributary
12	12/S/02	77	Slaney	S1	Slaney		
12	12_2577	77	Slaney	S1/1	Slaney	Jamestown stream	
12	12_1957	77	Slaney	S1/2	Slaney	Ballynaslaney Stream	
12	12_1937	77	Slaney	S1/2/1	Slaney	Ballynaslaney Stream	Ballynaslaney west fork
12	12_1131	77	Slaney	S1/2/2	Slaney	Ballynaslaney Stream	Ballynaslaney Stream (E fork)
12	12_787	77	Slaney	S1/3	Slaney	Tinnahask Stream	
12	12_839	77	Slaney	S1/5	Slaney	Ballynacarrig Stream	
12	12_2287	77	Slaney	S1/5/1	Slaney	Ballynacarrig Stream	Ballynacarrig Stream (North fork)
12	12_2567	77	Slaney	S1/6	Slaney	Ballydicken Stream	
12	12_1888	77	Slaney	S1/6/1	Slaney	Ballydicken Stream	Ballydicken Stream (E fork)
12	12_1737	77	Slaney	S1/8	Slaney	Killowen west Stream	
12	12_1128	77	Slaney	S1/8/1	Slaney	Killowen west Stream	Killowen west fork
12	12_714	77	Slaney	S1/10	Slaney	Kavanaghspark Stream	
12	12_2533	77	Slaney	S1/10/1	Slaney	Newcastle Stream	
12	12_887	77	Slaney	S1/10/2	Slaney	Ballywater	
12	12_96	77	Slaney	S1/10/3	Slaney	Mountanna Stream	
12	12_91	77	Slaney	S1/11	Slaney	Ferrycarrig Stream	
12	12_93	77	Slaney	S1/11/1	Slaney	Ferrycarrig Stream	Ferrycarrig south fork
12	12_905	77	Slaney	S1/12	Slaney	Killeen Stream	
12	12_826	77	Slaney	S1/13	Slaney	Saunderscourt Stream	Saunderscourt (W fork)
12	12_66	77	Slaney	S1/13/1	Slaney	Saunderscourt Stream	Saunderscourt (E fork)
12	12_2220	77	Slaney	S1/14	Slaney	Garrycleary Stream	
12	12/T/02	77	Slaney	S1/15	Slaney	Tinnokilla Stream	
12	12_301	77	Slaney	S1/15/2	Slaney	Tinnokilla Stream	Reddina Stream
12	12_1319	77	Slaney	S1/15/1	Slaney	Tinnokilla Stream	Shanahona Stream
12	12_2557	77	Slaney	S1/16	Slaney	Ballyvoleen River	
12	12_1289	77	Slaney	S1/16/2	Slaney	Ballyvoleen River	Lambstown great
12	12_1808	77	Slaney	S1/16/1	Slaney	Ballyvoleen River	Lambstown little
12	12_1291	77	Slaney	S1/16/3	Slaney	Ballyvoleen River	Bloodygap north fork
12	12_2545	77	Slaney	S1/17	Slaney	Ballyvalloge River	
12	12_260	77	Slaney	S1/17/1	Slaney	Ballyvalloge River	Knockataylor east
12	12_2349	77	Slaney	S1/17/2	Slaney	Ballyvalloge River	Muchwood Stream
12	12_2135	77	Slaney	S1/17/3	Slaney	Ballyvalloge River	Holmestown east fork
12	12_639	77	Slaney	S1/17/4	Slaney	Ballyvalloge River	Bregorteen Stream
12	12_255	77	Slaney	S1/17/5	Slaney	Ballyvalloge River	Davidstown Stream
13	12_2541	77	Slaney	S1/18	Slaney	Mullinree Stream	
12	12_1790	77	Slaney	S1/18/1	Slaney	Mullinree Stream	Ballynaglogh Stream
12	12_261	77	Slaney	S1/18/2	Slaney	Mullinree Stream	Keeloges Stream
12		77	Slaney	S1/18/3	Slaney	Mullinree Stream	Ballgoman Stream
12	12_2535	77	Slaney	S1/19	Slaney	Cullentra west Stream	
12		77	Slaney	S1/20	Slaney	Cullentra Stream	
12		77	Slaney	S1/21	Slaney	Healthfield stream	
13	13/C/01	77	Corock	C1	Corock	Mulmontry River	
13	13_535	77	Corock	C1/1	Corock	Mulmontry River	Coolstuff Stream
13	13_623	77	Corock	C1/2	Corock	Mulmontry River	Coolteen Stream

Table A2.1 (continued) The classification of the watercourses within the study area.

Hydrometric Area	EPA Code	OS Map Number	Catchment	Survey reference	River	Tributary	Sub-tributary
13	13/D/01	77	Bridgetown/Duncormick coastal	B-DC1	Duncormick		
13	13_443	77	Bridgetown/Duncormick coastal	B-DC1/1	Duncormick	Siginshaggard Stream	
13	13_118	77	Bridgetown/Duncormick coastal	B-DC1/2	Duncormick	Ballyshelin Stream	
13	13/C/04	77	Bridgetown/Duncormick coastal	B-DC2	Cleristown Stream		
13	13_54	77	Bridgetown/Duncormick coastal	B-DC2/1	Cleristown Stream	Durra Stream	
13	13_56	77	Bridgetown/Duncormick coastal	B-DC2/2	Cleristown Stream	Coolsallagh Stream	
13	13_62	77	Bridgetown/Duncormick coastal	B-DC2/3	Cleristown Stream	Newbridge Stream	
13	13_63	77	Bridgetown/Duncormick coastal	B-DC2/4	Cleristown Stream	Knockbrack Stream	
13	13/B/01	77	Bridgetown/Duncormick coastal	B-DC3	Bridgestown Stream		
13	13_348	77	Bridgetown/Duncormick coastal	B-DC3/1	Bridgestown Stream	Corramacorra Stream	
13	13_694	77	Bridgetown/Duncormick coastal	B-DC3/2	Bridgestown Stream	Gaynestown Stream	
13		77	Bridgetown/Duncormick coastal	B-DC3/3	Bridgestown Stream	Sleedagh Stream	
13		77	Bridgetown/Duncormick coastal	B-DC3/4	Bridgestown Stream	Fardystown Stream	
12	12/A/02	77	Bishops water Coastal	BW-C1/1	Assaly River		
12	n/a	77	Bishops water Coastal	BW-C1/1/1	Assaly River	Murntown Stream	
12	12_149	77	Bishops water coastal	BW-C1/1/3	Assaly River	PiercetownStream	
12	12_148	77	Bishops water coastal	BW-C1/1/5	Assaly River	Ballyfinoge great Stream	
12	12_315	77	Bishops water coastal	BW-C1/1/6	Assaly River	Orristown Stream	
12	12_681	77	Bishops water coastal	BW-C1/1/7	Assaly River	Ballyfinoge little Stream	
12	12_2444	77	Bishops water coastal	BW-C1/1/8	Assaly River	Assaly River (Killinick stn)	
12	12_622	77	Bishops water coastal	BW-C1/1/9	Assaly River	Assaly River (Ballydusker)	
12	12_819	77	Bishops water coastal	BW-C1/1/10	Assaly River	Ballyrane Stream	
12	12_2438	77	Bishops water coastal	BW-C1/1/11	Assaly River	Ballyminaun Stream	
12	12_02	77	Bishops water coastal	BW-C1/1/12	Assaly River	Ballycorboys Stream	
12	12_112	77	Bishops water coastal	BW-C1/2	Assaly River	Rathdowney Stream	
12	12_115	77	Bishops water coastal	BW-C1/2/2	Assaly River	Rathdowney Stream	Shilmaine Stream
12	12_771	77	Bishops water coastal	BW-C1/2/1/2	Assaly River	Rathdowney Stream	Ballykelsh Stream
12		77	Bishops water coastal	BW-C1/2/1	Wexford harbour	Rathdowney Stream	Hayesland Stream
12		77	Bishops water coastal	BW-C1/2/1/1	Wexford harbour	Rathdowney Stream	Streamstown Stream
12		77	Bishops water coastal	BW-C1/1/4	Assaly River	Whitestown Stream	
12	12_2346	77	Bishops water coastal	BW-C2	Wexford harbour	Kellystown Stream	
12	12_669	77	Bishops water coastal	BW-C2/1	Wexford harbour	Latimerstown Stream	
12	12_2376	77	Bishops water coastal	BW-C3/	Wexford harbour	Newbay Stream	
12	12_161	77	Bishops water coastal	BW-C3/1	Wexford harbour	Newbay Stream	Hayestown Stream
12	12_799	77	Bishops water coastal	BW-C3/2	Wexford harbour	Coolree Stream	
12	12_100	77	Bishops water coastal	BW-C3/3	Wexford harbour	College Stream	
12	12/S/03	77	Sow -coastal	S-C1	Sow River		
12	12_1003	77	Sow-coastal	S-C1/1	Sow River	Martingale Stream	

APPENDIX 3 NPWS 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 4 Macroinvertebrates recorded during April 2009

Table A4.1 Macroinvertebrates recorded during the April 2009 kick sampling surveys of selected watercourses affected by the route options under consideration for the N11 / N25 Oilgate to Rosslare Road Scheme.

Group/organism	Pollution sensitivity group	Functional group	Relative abundance									
			Ballyvoleen River	River Sow	Mullinree River	Bally-valloge Stream	Tinnokilla Stream	Ballyfinoge great	Assaly River	Slaney Crossing 6	Slaney Crossing 5 (	Rathdowney Stream stream
MAYFLIES (Uniramia, Ephemeroptera)												
Family Heptagenidae												
False March brown *Ecdyonurus venosus*	A	Scraper & gathering collector	*		*	*				**	*	
Yellow upright *Rhithrogena semicolorata*	A	Scraper & gathering collector	*****		*****	*****	******	**			*	
Yellow may dun *Heptagenia sulphurea*	A	Scraper & gathering Collector		*****								
Spiny crawler mayflies (Ephemerellidae)												
Yellow evening dun *Ephemerella notata*	C	Gathering collector									*	
Baetidae												
Large dark olive *Baetis rhodani*	C	Scraper & gathering collector	******	*	******	*****	******	******			*	
Iron blue dun *Baetis muticus*	B	Scraper & gathering collector		***								
STONEFLIES (Order Plecoptera)												
Perlodid stoneflies (Perlodidae)												
Common yellow sally *Isoperla grammatica*	A	Shredder	**			***				**	*	
Brown stoneflies (Nemouridae)												
Amphinemoura sulcicollis	A	Shredder				*	*					
Little yellows and little greens (Chloroperlidae)												
Chloroperla torrentium	A	Shredder	**		*	*	**				*	
CASED CADDIS FLIES (Tricoptera)												
Northern caddisflies (Limnephilidae)												
Anabolia nervosa	B	Shredder								*		
Halesus digitatus	B	Shredder							*	**		
Halesus radiatus	B	Shredder	*			*	*	*	*****			**
Limnephilus flavicornis	B	Shredder										*****
Limnephilus sp.	B	Shredder										**
Micropterna sp.	B	Shredder						**				
Potamophylax sp.	B	Shredder	*	*		***						
Little brown-green sedges (Lepidostomatidae)												
Lepidostoma hirtum	B	Shredder								*		
Long horned caddisflies (Leptoceridae)												
Mystacides azurea	B	Shredder								*		
Glossosomatidae												
Little black caddisfly *Agapetus fuscipes*	B	Scraper	****					******				
Primitive caddisflies (Sericostomatidae)												
Black caperer *Sericostoma personatum*	B	Shredder		*								
Odontoceridae												
Odontocerum albicorne	B	Gathering collector					*					
Family Goeridae												
Goera pilosa	B	Scraper								*		
Silo pallipes	B	Scraper	**			***						
CASELESS CADDIS FLIES (Trichoptera)												

Group/organism	Pollution sensitivity group	Functional group	Relative abundance									
			Ballyvoleen River	River Sow	Mullinree River	Bally-valloge Stream	Tinnokilla Stream	Ballyfinoge great	Assaly River	Slaney Crossing 6	Slaney Crossing 5 (	Rathdowney Stream stream
Grey flags (Hydropsychidae)												
Hydropsyche pellucidula	C	Filtering Collector		*****		*	*****	*****				
Hydropsyche siltalai	C	Filtering Collector	***		***	**						
Green sedges (Rhyacophilidae)												
The sandfly	C	Predator				**	*					
Trumpet-net caddisflies (Polycentopodidae)												
Plectronemia conspersa	C	Filtering collector	*									
TRUE FLIES (Diptera)												
Blackfly (Simulidae)	C	Filtering collector			*		*	***				
Craneflies (Tipulidae)	C	Shredder										
Dicronata sp.	C	Shredder	*	*	**	*	***					
Family Chironomidae												
Bloodworm *Chironomous sp.*	E	Filtering collector		*					****	**		***
Green chironomid	C	Filtering collector	*	**	**	*		**	**	***		
BEETLES (Coleoptera)												
Whirligig beetle larvae (Gyrinidae)	C	Predator				*			**			
Common whirligig beetle *Gyrinus sp.*	C	Predator										
Diving beetles (Dytiscidae)												
Sub family Colymbetinae	C	Predator/scraper			*							
Sub family Hydroporinae												
Potamonectes depressus elegans	C	Predator								**		
Stictotarsus duodecimpustulatus	C	Predator								*		
Riffle beetle (Elmidae)												
Elmis sp.	C	Predator	*	**		**	*	**	*			
Limnius sp.	C	Grazer			***	*	*					
Burrowing Water Beetles (Noteridae)	C	Predator								*		
SNAILS (Mollusca, Gastropoda)												
Family Lymnaeidae												
Wandering snail *Lymnaea peregra*	D	Shredder								***		
Great pond snail *Lymnaea stagnalis*	C	Shredder										*
Family Planorbiidae												
Keeled Ramshorn Snail *Planorbis carinatus*	C	Scraper								****		
Ramshorn Snail *Planorbis contortus*	C	Scraper								**		
Family Hydrobiidae												
Common Bithynia *Bithynia tentaculata*	C	Shredder								**		
Jenkin's spire shell *Potamopyrgus jenkinsi*	C	Grazer	*	*							****	
Family Ancylidae												
River limpet *Ancylus fluviatilis*	C	Grazer	**									
Valvatidae												
Valve Snail *Valvata piscinalis*	C	Shredder									*	
MUSSELS (Mollucsa, Lamellibranchiata)												
Orb/Pea Mussels (Sphaeridae)	D	Filtering Collector										
Pisidium sp.	D	Filtering Collector		*						****		****
Unionidae												
Freshwater duck mussel *Anodonta anatina*	C	Filtering Collector								**		

Group/organism	Pollution sensitivity group	Functional group	Relative abundance									
			Ballyvoleen River	River Sow	Mullinree River	Bally-valloge Stream	Tinnokilla Stream	Ballyfinoge great	Assaly River	Slaney Crossing 6	Slaney Crossing 5 (	Rathdowney Stream stream
CRUSTACEANS (Crustacea)												
Amphipods (Amphipoda, Gammaridae)												
Freshwater shrimp *Gammarus duebeni*	C	Shredder	****	****	****	****	*****	******	****	****	*	
Gammarus zaddachi	C	Shredder									******	
Isopods, Asellidae												
Asellus aquaticus	D	Shredder		**					***	*		****
LEECHES (Hirudinae)												
Glossiphonidae												
Glossiphonia complanata	D	Predator	*									
Hirudinae												
Horse leech *Haemopis sanguisuga*	D	Predator									*	
BUGS (Hemiptera)												
Water crickets/Broad-Shouldered Water Striders (Veliidae)	C	Predator							*			*
Greater water boatman (Notonectidae)	C	Predator							**			**
ALDERFLIES (Megaloptera/)												
Alderfly larvae (Sialidae)												
Sialis sp.	D	Predator								**		
SEGMENTED WORMS (Annelida, Clitellata)												
Aquatic earthworm (Lumbricidae)	D	Collector	*					*			**	
Aquatic earthworm (Lumbriculidae)	D	Collector					*			***		**
DIPLOPODA	N/A	Shredder	*				*	*				
FLATWORMS (Platyhelminthes)	N/A	Collector	*				*					
ROUNDWORMS (Nematoda)	D	Collector								*		
MITES (Hydracarina)	C	Gathering collector		**	**	*			***		***	**

*Present (1 or 2 individuals), **Scarce/Few (<1%), ***Small Numbers (<5%), ****Fair Numbers (5-10%), *****Common (10-20%), ******Numerous (25-50%), *******Dominant (50-75%), ********Excessive (>75%).

Table A3.2 Aquatic species recorded during the intertidal surveys on the River Slaney Estuary during April 2010.

	Crossing 1	Crossing 2	Crossing 3
ANNELIDA			
Polychaeta, Arenicolidae			
Lugworm *Arenicola marina*			
Polychaeta, Nephtyidae			
Ragworm *Hediste diversicolor*	✓		✓
ARTHROPODA, **CRUSTACEA**			
Amphipoda, Corophidae			
Corophium volutator		✓	
Amphipoda, Gammaridae			
Shrimp *Gammarus zaddachi*	✓		
Decapoda, Palaemonidae			
Common shrimp *Palaemon sp.*	✓		
Decapoda, Portunidae			
Green shore core *Carcinus maenas*	✓		
Mysidacea, Mysidae			
Neomysis integer	✓		
Isopoda, Anthuridae			
Cyathura carinata		✓	✓
CHORDATA			
Gasterosteiformes, Gobiidae			
Common goby *Pomatoschistus microps*	✓		
Perciformes, Mugilidae			
Thick lipped grey mullet *Chelon labrosus*		✓	
Pleuronectiformes, Pleuronectidae			
Pleuronectes flesus		✓	✓

APPENDIX 5 Watercourse Description and Evaluation

Catchment	Code	Tributary	Sub-tributary	Water quality	Aquatic habitat and evaluation	Fisheries evaluation	Presence of protected aquatic species	Overall evaluation
Slaney	S1			Considered Unpolluted	Estuarine habitat, influenced by the tide throughout the study area. Designated as an SAC, good macroinvertebrate diversity	Provides passage for important species of fish; lampreys, salmon, eel and shad	Salmon, shad, lamprey, otter	Internationally important (A)
Slaney	S1/1	Jamestown stream		No EPA data	1st order, channelised stream with low flow	Little fisheries value, marginal trout habitat present	Unlikely to occur	Low value, local importance (E)
Slaney	S1/2	Ballynaslaney stream		No EPA data	2nd order stream, low gradient , poor physical diversity	Trout likely to be present	Unlikely to occur	Moderate value, local importance (D)
Slaney	S1/2/1	Ballynaslaney stream	Ballynaslaney west fork	No EPA data	1st order stream	Little or no fisheries value	Unlikely to occur	Low value, local importance (E)
Slaney	S1/2/3	Ballynaslaney stream	Ballynaslaney west fork	No EPA data	minor stream	Little or no fisheries value	Unlikely to occur	Low value, local importance (E)
Slaney	S1/3	Tinnahask Stream		No EPA data	minor stream	Little or no fisheries value	Unlikely to occur	Low value, local importance (E)
Slaney	S1/5	Ballynacarrig stream		No EPA data	2nd order stream, low gradient stream, low physical diversity, Poor macroinvertebrate habitat	Little or no fisheries value	Unlikely to occur	Low value, local importance (E)
Slaney	S1/5/1	Ballynacarrig stream	north fork	No EPA data	minor stream	Little or no fisheries value	Unlikely to occur	Low value, local importance (E)
Slaney	S1/6	Ballydicken stream		No EPA data	2nd order stream, low gradient stream, low physical diversity, draining improved agricultural grassland	Little or no fisheries value	Unlikely to occur	Low value, local importance (E
Slaney	S1/6/1	Ballydicken stream	east fork	No EPA data	Minor stream	Little or no fisheries value	Unlikely to occur	Low value, local importance (E)
Slaney	S1/8	Killowen west stream		No EPA data	2nd order stream, low gradient stream draining improved agricultural grassland	May contain trout in the lower reaches	Unlikely to occur	Low value, local importance (E)
Slaney	S1/8/1	Killowen west stream	West fork	No EPA data	Minor stream	Little or no fisheries value	Unlikely to occur	Low value, local importance (E)
Slaney	S1/9	Killowen east stream		No EPA data	Minor stream	Little or no fisheries value	Unlikely to occur	
Slaney	S1/10	Kavanaghspark stream		No EPA data but deemed polluted	1st order high gradient stream, drains improved agricultural grassland, crossed by existing N11	Likely to contain trout	Juvenile salmon and otter may use the lower reaches	Moderate value, locally important (D)
Slaney	S1/10/1	Newcastle		No EPA data	2nd order stream low gradient stream with low physical diversity	May contain trout in the lower reaches	Unlikely to occur	Low value, local importance (E)
Slaney	S1/10/2	Ballywater stream		No EPA data	1st order stream, low gradient stream, low physical diversity, draining improved agricultural grassland	May contain juvenile salmonids in the lower reaches	Unlikely to occur	Low value, local importance (E)
Slaney	S1/10/3	Mountanna stream		No EPA data but deemed unpolluted	1st order high gradient stream, drains improved agricultural grassland	Likely to harbour trout, too small for salmon	Juvenile salmon may use the lower reaches, otter also	Moderate value, locally important (D)
Slaney	S1/11	Ferrycarrig Stream		No EPA data	Minor stream	Little or no fisheries value	Unlikely	Low value, local importance (E)
Slaney	S1/11/1	Ferrycarrig Stream	Ferrycarrig south fork	No EPA data	Minor stream	Little or no fisheries value	Unlikely	Low value, local importance (E)

Catchment	Code	Tributary	Sub-tributary	Water quality	Aquatic habitat and evaluation	Fisheries evaluation	Presence of protected aquatic species	Overall evaluation
Slaney	S1/12	Killeen Stream		No EPA data	Minor stream	Little or no fisheries value	Unlikely	Low value, local importance (E)
Slaney	S1/13	Saunderscourt Stream	Saunderscourt (W fork)	No EPA data	1st order stream, low gradient stream, low physical diversity, draining improved agricultural grassland	May contain juvenile salmonids in the lower reaches	Unlikely to occur	Low value, local importance (E)
Slaney	S1/13/1	Saunderscourt Stream	Saunderscourt (E fork)	No EPA data	1st order stream, low gradient stream, low physical diversity, draining improved agricultural grassland	May contain juvenile salmonids in the lower reaches	Unlikely to occur	Low value, local importance (E)
Slaney	S1/14	Garrycleary Stream		No EPA data but appeared clean and deemed unpolluted	3rd order soft stream, semi-natural habitat, slightly silted, fines at end of pools	Trout are likely to occur, good spawning and nursery habitat for salmonids	Sub-adult salmon possibly occur in lower reaches, otter likely to use stream at least occasionally	Moderate value, locally important (D)
Slaney	S1/15	Tinnokilla stream		Rated Q3-4 Moderately polluted, WFD Moderate status	4th order high gradient stream. Wetted width of 5m, mean depth ca. 20cm. Silt present in water column. Algae luxuriant. Suboptimal macroinvertebrate habitat.	Combination of riffle, glide and pools provide good salmonid spawning, nursery and rearing habitat. This stream is an important tributary of the Slaney River and is likely to be used by salmon. No lamprey juvenile habitat present.	Salmon, trout and otter likely to occur	High value, local importance (C)
Slaney	S1/15/2	Tinnokilla stream	Reddina stream	No EPA data	1st order stream, drained, silty substrate, no flow, nearly dried up	No fisheries value	Unlikely to occur	Low value, local importance (E)
Slaney	S1/15/1	Tinnokilla stream	Shanahona stream	No EPA data	1st order stream, draining mainly improved agricultural grassland, suboptimal macroinvertebrate habitat	Trout may occur in the lower reaches of the stream	Unlikely	Moderate value, local importance (D)
Slaney	S1/16	Ballyvoleen River		No EPA data	3rd order semi-natural stream, slightly eroding bank, filamentous algae present, good physical diversity, optimal macroinvertebrate habitat.	Lamprey juvenile habitat present but no lampreys recorded, Good salmonid rearing and foraging habitat	Important tributary of the Slaney River; likely to contain salmon and otter	High value, local importance (C)
Slaney	S1/16/1	Ballyvoleen River	Lambstown little stream	No EPA data	1st order stream with some semi-natural habitat, drains improved agricultural grassland	Salmon may occur in lower reaches of the stream and trout may also occur	Salmon and otter may occur	Moderate value, locally important (D)
Slaney	S1/16/2	Ballyvoleen River	Lambstown great	No EPA data	1st order stream with some semi-natural habitat, drains improved agricultural grassland	Salmon may occur in lower reaches of the stream and trout may also occur	Salmon and otter may occur	Moderate value, locally important (D)
Slaney	S1/16/3	Ballyvoleen River	Bloodygap stream	No EPA data	1st order stream with some semi-natural habitat, drains improved agricultural grassland	Considered too small for salmonids but may occur at the confluence with the Ballyvoleen main channel	Unlikely	Moderate value, locally important (D)
Slaney	S1/17	Ballyvalloge River		No EPA data	3rd order soft stream. Wetted width 4.5m, lightly silted, significant amount of algae present, suboptimal macroinvertebrate habitat	Good lamprey habitat for juvenile stage, good potential salmonid habitats, limited spawning grounds due to paucity of	Important tributary of the River Slaney. Juvenile River/brook lamprey present, likely to support	High value, locally important (C)

Catchment	Code	Tributary	Sub-tributary	Water quality	Aquatic habitat and evaluation	Fisheries evaluation	Presence of protected aquatic species	Overall evaluation
						riffles and suitable substrate	salmon and otter	
Slaney	S1/17/1	Ballyvalloge River	Knocktaylor east stream	No EPA data	1st order soft stream, draining improved agricultural land	Salmonids may occur in the lower reaches	Lower reaches may contain salmon and may be used on occasion by otter	Moderate value, locally important (D)
Slaney	S1/17/2	Ballyvalloge River	Muchwood stream	No EPA data	1st order stream, semi-natural habitat, lightly silted with maximum depth of 50cm and mean depth of 25cm	Good potential juvenile lamprey habitat. Poor salmonid habitat due to high amount of fine material present in stream	Lamprey present, salmon and otter may also occur	Moderate value, locally important (D)
Slaney	S1/17/3	Ballyvalloge River	Holmestown east fork	No EPA data	1st order soft stream, draining improved agricultural land	Salmonids may occur in the lower reaches	Lower reaches may contain salmon and may be used on occasion by otter	Moderate value, locally important (D)
Slaney	S1/17/4	Ballyvalloge River	Bregorteen Stream	No EPA data	1st order soft stream, draining improved agricultural land	Salmonids may occur in the lower reaches	Lower reaches may contain salmon and may be used on occasion by otter	Moderate value, locally important (D)
Slaney	S1/17/5	Ballyvalloge River	Davidstown Stream	No EPA data	1st order soft stream, draining improved agricultural land	Salmonids may occur in the lower reaches	Lower reaches may contain salmon and may be used on occasion by otter	Moderate value, locally important (D)
Slaney	S1/17/1	Ballyvalloge River	Knocktaylor east stream	No EPA data	1st order soft stream, draining improved agricultural land	Salmonids may occur in the lower reaches	Lower reaches may contain salmon and may be used on occasion by otter	Moderate value, locally important (D)
Slaney	S1/18	Mullinree stream		Moderately polluted (Q3-4), WFD Moderate status.	4th order, soft water River. Riverbed mostly of gravel and fine. Series of riffles glide and pool. High (95%) bank cover of mixed woodland, suboptimal macroinvertebrate habitat	Good salmonid and lamprey nursing, spawning and rearing habitats, lamprey and trout present	Important tributary of the River Slaney, likely to contain juvenile salmon and may be used occasionally by otter in the lower reaches	High value, local importance (C)
Slaney	S1/18/1	Mullinree River	Ballynaglogh stream	No EPA data but deemed equivalent to Mullinree main channel	1st order stream, ca. 1km long, semi-natural habitat	Lower reaches of stream likely to contain salmonids.	Juvenile salmon may migrate into the lower reach of this stream from the Mullinree River	High value, local importance (C)
Slaney	S1/18/2	Mullinree River	Keeloges stream	No EPA data but deemed equivalent to Mullinree main channel	2nd order stream, mixed woodland habitat, algae present, suboptimal macroinvertebrate habitat	Lower reaches of stream likely to contain salmonids.	Juvenile salmon may migrate into the lower reach of this stream from the Mullinree River	Moderate value, local importance (C)
Slaney	S1/18/3	Mullinree River	Ballygoman stream	No EPA data but deemed equivalent to Mullinree main channel	1st order stream, semi-natural habitat	Lower reaches of stream likely to contain salmonids.	Juvenile salmon may migrate into the lower reach of this stream from the Mullinree River	High value, local importance (C)
Slaney	S1/19	Slaney River	Cullentra west Stream	No EPA data	1st order stream, draining mainly improved agricultural land	Trout may be present, but this stream is unlikely to	Unlikely	Low value, local importance (E)

Catchment	Code	Tributary	Sub-tributary	Water quality	Aquatic habitat and evaluation	Fisheries evaluation	Presence of protected aquatic species	Overall evaluation
						contain significant populations of any species of fish.		
Slaney	S1/20	Slaney River	Cullentra stream	No EPA data	1st order stream, draining mainly improved agricultural land	Trout may be present, but this stream is unlikely to contain significant populations of any species of fish.	Unlikely	Low value, local importance (E)
Slaney	S1/21	Slaney River	Healthfield stream	No EPA data	2nd order stream, draining mainly improved agricultural land	Satisfactory trout and lamprey nursing, spawning and rearing habitats	Unlikely but salmon and lamprey may occur	Moderate value, local importance (D)
Corock	C1	Mulmontry River		Appeared Slightly polluted (Q3-4), WFD Moderate status.	5th order lowland River. Riverbed mostly of glide habitat containing floating river vegetation.	Satisfactory salmonid and lamprey nursing, spawning and rearing habitats	Important tributary of the Corock, likely to contain juvenile salmon and otter lamprey recorded	High value, local importance (C)
Corock	C1/1	Mulmontry River	Coolstuff stream	No EPA data	2nd order upland stream drains mainly improved agricultural grassland	Good potential juvenile lamprey habitat and good potential salmonid habitat	Likely to contain juvenile salmon in its lower reaches	Moderate value, local importance (D)
Corock	C1/2	Mulmontry River	Coolteen stream	No EPA data	3rd order upland stream, drains improved agricultural land, filamentous algae present and mainly fine substrate	Excellent juvenile lamprey habitat, poor spawning habitat for both salmonids and lampreys.	Lamprey present, otter may also occur	High value, local importance (C)
Bridgetown/Duncormick	B-DC1	Duncormick River		Unpolluted (Q4), WFD Good status.			Salmon and otter likely to be present	Moderate value, local importance (D)
Bridgetown/Duncormick	B-DC1/1	Duncormick River	Siginshaggard stream	No EPA Data- moderately silted, estimated rating: Q3-4	Watercourse which has been subject to drainage, poor physical diversity, poor habitat for macroinvertebrate production	Trout may be present but this watercourse has limited spawning potential.	Unlikely	Low value, local importance (E)
Bridgetown/Duncormick	B-DC1/2	Duncormick River	Ballyshelin stream	No EPA Data, slightly polluted	Minor watercourse, low flows, variable substrate, algae present	Poor salmonid and lamprey habitat	Unlikely	Low value, local importance (E)
Bridgetown/Duncormick	B-DC2	Cleristown stream		No EPA Data, slightly polluted	Watercourse which has been subject to drainage, poor physical diversity, poor habitat for macroinvertebrate production	Trout may be present but this watercourse has limited spawning potential.	Unlikely	Low value, local importance (E)
Bridgetown/Duncormick	B-DC2/1	Cleristown stream	Durra stream	No EPA data but deemed equivalent to Cleristown main channel	1st order upland stream, draining improved agricultural grassland	Trout may be present, but this stream is unlikely to contain significant populations of any species of fish.	Unlikely	Low value, local importance (E)
Bridgetown/Duncormick	B-DC2/2	Cleristown stream	Coolsallagh stream	No EPA data but deemed equivalent to Cleristown main channel	1st order upland stream, draining improved agricultural grassland	Trout may be present, but this stream is unlikely to contain significant populations of any species of fish.	Unlikely	Low value, local importance (E)
Bridgetown/Duncormick	B-DC2/3	Cleristown stream	Newbridge stream	No EPA Data	2nd order stream, draining some forested land	Sub-optimal salmonid habitat. Not likely to contain significant populations of any	Unlikely	Low value, local importance (E)

Catchment	Code	Tributary	Sub-tributary	Water quality	Aquatic habitat and evaluation	Fisheries evaluation	Presence of protected aquatic species	Overall evaluation
						species of fish.		
Bridgetown/Duncormick	B-DC2/4	Clerystown stream	Knockbrack stream	No EPA data	1st order stream, eroding bank, wetted width approximately 0.5m. Maintained channel.	Sub-optimal salmonid habitat. Not likely to contain significant populations of any species of fish.	Unlikely	Low value, local importance (E)
Bridgetown/Duncormick	B-DC3	Bridgestown stream		Unpolluted (Q4) WFD status Good	4th order soft water, draining improved agricultural grassland and forestry,	Middle and lower reaches likely to contain brown trout.	Salmon likely to use lower reach of this watercourse	High value, local importance (C)
Bridgetown/Duncormick	B-DC3/1	Bridgestown stream	Corramacorra stream	No EPA data	2nd order upland stream, wetted width approximately 1m, semi-natural habitat, sub-optimal macroinvertebrate habitat	Mixed substrate and high water quality, likely to contain juvenile salmonids	Salmon may to use lower reaches	Moderate value, local importance (D)
Bridgetown/Duncormick	B-DC3/2	Bridgestown stream	Gaynestown stream	No EPA Data, considered unpolluted	1st order stream, draining agricultural grassland, semi-natural habitat	Stream possibly supports trout	Unlikely except in lower reaches	Moderate value, local importance (D)
Bridgetown/Duncormick	B-DC3/3	Bridgestown stream	Sleedagh stream	No EPA Data, considered unpolluted	1st order stream, draining agricultural grassland, semi-natural habitat	Stream possibly supports trout	Unlikely except in lower reaches	Low value, local importance (E)
Bridgetown/Duncormick	B-DC3/4	Bridgestown stream	Fardystown stream	No EPA Data, considered unpolluted	1st order stream, draining agricultural grassland, semi-natural habitat	Stream possibly supports trout	Unlikely except in lower reaches	Low value, local importance (E)
Bishop's coastal water	BW-C1/1	Assaly River		Unpolluted (Q4) WFD status Good	4th order channelised River, approximately 1.4m wetted width, draining mainly agricultural grassland	Good lamprey juvenile habitat, high water quality and mixed substrate likely to contain juvenile salmonids	Unlikely	Low value. Local importance (E)
Bishop's coastal water	BW-C1/1/1	Assaly River	Murntown stream	No EPA data	1st order stream, draining mainly improved agricultural grassland, semi-natural habitat,	Poor fisheries value due to degraded nature (sluggish flow and lack of spawning gravels)	Unlikely	Low value. Local importance (E)
Bishop's coastal water	BW-C1/1/3	Assaly River	Piercestown stream	No EPA data	1st order stream, draining agricultural land	Not likely to contain significant populations of any species of fish.	Unlikely	Low value. Local importance (E)
Bishop's coastal water	BW-C1/1/5	Assaly River	Ballyfinoge great stream	No EPA data	1st order, high gradient upland stream, slightly silted. Wetted width approximately 1m, semi-natural habitat	Unsuitable juvenile lamprey habitat, but satisfactory trout nursery and rearing habitats	Unlikely	Moderate value, local importance (D)
Bishop's coastal water	BW-C1/1/6	Assaly River	Orristown stream	No EPA data	1st order channelised stream	Likely to contain trout, satisfactory nursery habitat.	Unlikely	Moderate value, local importance (D)
Bishop's coastal water	BW-C1/1/7	Assaly River	Ballyfinoge little stream	No EPA data	1st order, high gradient upland stream, slightly silted. Wetted width approximately 1m, semi-natural habitat	Unsuitable juvenile lamprey habitat, but satisfactory trout nursery and rearing habitats	Unlikely	Moderate value, local importance (D)
Bishop's coastal water	BW-C1/1/8	Assaly River	Assaly River (Killinick stn)		4th order channelised River, approximately 1.4m wetted width, draining mainly agricultural grassland	Good lamprey juvenile habitat but poor/unsuitable spawning habitat	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C1/1/9	Assaly River	Assaly River (Ballydusker)	No EPA data	Minor stream severely deepened and canalised	Poor for salmonids, and lampreys	Unlikely	Low value, local importance (E)

Catchment	Code	Tributary	Sub-tributary	Water quality	Aquatic habitat and evaluation	Fisheries evaluation	Presence of protected aquatic species	Overall evaluation
Bishop's coastal water	BW-C1/1/10	Assaly River	Ballyrane stream	No EPA data	1st order stream, draining improved agricultural grassland	Likely to contain juvenile trout in it lower reaches	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C1/1/11	Assaly River	Ballyminaun stream	No EPA data	2nd order stream, draining improved agricultural grassland, crosses the existing N25, channelised stream, mainly fine substrate, depositing and poor physical diversity	Juvenile lamprey habitat present, poor salmonid habitat present.	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C1/1/12	Assaly River	Ballycorboys stream	No EPA data	2nd order stream, draining improved agricultural grassland, crosses the existing N25, channelised stream, mainly fine substrate, depositing and poor physical diversity	Juvenile lamprey habitat present, poor salmonid habitat present.	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C1/1/13	Assaly River	Stephenstown stream	No EPA data	Minor stream	Stream possibly supports trout	Unlikely except in lower reaches	Moderate value, local importance (D)
Bishop's coastal water	BW-C1/2/2	Assaly River	Shilmaine stream	No EPA data	2nd order stream, draining improved agricultural grassland, crosses the existing N25, channelised stream and heavily silted	Marginal macroinvertebrate composition, poor water quality, no salmonid habitats in terms of spawning, nursery or rearing	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C1/2/1/2	Assaly River	Ballykelsh stream	No EPA data	2nd order stream, draining improved agricultural grassland, crosses the existing N25, channelised stream and heavily silted	Marginal macroinvertebrate composition, poor water quality, no salmonid habitats in terms of spawning, nursery or rearing	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C2	Wexford harbour	Kellystown stream	No EPA data	2nd order high gradient stream, good physical diversity, semi-natural habitat, algae present	Trout possible, good salmonid habitat	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C1/2/1	Assaly River	Hayesland Stream	No EPA data	2nd order stream, draining improved agricultural grassland, crosses the existing R736, channelised stream and heavily silted	Marginal macroinvertebrate composition, poor water quality, no salmonid habitats in terms of spawning, nursery or rearing	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C1/2/1/1	Assaly River	Streamstown Stream	No EPA data	Drains improved agricultural grassland	Likely to contain juvenile trout in it lower reaches	Unlikely	Low value, local importance (E)
Bishop's Water Coastal	BW-C1/2	Bishop's Water	Rathdowney	No EPA data	Sluggish stream heavily drained	This stream is unlikely to contain significant populations of any species of fish.	Unlikely	Low
Bishop's Water Coastal	BW-C1/1/4	Assaly River	Whitestown stream	No EPA data	Minor stream/heavily drained	This stream is unlikely to contain significant populations of any species of fish.	Unlikely	Low
Bishop's coastal water	BW-C1/2/1	Wexford harbour	Latimerstown stream	No EPA data	Minor stream/heavily drained	This stream is unlikely to contain significant populations of any	Unlikely	Low value, local importance (E)

Catchment	Code	Tributary	Sub-tributary	Water quality	Aquatic habitat and evaluation	Fisheries evaluation	Presence of protected aquatic species	Overall evaluation
						species of fish.		
Bishop's coastal water	BW-C3/1	Newbay Stream	Hayestown stream	No EPA data	3rd order stream/drained/flows under the existing N25	This stream is unlikely to contain significant populations of any species of fish.	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C3	Wexford harbour	Newbay Stream	No EPA data	Drains improved agricultural grassland	Likely to contain trout	Unlikely	High value, local importance (C)
Bishop's coastal water	BW-C3/2	Wexford harbour	Coolree stream	No EPA data	Minor stream/drained	This stream is unlikely to contain significant populations of any species of fish.	Unlikely	Low value, local importance (E)
Bishop's coastal water	BW-C3/3	Wexford harbour	College stream	No EPA Data, deemed Q3-4	2nd order high gradient stream with varied characteristics, mixed woodland habitat, moderately silted	Good salmonid habitat present, juvenile lamprey habitat poor	Likely to contain trout, may also contain salmon and otter	High value, local importance (C)
Sow	S-C1	Sow River		Unpolluted (Q4) WFD status good	5th order watercourse, high gradient dredged River, with a mixed substrate of gravel and fine. Semi-natural habitat.	Sub-optimal macroinvertebrate habitat, high water quality, good salmonid spawning and nursery habitats, trout likely to use middle and lower reaches	Otter may occur	High value, local importance (C)
Sow	S-C1/1	Sow River	Martingale stream	No EPA data	1st order stream, low physical diversity, substrate mainly gravel and fine, <5cm deep, eroding bank.	This stream is unlikely to contain significant populations of any species of fish- poor rearing habitat	Unlikely	Low value, local importance (E)

APPENDIX 6 Number of watercourse crossings for each proposed route

Catchment	Code	Tributary	Sub-tributary	Overall evaluation	Blue	Green	Purple	Yellow	Red	Orange	Cyan	Brown
Slaney	S1			Internationally important (A)	1	1	1	1	1	1	1	1
Slaney	S1/1	Jamestown stream		Low value, local importance (E)	1							
Slaney	S1/2	Ballynaslaney stream		Moderate value, local importance (D)	1							
Slaney	S1/2/1	Ballynaslaney stream	Ballynaslaney west fork	Low value, local importance (E)								
Slaney	S1/2/3	Ballynaslaney stream	Ballynaslaney west fork	Low value, local importance (E)								
Slaney	S1/3	Tinnahask Stream		Low value, local importance (E)				1		1		1
Slaney	S1/5	Ballynacarrig stream		Low value, local importance (E)	1							1
Slaney	S1/5/1	Ballynacarrig stream	north fork	Low value, local importance (E)	1							
Slaney	S1/6	Ballydicken stream		Low value, local importance (E	1			1	1			
Slaney	S1/6/1	Ballydicken stream	east fork	Low value, local importance (E)								1
Slaney	S1/8	Killowen west stream		Low value, local importance (E)				1				
Slaney	S1/8/1	Killowen west stream	West fork	Low value, local importance (E)				1				
Slaney	S1/9	Killowen east stream	West fork	Low value, local importance (E)							1	1
Slaney	S1/10	Kavanaghspark stream		Moderate value, locally important (D)			1		1	1	1	
Slaney	S1/10/1	Newcastle		Low value, local importance (E)						1		
Slaney	S1/10/2	Ballywater stream		Low value, local importance (E)						1	2	
Slaney	S1/10/3	Mountanna stream		Moderate value, locally important (D)			2					
Slaney	S1/11	Ferrycarrig Stream		Low value, local importance (E)			1			1		
Slaney	S1/11/1	Ferrycarrig Stream	Ferrycarrig south fork	Low value, local importance (E)			1			1		
Slaney	S1/12	Killeen Stream		Low value, local importance (E)			1					
Slaney	S1/13	Saunderscourt Stream	Saunderscourt (W fork)	Low value, local importance (E)			1					
Slaney	S1/13/1	Saunderscourt Stream	Saunderscourt (E fork)	Low value, local importance (E)			1					
Slaney	S1/14	Garryoleary Stream		Moderate value, locally important (D)			1		1		1	
Slaney	S1/15	Tinnokilla stream		High value, local importance (C)		1		1				
Slaney	S1/15/2	Tinnokilla stream	Reddina stream	Low value, local importance (E)								
Slaney	S1/15/1	Tinnokilla stream	Shanahona stream	Moderate value, local importance (D)		1						
Slaney	S1/16	Ballyvoleen River		High value, local importance (C)		1						
Slaney	S1/16/1	Ballyvoleen River	Lambstown little	Moderate value, local importance (D)		1						
Slaney	S1/16/2	Ballyvoleen River	Lambstown great	Moderate value, locally important (D)		1						
Slaney	S1/16/3	Ballyvoleen River	Bloodygap stream	Moderate value, locally important (D)		1						
Slaney	S1/17	Ballyvalloge River		High value, locally important (C)	1	1			1			
Slaney	S1/17/1	Ballyvalloge River	Knocktaylor east stream	Moderate value, locally important (D)					1			
Slaney	S1/17/2	Ballyvalloge River	Muchwood stream	Moderate value, locally important (D)	1							
Slaney	S1/17/3	Ballyvalloge River	Holmestown east fork	Moderate value, locally important (D)	1							

Catchment	Code	Tributary	Sub-tributary	Overall evaluation	Blue	Green	Purple	Yellow	Red	Orange	Cyan	Brown
Slaney	S1/17/4	Ballyvalloge River	Bregorteen Stream	Moderate value, locally important (D)	1							
Slaney	S1/17/5	Ballyvalloge River	Davidstown Stream	Moderate value, locally important (D)		1						
Slaney	S1/17/1	Ballyvalloge River	Knocktaylor east stream	Moderate value, locally important (D)								
Slaney	S1/18	Mullinree stream		High value, local importance (C)				1				
Slaney	S1/18/1	Mullinree River	Ballynaglogh stream	High value, local importance (C)					1			
Slaney	S1/18/2	Mullinree River	Keeloges stream	Moderate value, local importance (C)				2	1			
Slaney	S1/18/3	Mullinree River	Ballygoman stream	High value, local importance (C)				1	1			
Slaney	S1/19	Slaney River	Cullentra west Stream	Low value, local importance (E)				3	1			
Slaney	S1/20	Slaney River	Cullentra stream	Low value, local importance (E)					1			
Slaney	S11/21	Slaney River	Healthfield stream	Moderate value, local importance (D)	1							
Corock	C1	Mulmontry River		High value, local importance (C)								
Corock	C1/1	Mulmontry River	Coolstuff stream	Moderate value, local importance (D)	4	2						
Corock	C1/2	Mulmontry River	Coolteen stream	High value, local importance (C)		4						
Bridgetown/Duncormick	B-DC1	Duncormick River		Moderate value, local importance (D)	1	3						
Bridgetown/Duncormick	B-DC1/1	Duncormick River	Siginshaggard stream	Low value, local importance (E)	2							
Bridgetown/Duncormick	B-DC1/2	Duncormick River	Ballyshelin stream	Low value, local importance (E)	1	1						
Bridgetown/Duncormick	B-DC2	Cleristown stream		Low value, local importance (E)	1	1						
Bridgetown/Duncormick	B-DC2/1	Cleristown stream	Durra Stream	Low value, local importance (E)								
Bridgetown/Duncormick	B-DC2/2	Cleristown stream	Coolsallagh stream	Low value, local importance (E)								
Bridgetown/Duncormick	B-DC2/3	Cleristown stream	Newbridge stream	Low value, local importance (E)	1	1						
Bridgetown/Duncormick	B-DC2/4	Cleristown stream	Knockbrack stream	Low value, local importance (E)	1	1						
Bridgetown/Duncormick	B-DC3	Bridgestown stream		High value, local importance (C)								
Bridgetown/Duncormick	B-DC3/1	Bridgestown stream	Corramacorra stream	Moderate value, local importance (D)	1	1						
Bridgetown/Duncormick	B-DC3/2	Bridgestown stream	Gaynestown stream	Moderate value, local importance (D)	1	1						
Bridgetown/Duncormick	B-DC3/3	Bridgestown stream	Sleedagh stream	Low value, local importance (E)	1	1						
Bridgetown/Duncormick	B-DC3/4	Bridgestown stream	Fardystown stream	Low value, local importance (E)	1	1						
Bishop's coastal water	BW-C1/1	Assaly River		Low value. Local importance (E)	1	1	1	1	1	1	1	1
Bishop's coastal water	BW-C1/1/1	Assaly River	Murntown stream	Low value. Local importance (E)	1	1						
Bishop's coastal water	BW-C1/1/3	Assaly River	Piercestown stream	Low value. Local importance (E)	1	1						

Catchment	Code	Tributary	Sub-tributary	Overall evaluation	Blue	Green	Purple	Yellow	Red	Orange	Cyan	Brown
Bishop's coastal water	BW-C1/1/5	Assaly River	Ballyfinoge great stream	Moderate value, local importance (D)	1	1		1	1		1	
Bishop's coastal water	BW-C1/1/6	Assaly River	Orristown stream	Moderate value, local importance (D)								
Bishop's coastal water	BW-C1/1/7	Assaly River	Ballyfinoge little stream	Moderate value, local importance (D)	1		1			1		
Bishop's coastal water	BW-C1/1/8	Assaly River	Assaly River (Killinick stn)	Low value, local importance (E)	1		1			1		1
Bishop's coastal water	BW-C1/1/9	Assaly River	Assaly River (Ballydusker)	Low value, local importance (E)		1		1	1		1	
Bishop's coastal water	BW-C1/1/10	Assaly River	Ballyrane stream	Low value, local importance (E)	1	1	1	1	1	1	1	1
Bishop's coastal water	BW-C1/1/11	Assaly River	Ballyminaun stream	Low value, local importance (E)	1	1		1	1	1	1	1
Bishop's coastal water	BW-C1/1/12	Assaly River	Ballycorboys stream	Low value, local importance (E)		1	1	1	1		1	
Bishop's coastal water	BW-C1/1/13	Assaly River	Stephenstown stream	Low value, local importance (E)								1
Bishop's coastal water	BW-C1/2/2	Assaly River	Shilmaine stream	Low value, local importance (E)		1		1	1		1	
Bishop's coastal water	BW-C1/2/1/2	Assaly River	Ballykelsh stream	Low value, local importance (E)	1	1	1	1	1	1	1	1
Bishop's coastal water	BW-C2	Wexford Harbour	Kellystown stream	Moderate value, local importance (D)			2	7	7	2	7	2
Bishop's Water Coastal	BW-C1/2/1	Assaly River	Hayesland stream	Low value, local importance (E)	2	1	2	1	1	2	1	2
Bishop's Water Coastal	BWC1/2/1/1	Assaly River	Streamstown stream	Low value, local importance (E)	1		1			1		1
Bishop's Water Coastal	BW-C1/2	Assaly River	Rathdowney	Low value, local importance (E)	1		1			1		1
Bishop's Water Coastal	BW-C1/1/4	Assaly River	Whitestown stream	Low value, local importance (E)			1					1
Bishop's coastal water	BW-C2/1	Wexford Harbour	Latimerstown stream	Low value, local importance (E)								
Bishop's coastal water	BW-C3/1	Wexford Harbour	Hayestown stream	Low value, local importance (E)				4	4	1	4	1
Bishop's coastal water	BW-C3	Wexford Harbour	Newbay stream	Low value, local importance (E)			3	1	1	3	1	3
Bishop's coastal water	BW-C3/2	Wexford Harbour	Coolree stream	Moderate value, local importance (D)				1	1		1	
Bishop's coastal water	BW-C3/3	Wexford Harbour	College stream	High value, local importance (C)			1	2	2	1	2	1
Sow	S-C1	Sow River		High value, local importance (C)								
Sow	S-C1/1	Sow River	Martingale stream	Low value, local importance (E)			1	1	1	1	1	1

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