SLR Consulting Ireland

Brownswood Quarry Restoration, Brownswood, Co. Wexford

Article 6 Appropriate Assessment: Natura Impact Statement

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TABLE OF CONTENTS

1. INTRODUCTION

This report provides an assessment of the likely significant effects on the Natura 2000 network arising from the proposed Brownswood Quarry restoration scheme at Brownswood, Enniscorthy, Co. Wexford. The proposed restoration of Brownswood Quarry site provides for backfilling of the existing worked-out quarry void and the development of an Inert Waste (Soil) Recovery Facility at the site. The principal elements of the scheme includes the use of imported natural materials, principally excess inert soil, stones and/or broken rock excavated on local construction sites, to backfill and restore the worked out void created by previous extraction of bedrock. The restoration also provides for the placement of cover soils, seeding and return to use as agricultural grassland.

An Article 6 Appropriate Assessment or Natura Impact Statement is required under the Habitats Directive (92/43/EEC), in instances where a plan or project may give rise to significant effects upon a Natura 2000 site. Natura 2000 sites are those identified as sites of European Community importance designated under the Habitats Directive as Special Areas of Conservation (hereafter referred to as SACs) or under the Birds Directive (2009) as Special Protection Areas (hereafter referred to as SPAs).

This Appropriate Assessment therefore considers the potential impacts of the proposed restoration works which are to be carried out at Brownswood Quarry and the effects upon the conservation objectives and qualifying interests (including habitats and species) within the affected designated areas identified adjacent to the site. The current assessment identifies designated sites within 15km of the proposed scheme. The proposed facility is located adjacent to the Slaney River Valley cSAC (site code 000781) and the Wexford Harbour and Slobs SPA (site code 004076) approximately 30m from the site boundary of these designated sites. The NPWS site synopses for these sites are provided in Appendix 1.

The current document meets the requirements of an Article 6 Assessment by providing a Screening Assessment (Stage 1) and a further Stage 2 Natura Impact Statement of the proposed development and follows the guidance published by the National Parks and Wildlife Service of the Department of the Environment, Heritage and Local Government (DoEHLG 2009) '*Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*'.

According to NPWS (2009), screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3) of the EU Habitats Directive: i.e. whether a plan or project is directly connected to or necessary for the management of the site; and whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of its conservation objectives. When assessing the significance of potential effects, NPWS (2009) recommends that "*a precautionary approach is fundamental and, in cases of uncertainty, it should be assumed the effects could be significant*". Consequently due to the intrusive nature of the works proposed, the Article 6 Appropriate Assessment process proceeds to Stage 2 Appropriate Assessment: Natura Impact Statement (NIS). Both the Screening Report and NIS are detailed below. The current report was prepared by ECOFACT Environmental Consultants Ltd. on behalf of SLR Consulting Ireland and Roadstone Wood Limited, the promoter of the proposed soil recovery facility at Brownswood Quarry.

1.1 Consultation

Consultation, including the review of publically available material, has been undertaken with the following statutory bodies and competent authorities:

- National Parks and Wildlife Service (NPWS);
- Inland Fisheries Ireland (IFI);
- Environmental Protection Agency (EPA);
- Wexford County Council
- South Eastern River Basin District (SERBD)

1.2 Legislative context

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora - '*The Habitats Directive'*, has been transposed into Irish law by The European Community (Natural Habitats) Regulations 1997 (S.I. No. 94/1997). The 1997 Regulations were updated in 1998 by The European Communities (Natural Habitats) (Amendment) Regulations 1998 (S.I. No. 233/1998) to include Council Directive 97/62/EC which served to update Council Directive 92/43/EEC, adapting it to technical and scientific progress made in the intervening years.

The 1997 Regulations were again updated in 2005, by The European Communities (Natural Habitats) (Amendment) Regulations 2005 (S.I. No. 378/2005). This amendment served to consolidate the main nature conservation legislation enacted in Ireland, meaning The Wildlife Act 1976, The Wildlife (Amendment) Act 2000, The European Communities (Natural Habitats) Regulations 1997, The European Communities (Natural Habitats) (Amendment) Regulations 1998, and to draw direct reference upon Council Directive (2009/147/EC) on the conservation of wild birds – '*The Birds Directive'*.

The Birds Directive (2009/147/EC) seeks to protect birds of special importance by the designation of Special Protection Areas (SPAs) whereas the Habitats Directive does the same for habitats and other species groups within Special Areas of Conservation (SACs). It lists certain rare habitats (Annex I) and species (Annex II) whose conservation is of community interest. It is the responsibility of each member state to designate SPAs and SACs, both of which will form part of Natura 2000, a network of protected areas throughout the European Community.

Article 6, paragraphs 3 and 4 of the Habitats Directive state that:

6(3) Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

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

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

2. METHODOLOGY

2.1 Desk study

A desktop study was undertaken to identify the location and conservation interests of designated Natura 2000 sites which may potentially be affected by the proposed Brownswood Quarry restoration scheme. The desktop study identified the conservation interests of the designated sites with respect to the qualifying interests (species and habitats) relevant to the designated sites within the study area. The conservation site synopses are presented in Appendix 1.

Further desk study research included publically available information from statutory bodies such as the National Parks and Wildlife Service, the Environmental Protection Agency and WFD Ireland. The desk study included data gathering with regard to ecological interests and current and historical water quality and hydrological data within the study area. The ecological and hydrological investigations undertaken for the preparation of the Environmental Impact Statement (SLR, 2011) for the scheme were used to inform the current assessment.

2.2 Field survey

Building on the terrestrial ecological surveys undertaken for the EIS, the preparation of this Appropriate Assessment included additional field survey work to characterise the habitats and ecological features within the River Slaney Valley cSAC and the SPA adjacent to the Brownswood facility, with regard to the key qualifying interests of the site. Annex I habitats for which the cSAC is designated were recorded within the study area, as was any evidence of Annex II species or suitable habitats supporting these species within the cSAC. Key features for which the SPA is designated were also identified.

The River Slaney corridor was surveyed during both March and April 2011 to approximately 1 kilometre upstream and downstream of the Brownswood quarry facility. Walkover surveys and a boat based survey were undertaken to assess the ecological communities of the riparian and aquatic habitats. Macroinvertebrate sampling was undertaken at two locations on the River Slaney adjacent to the bank, upstream and downstream of the Brownswood quarry facility. Sampling was carried out using a sweep net, both from the boat and from the shore; where physical conditions in this depositing stretch of the River Slaney were unsuitable for kick-sampling due to depth and soft substrate.

A sampling exercise was carried out on the body of water in the quarry void during April 2011 to complement the existing water quality sampling data available and to determine if there were any significant water quality issues in the waterbody which is to be dewatered to the River Slaney via settlement ponds. Using a small inflatable boat two water samples were taken at each of two reference stations on the quarry void, one subsurface and one hypolimneal. Samples were retrieved using a WaterMark polycarbonate horizontal water sampler. The four no. water samples were analysed for the following parameters; BOD, Total Phosphate, Orthophosphate, Total Ammonia, Nitrate, Nitrite, Suspended Solids, pH, Heavy Metals (10), DRO, and PRO.

2.3 Appropriate Assessment Methodology

This Natura Impact Statement follows the guidance published by the National Parks and Wildlife Service (NPWS 2009) '*Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities'*. The safeguards set out in Article 6(3) and (4) of the Habitats Directive are triggered not by certainty but by the possibility of significant effects. Thus, in line with the precautionary principle, it is necessary to undertake an appropriate assessment to ascertain the potential for significant effects.

Based on these guidelines, the Appropriate Assessment process is a four-staged approach described below:

Stage One: Screening / Test of Significance - the process which identifies the likely impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;

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

Stage Three: Assessment of Alternative Solutions - the process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site; and

Stage Four: Assessment Where Adverse Impacts Remain - an assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest (IROPI), it is deemed that the project or plan should proceed.

2.3.1 Stage 1: Screening

Following the guidelines set out by DoEHLG (2009) Appropriate Assessment Stage 1: Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3) of the EU Habitats Directive:

1) Whether a plan or project is directly connected to or necessary for the management of the site; and
2) Whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site or sites in view of its conservation objectives.

The proposed Brownwood Quarry restoration scheme does not comply with the first screening test (i.e. the proposed works are not directly connected to or necessary for the management of any Natura 2000 site). The current Screening Assessment therefore sets out to determine whether the proposed project, alone or in combination with other plans and projects, is likely to have significant effects on the Natura 2000 sites within the study area. If the effects are deemed to be significant, potentially significant, or uncertain, or it the screening process becomes overly complicated, then the process must proceed to Stage 2 Appropriate Assessment i.e. a Natura Impact Statement. When assessing the significance of potential effects, the NPWS Guidelines (2009) recommend that "*a precautionary approach is fundamental and, in cases of uncertainty, it should be assumed the effects could be significant*".

2.3.2 Stage 2: Appropriate Assessment

This stage considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the *integrity* of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The Stage 2 Appropriate Assessment will comprise a scientific examination of the plan / project and the relevant Natura 2000 sites; to identify and characterise any possible implications for the site in view of the site's conservation objectives, structure and function, taking account of in combination effects. The requirements for Appropriate Assessment derive directly from Article 6(3) of the EU Habitats Directive (1992).

An ecological impact assessment of the proposed scheme has been for the site and is detailed in the Environmental Impact Statement for the proposed scheme (SLR, 2011). Direct and indirect impacts in isolation or in combination with other plans and projects on the identified Natura 2000 sites in view of the sites' conservation objectives have been examined. Case law of the European Court of Justice (ECJ) has established that Appropriate Assessment must be based on best scientific knowledge in the field. These are the Annex I

habitats (and their species) and Annex II species (and their habitats) hosted by a site and for which that site has been selected.

The conservation objectives for Natura sites (cSACs and SPAs) are determined under Article 4 of the Habitats Directive and are intended to ensure that the relevant qualifying interests i.e. Annex I habitats and Annex II species present on a site are maintained in a favourable condition.

The current report includes a Stage 2 Appropriate Assessment. This provides a description of the project and the receiving environment. The conservation objectives of Natura 2000 sites potentially affected by the proposed development are listed and potential impacts outlined with respect to the integrity of the Natura 2000 site. Mitigation measures have been proposed for the protection of the conservation interests and the avoidance of impacts to the cSAC and the SPA located in close proximity to the proposed development.

3. STAGE 1: SCREENING / TEST OF SIGNIFICANCE

3.1 Description of the project

The proposed restoration of the Brownswood Quarry site will allow for the development of a Waste Recovery Facility within the existing quarry void. The principle elements of the scheme includes the use of imported natural materials, principally excess inert soil, stones and/or broken rock excavated on construction sites, to backfill and restore a large existing void created by previous extraction of bedrock. This will include the placement of cover soils and seeding and return to use as agricultural grassland. Any non-inert construction and demolition waste (principally metal, timber, PVC pipes and plastic) which may have been unintentionally imported to site will be separated prior to removal off-site to appropriately licensed waste disposal or recovery facilities. The temporary stockpiling of topsoil and subsoil pending re-use as cover material for final restoration of the site is also required. Environmental monitoring of noise, dust, surface water and groundwater will be undertaken for the duration of the site restoration works and for a short period of aftercare.

The existing void will only be infilled using inert soil materials imported from pre-approved external construction sites. Soil stockpiled in existing over-burden mounds around the quarry will also be used to backfill the quarry void. No peat, contaminated soils or non-hazardous waste will be accepted at the proposed recovery facility.

Full details of the proposed development are included in the Environmental Impact Statement prepared by SLR Consulting Ireland (2010). The site location and layout of the existing site and proposed waste licence application area are presented in Figure 1.

3.2 Identification of relevant Natura 2000 Sites

3.2.1 Screening of Natura 2000 Sites within 15km of the study area

The current Screening Assessment has identified the designated Natura 2000 sites within a 15km radius of the proposed Brownswood Quarry restoration scheme. Only two sites were identified, the Slaney River Valley SAC and the Wexford Harbour and Slobs SPA.

The River Slaney Valley cSAC is located directly adjacent to the Brownswood quarry facility. This designated site primarily follows the River Slaney corridor but also includes wet woodland habitats on both sides of the N11 road in close proximity to the proposed development.

The Wexford Harbour and Slobs SPA extends from the River Slaney estuary and Slobs upstream to include the river corridor adjacent to the Brownswood site. This designation is principally for wintering bird species which use the intertidal estuarine habitats of the Slaney Estuary and Wexford Harbour.

3.2.2 Description of Natura 2000 site likely to be affected by the proposed project

The Slaney River within the study area is designated under the Slaney River Valley cSAC. SACs are of international importance and are given legal status in Ireland under the European Communities (Natural Habitats) Regulations 1997 (S.I. No. 94/1997). The River Slaney is also 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 site synopsis for the River Slaney Valley SAC is presented in Appendix 1. This SAC 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. The River is up to 100 m wide in places and is tidal at the southern end from Edermine Bridge below Enniscorthy.

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 Lamprey species - 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*).

The Wexford Harbour and Slobs SPA (site code 004076) includes the river section of the site 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 reed swamp is well developed. 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.

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.

3.3 Screening Assessment of Likely Effects

3.3.1 Assessment of likely direct impacts affecting the Natura 2000 sites

The proposed restoration works to be undertaken at the quarry would be carried out within 30m of the River Slaney Valley cSAC and SPA site boundary. The site boundary of the proposed waste licence application area lies outside of the these designations; however existing (licensed) discharge pipelines and channels associated with the pre-existing development (which are to be retained and used for discharging water from the application area) lie within the designated site boundary and discharge into wetland habitats within the cSAC and SPA.

Direct habitat loss affecting the cSAC or SPA is considered unlikely; however there is the potential for direct impacts affecting these sites arising from development works, increased traffic disturbance (similar in significance to historical and ongoing impacts), spread of invasive non-native species, discharge of water from the quarry void and surface water run-off occurring directly adjacent to the boundary of these designated sites.

3.3.2 Assessment of likely indirect impacts affecting the Natura 2000 site

Conservation interests of the River Slaney Valley cSAC may potentially be affected by indirect water quality impacts, in relation to both increased suspended solids impacts and also the release of pollutants during the restoration scheme which may affect both the vertebrate fauna and the invertebrate food sources for these Annexed species within the cSAC.

It is considered that the proposed restoration works have the potential to give rise to indirect impacts affecting the cSAC with regard to disturbance of key species for which the site is designated by virtue of the duration of the proposed works, extractions and emissions and also potential changes in water quality and hydrological regimes; all of which may potentially affect water quality within the Slaney River main channel. Water quality in the Slaney River has been identified as a key indicator of conservation value for the aquatic Annex II species for which this cSAC is designated, as well as supporting the wetland habitats upon which the qualifying interests of the SPA depend. Further indirect impacts may potentially arise via the spread of invasive, non-native species which occur within the Brownswood Quarry site

(namely Japanese knotweed and Himalayan balsam) to the cSAC. These species already occur within the designated sites adjacent to the Brownswood quarry; however, further spread or introduction to uncontaminated areas along the Slaney corridor is possible. Any construction phase impacts arising may potentially be significant, particularly in relation to water quality impacts and hydrological alterations affecting the cSAC or the SPA.

3.3.3 Assessment of likely cumulative impacts affecting the Natura 2000 Network

Cumulative impacts or effects are changes in the environment that result from numerous human-induced, small-scale alterations. Cumulative impacts can be thought of as occurring through two main pathways: first, through persistent additions or losses of the same materials or resource, and second, through the compounding effects as a result of the coming together of two or more effects (Bowers-Marriott, 1997).

Other projects that have recently taken place or are currently proposed near / within the River Slaney Valley SAC / Wexford Harbour and Slobs SPA include the ongoing works within the Brownswood Quarry site including the concrete block batching plant, asphalt/macadam mixing plant and associated discharges. Furthermore Wexford County Council are currently proposing to construct bypass of Wexford Town which will likely require a crossing of the River Slaney corridor within the SAC. In combination with these activities there is potential for cumulative impacts affecting the conservation interests of the SAC, with particular reference to water-dependant Annex I habitats and Annex II species.

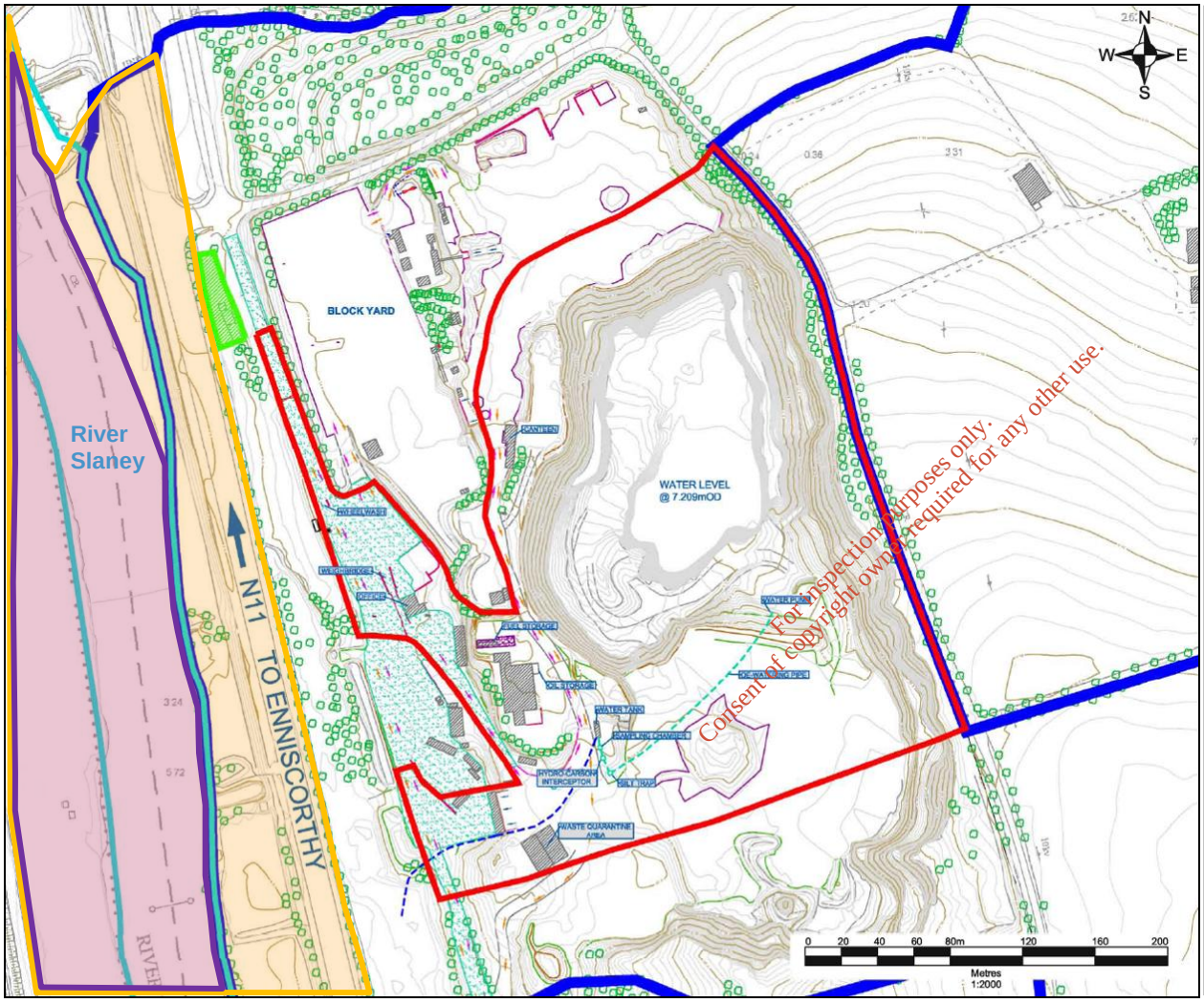
Ongoing polluting discharges to the River Slaney upstream of the development would comprise a cumulative pressure on the conservation interests of the SAC; where Annex II aquatic species are considered to be under stress due to poor background water quality, irrespective of the current proposal. Discharges to the River Slaney affecting water quality are highlighted in annual EPA water quality monitoring reports, as well as in the NPWS site synopsis for the River Slaney Valley cSAC.

3.4 Screening statement with conclusions

According to NPWS (2009), the Appropriate Assessment Screening exercise can either identify that an Appropriate Assessment is not required; or that there is no potential for significant effects (i.e. Appropriate Assessment is not required); or that significant effects are certain, likely or uncertain (i.e. the project must either proceed to Stage 2 (AA) or be rejected).

From the examination of the information available it is considered that the proposed restoration scheme at the Brownswood Quarry site has the *potential* to result in impacts to the Natura 2000 site network, specifically in relation to indirect impacts affecting the water-dependant conservation interests of the Slaney River Valley SAC and the wetland and aquatic habitats of the Wexford Harbour and Slobs SPA occurring within the study area. Impacts on the key conservation interests of these Natura sites i.e. water quality and protected Annex II species are uncertain following the Precautionary Principle and may be significant.

Based on the information provided, the current Screening Assessment has determined that the proposal must progress to Stage 2 with regard to the potential for impacts affecting the Slaney River Valley SAC and the Wexford Harbour and Slobs SPA i.e. a Stage 2 Appropriate Assessment for the proposed Brownswood Quarry Waste Recovery Facility is required.



LEGEND:

Roadstone Wood Ltd. land holding (c.86.2 ha.)

Waste licence application area (c. 8.1 ha.)

Area not owned by Roadstone Wood Ltd. (c. 0.1 ha)

River Slaney cSAC boundary

Wexford Harbour and Slobs SPA boundary

Figure 1 Layout of the existing Brownswood Quarry site, showing the Natura 2000 site boundaries and the current waste licence application area.

4. STAGE 2: APPROPRIATE ASSESSMENT

This stage considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the *integrity* of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The Stage 2 Appropriate Assessment comprises a scientific examination of the plan / project and the relevant Natura 2000 sites; to identify and characterise any possible implications for the site in view of the site's conservation objectives, structure and function; taking account of in combination effects.

The study area of the current assessment therefore considers the proposed development site at the Brownwood Quarry holding, the adjoining lands and River Slaney Valley cSAC. As this cSAC is a designated conservation site and is aquatic in nature the adjacent habitats and downstream conservation interests of the site are also considered within the current study area.

4.1 Description of the Receiving Environment

4.1.1 Overview of the River Slaney catchment

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).

4.1.2 Water quality in the Lower River Slaney

According to the EPA water quality mapping (www.epa.ie) the Upper Slaney Estuary is characterised as being of 'moderate status' adjacent to the Brownswood site. The ecological status of both the Upper (Code IE_SE_040_0200) and Lower (IE_SE_040_0200) Slaney Estuary are classed as 'Moderate Status' and are in the '1a at risk' category. The objective is to restore this waterbody to 'Good Status' by 2015 under the requirements of the Water Framework Directive (2000).

The EPA carry out chemical monitoring at prescribed stations on the River Slaney as part of the Water Framework Directive (2000) monitoring programme. Station 2400 is located downstream of Enniscorthy within the tidal portion of the river, approximately 1 kilometre upstream of the Brownswood Quarry site. EPA chemical water quality data from six sampling occasions in 2010 at this monitoring station was found to be generally within the limits of the Surface Water Regulations (2009) for Ammonia, BOD and Dissolved Oxygen; however, Orthophosphate exceeded the 'Good Status' limits of 0.035mg/l on three occasions out of six.

Biological water quality monitoring on the River Slaney at the same monitoring station (2400) was undertaken in 2007 by the EPA, where biological water quality was rated as Q3-4 with

significant siltation present. This is below the 'good ecological status' requirements of the Surface Water Regulations (2009).

In the Irish classification scheme for tidal waters a dissolved inorganic nitrogen (DIN) level of 2.6 mg/l N has been given as one element of a set of criteria above which tidal fresh waters can be defined as eutrophic or enriched. Because of its toxicity to some aquatic organisms a maximum level of 2 mg/l N has been deemed appropriate for protecting the most sensitive freshwater species (Lucey 2007). This is considered to be appropriate in the case of the River Slaney within the study area, due to the designation as a candidate Special Area of Conservation for sensitive aquatic species. It is also important to control the input of nitrogen into tidal areas in order to protect transitional and coastal waters (EPA, 2008). This limit level is exceeded in the River Slaney on all sampling occasions during 2010, with a maximum Nitrate level of 5.3mg/l, minimum of 2.6mg/l and average of 4.13mg/l recorded during the sampling period.

Macroinvertebrate sampling in the Slaney Estuary was undertaken by Ecofact Environmental Consultants during 2009 (Ecofact, 2010) downstream of the Brownswood Quarry site. These sampling stations were located approximately 1km downstream of Kings Island at Ballyhoge and at Deep's Bridge, i.e. approximately 4.5km and 9km downstream of the Brownswood Quarry site respectively. Biological Monitoring Working Party (BMWP) specific scores for sluggish rivers were obtained for both of these sampling sites, where the macroinvertebrate communities present were of poor diversity and indicative of moderately impacted freshwater conditions; 1 km downstream of King's Island (BMWP score=41.4) and at Deep's Bridge (BMWP score=68.2).

For the purposes of this current assessment, additional macroinvertebrate sampling was undertaken by Ecofact during April 2011 at two stations on the River Slaney upstream (Site 1: reference) and downstream (Site 2: receptor) of the Brownswood Quarry site. The locations of the sampling sites are as follows:

- Site 1: River Slaney left bank, upstream of Brownswood. Grid reference IS 97461 37462
- Site 2: River Slaney left bank, downstream of Brownswood. Grid reference IS 97645 36295

Sweep net sampling was undertaken at both locations from the river bank margins and using a boat. Due to the prevailing uniform, featureless silt substrate, macroinvertebrate community diversity was found to be low with 15 taxa recorded from Site 1 upstream and 12 taxa recorded from Site 2 downstream. The depositing habitat with soft, unstable silt substrates at both sampling stations rendered the standard EPA kick sampling methodology unsuitable within the study area; the Q-value biotic index was also considered inappropriate with regard to the habitat conditions, where riffled or well-oxygenated instream habitat with potential to support pollution sensitive macroinvertebrate species was not present.

The Biological Monitoring Working Party (BMWP) scores for these sites was evaluated as 78.6 and 39.9 at Site 1 and Site 2 respectively, taking account of the scoring system for 'pool' or slow-flowing habitats. This corresponded to an Average Score Per Taxon (ASPT) score of 5.61 for Site 1 and 3.99 for Site 2. These results indicate that the aquatic macroinvertebrate communities are more diverse and representative of good water quality at the upstream reference station, where an ASPT score greater than 4.5 in a slow flowing / modified waterbody represents 'Good Ecological Status' (Waterways Ireland, 2008).

However, from observations during the sampling exercise it is considered that the lower diversity recorded at Site 2 downstream of the Brownswood quarry is more likely representative of poor habitat diversity, as opposed to direct water quality deterioration between the two sampling stations. The taxa recorded and their relative abundance at both sites is presented in Table 1.

Table 1 macroinvertebrate communities recorded from the River Slaney upstream and downstream of the Brownswood Quarry site, April 2011.

Group/organism	Site 1 Upstream reference	Site 2 Downstream receptor
MAYFLIES (Ephemeroptera)		
Family Caenidae		
Caenis sp.	**	
CASED CADDIS FLIES (Tricoptera)		
Family Limnephilidae		
Halesus sp.		*
Family Sericostomatidae		
Sericostoma personatum	*	
Family Hydroptilidae		
Hydroptila sp.	*	*
Family Goeridae		
Silo nigricornis	*	
DAMSELFLIES (Odonata, sub-order Zygoptera)		
Calopteryx sp.	****	
TRUE FLIES (Diptera)		
Family Chironomidae		
Green chironomid	***	***
Family Ceratopogonidae	**	**
SNAILS (Mollusca, Gastropoda)		
Family Lymnaeidae		
Lymnaea spp.		****
Family Hydrobiidae		
Potamopyrgus jenkinsi	****	****
Family Valvatidae		
Valvata piscinalis	***	*
Family Viviparidae		
Viviparus sp.	**	
MUSSELS (Mollucsa, Lamellibranchiata)		
Family Sphaeridae		
Pisidium sp.	***	***
CRUSTACEANS (Crustacea)		
Amphipoda, Family Gammaridae		
Gammarus duebeni	**	****
Isopoda, Family Asellidae		
Asellus aquaticus	**	**
BUGS (Hemiptera)		
Family Corixidae	****	****
ALDERFLIES (Megaloptera)		
Alderfly larvae (Sialidae)		
Sialis sp.	***	
WORMS (Oligochaetae)		
Family Tubificidae		**
Family diversity	15	12
BMWP score	78.6	39.9
ASPT score	5.61	3.99

Key to abundance score: *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%).

4.1.3 Water quality in the Brownswood Quarry void

In order to characterise the existing water body in the Brownswood Quarry void sampling was undertaken at two locations. Two samples were obtained from each site one below the surface (Samples 1a and 2a) and one at 20m (Samples 1b and 2b) in order to determine if there was any stratification present within the water body.

The sampling stations within the quarry void are identified as follows:

- Site 1: North eastern portion of the void (Grid reference IS 97886 37263)
- Site 2: Western portion of the void (Grid reference IS 97823 37185)

Conditions on the day of the survey were clear with a slight breeze. No recent rainfall events were recorded and April 2011 was drier than average. The surface of the quarry void appeared turbid. From the water quality sampling data a clear differentiation was identified between the surface water portion of the waterbody and the hypolimneal zone. The suspended solids levels for the surface samples (1a and 2a) at Sites 1 and 2 were elevated at 15mg/l and 11mg/l respectively; compared to the 20m samples (1b and 2b) which were considerably lower 1mg/l and 7mg/l respectively. Water temperature was also significantly lower; 15°C at 1a compared to 7.1°C at 1b and 14.6°C at 2a compared to 7.2°C at 2b, indicating possible thermally-driven stratification of groundwater and surface water within the void.

The chemical water quality results for surface samples and hypolimneal samples also varied sufficiently to indicate low levels of mixing within the water column. Ammonia levels were higher in both 1a and 2a compared to the hypolimneal samples, while the Nitrate levels in the hypolimneal samples (1b and 2b) were higher than those at the surface. Orthophosphate and Total phosphate levels did not vary considerably between depth, although Site 2 was found to have slightly higher values than Site 1 overall. The hypolimneal water quality results are considered to reflect groundwater quality within the groundwater flows which pass through the site to the River Slaney. There was no evidence of Hydrocarbon contamination within any of the samples. Furthermore, heavy metal results were also within the limits prescribed in the Environmental Objectives: Groundwater Regulations (S.I. 09/2010). The heavy metals sampling results for all samples are within the Overall Threshold Value Range prescribed in the Groundwater Regulations (2010). The results of the groundwater sampling exercise from the current survey are presented in Appendix 2.

Taking the limit values of the Groundwater Regulations (2010) for the '*Assessment of adverse impacts of chemical inputs form groundwater on associated surface water bodies'* (Schedule 5) it is concluded that the Threshold Limit Values for both Ammonia (0.065mg/l) and Orthophosphate (0.035mg/l) are significantly elevated in all samples retrieved from the Brownswood Quarry void with respect to potential for impacts affecting surface waters.

4.2 Description of the Natura 2000 sites affected

4.2.1 Slaney River Valley cSAC

Areas of importance for habitats and flora within the cSAC in the vicinity of the site are detailed below. Table 2 presents the qualifying interests of the Slaney River Valley cSAC, i.e. habitats and species listed on Annex I and Annex II of the EU Habitats Directive (1992) that occur within the study area.

4.2.1.1 Annex I habitats

According to the site synopsis for the River Slaney Valley cSAC good examples of wet woodland are found along the banks of the Slaney and within reed swamps on the lower reaches of the river. 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 intertidal mud-flat and estuarine habitats do not occur within the vicinity of the Brownswood site, where the River Slaney is characterised as a depositing lowland river downstream of Enniscorthy. It is influenced by tidal fluctuations but the macroinvertebrate and botanical communities of the riparian and aquatic habitats indicate that freshwater conditions prevail.

The riparian margins of the Slaney adjacent to the Brownswood facility were dominated by alluvial wet woodland (corresponding to the 91E0 priority Annex I habitat) and wet grassland / marsh habitat within the floodplain. The conservation value of these habitats has been recognised by the designation of this section of the river within the Slaney River Valley cSAC and also the Wexford Harbour and Slobs SPA (with respect to the provision of important bird habitats including these wetland habitats, reedbeds and wet woodlands).

Good examples of alluvial wet woodland have been recorded along the banks of the River Slaney within the study area. Grey Willow (*Salix cinerea*) dominates with willow coppice / scrub and pockets of wet carr woodland dominated by willow species and Alder (*Alnus glutinosa*) were recorded from both sides of the N11 road corridor within the cSAC designation. Himalayan balsam was found to dominate the understory of this woodland both at the settlement ponds within the Brownswood site and within the Alluvial wet woodland along the River Slaney corridor within the Natura 2000 designations. Japanese knotweed was also frequently recorded along the N11 road corridor within the cSAC and also within the Alluvial wet woodland opposite the Boro River confluence, downstream of the Brownswood Quarry site.

Rare aquatic plant species have been recorded from with the Slaney River Valley cSAC site. Short-leaved Water-starwort (*Callitriche truncata*) is a very rare, small aquatic herb and Opposite-leaved Pondweed (*Groenlandia densa*), a species that is legally protected under the Flora Protection Order, 1999. Both species occur within the River Slaney main channel and have been recorded from downstream of the study area at Macmine Junction / Edermine Bridge. However, neither of these species were recorded during the current field study and neither are they listed as qualifying Annex II species for the River Slaney Valley cSAC.

Table 2 Qualifying interests of the River Slaney Valley cSAC potentially affected by the proposed Brownswood Quarry restoration scheme.

	Qualifying interests	Potential occurrence within the Slaney cSAC within the study area
Annex I Habitats	Alluvial wet woodlands (91E0)	✓
	Old oak woodland (91A0)	
	Floating river vegetation (3260)	
	Estuaries (1130)	
	Upper saltmarsh (1330)	
	Mudflats and sandflats not covered by seawater at low tide (1140)	
Annex II Species	Sea lamprey (1095)	
	River lamprey (1099)	✓
	Brook lamprey (1096)	✓
	Freshwater pearl mussel (1029)	
	Twaite Shad (1103)	✓
	Allis Shad (1102)	✓
	Atlantic salmon (1106)	✓
	Otter (1355)	✓

4.2.1.2 Annex II species

Freshwater 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 River Slaney Valley cSAC; however, it occurs at a significant distance upstream of the study area within the Derreen River, a tributary of the Slaney, and will not be affected by the proposed scheme. The duck mussel (*Anadonta anatina*) belongs to the same family as the Freshwater pearl mussel (Unionidae) and has been recorded from the River Slaney within the current study area; however, this species in not listed under Annex II of the EU Habitats Directive (1992) and is not considered further in the current assessment.

Brook, River, and Sea lampreys

The brook lamprey is the smallest of the three lamprey species native to Ireland and it is the only one of the three species that is non-parasitic and spends all its life in freshwater (Maitland & Campbell 1992). The River lamprey is larger in size than the brook lamprey and exhibits an anadromous life cycle (i.e. where anadromous fish spend most of their adult lives in salt water, and migrate to freshwater rivers and lakes to reproduce). The sea lamprey is the largest of the Irish lampreys. 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. All three species have been recorded from the River Slaney (Kurtz & Costello, 1999).

An extensive sampling programme for lamprey and shad was undertaken in the Slaney cSAC, 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 cSAC upstream of Enniscorthy. Juvenile sea lamprey were also recorded in the Slaney with spawning of adult sea lamprey recorded in the main channel of the Slaney cSAC in low numbers, indicating cause for concern on the status of sea lamprey in the Slaney cSAC. Lamprey spawning was found to occur upstream of the study area, in the freshwater stretches of the River Slaney upstream of Enniscorthy.

No spawning habitat for lamprey species was recorded from within the study area; however, anadromous sea and river lamprey will occur within the study area as they migrate to spawn upstream. Juvenile River / Brook lamprey were recorded from extensive, suitable silt deposits along the River Slaney corridor within the study area during the sweep-net sampling exercise.

Atlantic salmon

The Atlantic salmon is listed under Annexes II and V of the EU Habitats Directive and Appendix III of the Berne Convention. Salmon are listed as one of the key conservation objectives of the Slaney River Valley SAC.

Salmon spawning and nursery areas are present throughout the upper reaches of the River; however, these do not occur within the lower depositing reaches of the study area at Brownswood. Important salmonid (salmon and trout) spawning tributaries of the River Slaney such as the Boro River have been identified directly downstream of the study area.

Shad

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 Lower Slaney. Both species are likely to occur within the study area. The status of both shad species is considered to be very vulnerable in the Slaney River cSAC.

Eurasian Otter

The otter *Lutra lutra* is listed under Annex II of the EU Habitats Directive and under Annex II of the Berne Convention it is also a legally protected species under the Wildlife Act, 1976 (and Wildlife (Amendment) Act, 2000). This species is listed as one of the qualifying interests of the Slaney Valley cSAC designation. Otter are found throughout Ireland and tend to occupy

linear territories along watercourses and are rarely found far away from water. Otters utilise the entire study area within the River Slaney corridor and more than one territory may be associated with the stretch of the river within the study area. No otter holts were identified within the study area during the walkover survey; however evidence of otter activity including spraints and prints were recorded along the river bank.

4.2.2 Wexford Harbour and Slobs SPA

Wintering birds are the key conservation interest of the Wexford Harbour and Slobs SPA and are also listed as a conservation interest of the Slaney River Valley SAC. The Draft Main conservation objectives for this site are to maintain the special conservation interests for this SPA at favourable conservation status: Cormorant; Bewick's Swan; Whooper Swan; Greenland White-fronted Goose; Light-bellied Brent Goose; Shelduck; Teal; Scaup; Red-breasted Merganser; Oystercatcher; Golden Plover; Grey Plover; Lapwing; Sanderling; Black-tailed Godwit; Bar-tailed Godwit; Curlew; Black-headed Gull; Little Tern ; 20,000 wintering waterbirds; Little Grebe; Great Crested Grebe; Grey Heron; Mallard; Wigeon; Pintail; Goldeneye; Hen Harrier; Coot; Knot; Dunlin; Redshank; Lesser Black-backed Gull; Wetland & Waterbirds.

A detailed wintering bird survey was undertaken during the 2009 / 2010 survey period by Ecofact (2010) to contribute to the Route Selection Report for N11 / N25 Oilgate to Rosslare upgrade scheme. The wintering bird species recorded (and listed in the conservation objectives) were associated with a number of important wintering bird habitats recorded from the River Slaney corridor within the study area, downstream of the Brownswood Quarry site, below Oilgate village. These were primarily; open intertidal mudflats (associated with the lower reaches of the river) and extensive reed bed habitat and limited intertidal mudflats within the upper reaches of the estuary near Oilgate.

4.3 Impact prediction: Impacts on the qualifying interests of the Natura 2000 sites

4.3.1 Direct Impacts

The proposed restoration of the Brownswood Quarry and the waste recovery facility proposed for the site are not direct in or directly adjacent to the site boundary of either the River Slaney Valley cSAC or the Wexford Harbour and Slobs SPA. However, the discharge from the proposed site, via a network of new and existing settlement ponds within the Roadstone Wood Ltd. land holding at Brownswood Quarry, will be directly to the cSAC. From the data provided in the Hydrogeological Section of the Environmental Impact Assessment (SLR, 2011) and from the groundwater monitoring undertaken within the quarry void for the current assessment it is considered that the void currently provides storage for groundwater passing through the groundwater body to the River Slaney and that the water quality of the proposed discharge from the quarry site reflects to a greater degree the groundwater quality entering the Slaney via groundwater flows.

There is therefore a pathway for direct impacts to the cSAC via the discharge from the proposed development, taking cognisance of the potential for water quality impacts which would have the potential to affect sensitive, Annex II aquatic species within the cSAC. There are no direct impacts identified which may affect the Annex I habitats of the cSAC or the wetland habitats or avifauna interests of the SPA adjacent to the development site.

A pathway is a mechanism or route by which a contaminant comes into contact with, or otherwise, affects a receptor. The pathway defines the likelihood of contact with, or transport to, a receptor; where the receptors in the context of the current Appropriate Assessment are the qualifying conservation interests of the cSAC and the SPA. Water quality has been identified as a key indicator of conservation value for the River Slaney Valley cSAC and is therefore evaluated as a conservation interest of the site i.e. a receptor.

There is no historical monitoring data for the discharge from Brownswood Quarry to the River Slaney. However, the current proposal includes for additional levels of treatment to the water

from this void prior to discharge to the River Slaney and a Waste Assimilation Capacity Assessment has been provided in Appendix 3 to demonstrate the assimilation capacity of the River Slaney for this discharge without treatment, where no impacts affecting the water quality status of this watercourse are registered with regard to chemical water quality status downstream of the discharge. It is important to note that the groundwater to be discharged from the quarry void will be treated via settlement ponds constructed adjacent to the existing settlement ponds within the Brownswood Quarry site. The groundwater flows to the River Slaney which have been impeded within the quarry void will therefore be treated via two sets of settlement ponds prior to discharge to the River Slaney Valley cSAC.

It is noted that the River Slaney adjacent to the Brownswood Quarry site is characterised as a depositing stretch of river, with extensive siltation deposits along the river margins and a deeper thalweg (centre channel) where deposition is less pronounced. Despite these conditions, suspended solids within the watercourse are relatively low according to EPA water quality monitoring and sensitive, Annex II fish species within the watercourse are considered to be potentially adversely affected by elevated suspended solids arising from any discharge from the proposed development.

4.3.2 Indirect impacts

Indirect impacts potentially affecting the designated cSAC and SPA conservation sites adjacent to the Brownswood Quarry restoration site have been identified in relation to disturbance arising from the construction of new settlement ponds and the remediation of the settlement ponds on the site and the general construction and operational impacts relating to heavy traffic entering and exiting the site adjacent to the cSAC and SPA site boundary. It is considered that the significance of these impacts is low, relative to the ongoing, background disturbance influence exerted by the existing N11 road corridor separating the site from the River Slaney corridor. Furthermore these construction works will be undertaken within the site boundary of the Brownswood Quarry site, outside of the cSAC / SPA site boundary.

Invasive, non-native species have been identified within the Brownswood Quarry restoration site and within the settlement ponds within the site which are to be utilised in the treatment of the quarry void dewatering process prior to discharge to the River Slaney. Both Himalayan balsam and Japanese knotweed occur on the site, with Himalayan balsam dominating the understory within the existing settlement ponds. The priority Annex I Alluvial wet woodland along the River Slaney flood plain adjacent to the site was found to be significantly affected by Himalayan balsam in the understory and also within the open marsh habitat of the floodplain. This species occurs both upstream and downstream of the Brownswood Quarry site and there is no evidence that the quarry has been responsible for the introduction of this species at this location.

However, the presence of this species within the settlement ponds on the quarry site provide a reservoir for this species, where discharge to the River Slaney acts as a vector for the spread of this species within the cSAC. Equally, Japanese knotweed occurs frequently along the N11 road corridor adjacent to the Brownswood quarry facility and less frequently within the River Slaney river corridor within the Natura 2000 designations.

It is considered that the proposed quarry restoration works, requiring the large-scale importation of fill material to the site with associated movement of traffic and surface water discharges from the site have the potential to increase the spread of non-native, invasive species within the River Slaney corridor. Mitigation measures to eradicate these species from within the Brownswood Quarry site are recommended for implementation.

4.3.3 Cumulative impacts

Cumulative impacts affecting the Natura 2000 network arising from the proposed quarry restoration scheme have been identified as being limited to in-combination water quality impacts. There are no in-combination impacts with regard to disturbance or habitat loss affecting the conservation interests of the River Slaney Valley cSAC and the Wexford Harbour and Slobs SPA.

Water quality impacts potentially arising from the proposed dewatering of the quarry void will be treated via a series of settlement ponds within the Brownswood Quarry site. The terminal ponds in this series are currently utilized to treat the surface water discharges from the ongoing works within the Brownswood Quarry site including the concrete block batching plant, asphalt/macadam mixing plant and associated discharges. There is therefore the potential for cumulative impacts arising where the discharge from the Brownswood facility, comprising both the dewatering of the quarry void for the proposed restoration scheme in combination with the existing surface water discharge from the ancillary works within the Brownswood Quarry site may result in a short term increase in the discharge volume from the Roadstone Wood Brownswood site during the period of dewatering of the void, prior to infilling.

Further water quality impacts affecting the River Slaney within the study area have been identified. The Enniscorthy WwTP is identified as being a point pressure on the Lower River Slaney according to the Slaney Lower Water Management Unit Action Plan (SERBD, 2010) and has been given Priority 1 status for action measures. Background water quality within the Lower River Slaney is also affected by Agriculture with 67% of Total Phosphorus arising from diffuse agricultural pollution. Of the 13 quarries within this Water Management Unit, none are identified as posing a risk to the Lower River Slaney (SERBD, 2010).

With regard to proposed plans or projects, Wexford County Council is in the planning stages of a bypass of Wexford Town as part of the proposed N11/N25 Oilgate to Rosslare scheme. This scheme will most likely require a crossing of the River Slaney corridor within the SAC, downstream of the proposed development site. These works would have the potential to directly affect both the conservation interests of the Natura 2000 sites on the River Slaney, as well as water quality. However, there is no interaction expected between the current proposal and this road scheme, as there is no scheduled date for the construction of the road scheme and taking account of its location at a considerable distance downstream of the Brownswood site.

With regard to potential water quality impacts arising from the proposed quarry restoration, in combination with background water quality pressures in the River Slaney downstream of Enniscorthy, a Waste Assimilation Capacity modelling exercise has been undertaken (see Appendix 3). This modelling of the discharge of water from the quarry void to the River Slaney was based on direct discharge and did not take account of the two-tiered system of settlement ponds which will be constructed on the site.

With regard to the chemical water quality standards set out in the European Communities Environmental Objectives (Surface Water) Regulations 2009 (SI. 272 of 2009) the 'Good Status' limit for Orthophosphate is exceeded in the background water quality of the River Slaney upstream of the Brownswood Quarry site. From the WAC model it can be seen that the proposed discharge does not result in any significant alteration in the mass balance of the parameters BOD, Suspended solids, Total Ammonia or Orthophosphate within the River Slaney downstream and would not affect the ability of this watercourse to meet the EQS chemical water quality standards required in the Surface Water Regulations (2009).

4.4 Mitigation measures

The timing of the proposed quarry restoration works is not identified as an important factor with regard to the potential impacts affecting the conservation interests of the designated Natura 2000 sites. No specific mitigation measures are required for individual Annex I habitats, Annex II species or bird species listed on Annex I of the EU Birds Directive (2009), as there are no specific impacts identified which may affect these species.

The key pathway for impacts affecting the designated Natura 2000 sites within the study area is via the discharge from the site which may act as a vector for water quality impacts to the River Slaney as well as for the spread of non-native, invasive species into the cSAC / SPA. Mitigation measures proposed are considered to ameliorate impacts within both Natura 2000 designations.

A Management Plan for the eradication of non-native species within the Brownswood Quarry site, which currently includes both Japanese knotweed and Himalayan balsam; in combination with effective management protocols for traffic movement and importation of material into the site would significantly avoid the risk of spread of these species into the cSAC. The outline Invasive Species Management Plan for the Brownswood site is presented in Appendix 4.

A Method Statement for the proposed importation of material for the quarry restoration works has been drawn up for the protection of water quality and the avoidance of importation of non-native invasive species to the site. These measures will be followed diligently during the entire restoration phase to impacts to the SAC. This Method Statement in presented in Appendix 5.

4.5 Impacts affecting the conservation objectives of the Natura 2000 sites

In the absence of a completed management plan for the Slaney River Valley cSAC or the Wexford Harbour and Slobs SPA sites, the conservation objectives are taken to include maintaining or restoring the 'favourable conservation status' (defined in the EU Habitats Directive for habitats and species) of habitats and species for which these sites have been selected, including the habitats of the annexed species. These objectives are summarised in Table 3.

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as candidate Special Areas of Conservation or Special Conservation Areas. The Government and its agencies (i.e. the NPWS, local authorities and other statutory bodies) are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites. According to the EU Habitats Directive (1992), favourable conservation status of a habitat is achieved when

"*...its natural range, and area it covers within that range, is stable or increasing, and the ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable*". The favourable conservation status of a species is achieved when "*population data on the species concerned indicate that it is maintaining itself, and the natural range of the species is neither being reduced or likely to be reduced for the foreseeable future, and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis*".

Table 3 The conservation objectives of designated Natura 2000 sites, in relation to their qualifying interests.

Number	Objective
Objective 1	To maintain the Annex I habitats for which the cSAC has been selected at favourable conservation status.
Objective 2	To maintain the Annex II / Annex I species for which the cSAC / SPA has been selected at favourable conservation status.
Objective 3	To maintain the extent, species richness and biodiversity of the entire site
Objective 4	To establish effective liaison and co-operation with landowners, legal users and relevant authorities.

The proposed restoration scheme at the Brownswood Quarry site has been identified as potentially affecting the water-dependant Annex II qualifying interests of the Slaney River Valley cSAC i.e. Atlantic salmon, otter, river lamprey, sea lamprey and brook lamprey. The

scale of the proposed works adjacent to the cSAC boundary is not likely to result in any habitat loss or degradation with respect to the priority Annex I Alluvial woodland which occurs within the cSAC adjacent to the Brownswood Quarry site. With regard to Annex II species occurring adjacent to the works area mitigation measures have been prescribed to avoid impacts affecting these qualifying interests, principally in relation to the water-dependant aquatic species and also taking cognisance of water quality which is a key indicator of conservation value for both the River Valley cSAC and the Wexford Harbour and Slobs SPA.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the '*coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or population of species for which the site is or will be classified'*.

Taking account of the mitigation measures proposed to include the implementation of a Method Statement for the importation of material into the site and an Invasive Species Management Plan; there are no impacts affecting the conservation objectives of the River Slaney Valley cSAC or the Wexford Harbour and Slobs SPA which would have implications for the integrity of either Natura 2000 site.

4.6 Stage 2 Appropriate Assessment Conclusions

The proposed Brownswood Quarry restoration site lies adjacent to the River Slaney Valley cSAC and the Wexford Harbour and Slobs SPA; both designations follow the River Slaney corridor within the study area. Priority Annex I Alluvial wet woodland (91E0) occurs along the banks of the River Slaney opposite the Brownswood Quarry facility which have developed on the constrained floodplain of the river, bounded by the N11 road to the east. A series of drains exist within this floodplain, the majority of which are vegetated and poorly maintained.

Annex II species including Brook / River lamprey and Otter were recorded from within the study area; Atlantic salmon are known to pass through the Slaney to spawning grounds upstream; while Allis shad and Twaite Shad are considered likely to occur within the River Slaney downstream of Enniscorthy, within the study area.

The presence of a number of the qualifying interests of the cSAC, with wetland habitats of importance to breeding birds within the SPA, highlights the importance of this section of the River Slaney corridor within the context of the Natura 2000 designations.

The Appropriate Assessment Stage 2 NIS has identified the potential for direct, indirect and cumulative impacts on the water-dependant Annex I habitats, Annex II species and wetland habitats of the cSAC and SPA; limited to water quality impacts and the spread of non-native invasive species. These potential impacts have been effectively avoided with the implementation of mitigation measures and proper design to avoid any significant impacts affecting the conservation objectives of this designated site. There will therefore be no direct, indirect or cumulative impacts affecting the integrity of the River Slaney Valley cSAC or the Wexford Harbour and Slobs SPA. Table 4 presents a checklist for identification of impacts affecting the integrity of the designated Natura 2000 site. It is concluded that the proposal does not have the potential to affect the conservation objectives of integrity of either the River Slaney Valley cSAC or the Wexford Harbour and Slobs SPA.

Table 4 Integrity of Site Checklist (adapted from DoEHLG, 2009)

Integrity of Site Checklist Conservation objectives **Does the project or plan have the potential to:**	**Y/N**
Cause delays in progress towards achieving the conservation objectives of the site?	No
Interrupt progress towards achieving the conservation objectives of the site?	No
Disrupt those factors that help to maintain the favourable conditions of the site?	No
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	No
Other objectives **Does the project or plan have the potential to:**	
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	No
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No
Reduce the area of key habitats?	No
Reduce the population of key species?	No
Change the balance between key species?	No
Reduce diversity of the site?	No
Result in disturbance that could affect population size or density or the balance between key species?	No
Result in fragmentation?	No
Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc.)?	No

REFERENCES

Bowers Marriott, B. (1997) Practical Guide to Environmental Impact Assessment: A Practical Guide. Published by McGraw-Hill Professional, 1997, 320 pp.

Clabby, K.J., Bradley, C., Craig, M., Lucey, J., McGarrigle, M., O' Boyle, S., Tierney, D. and Bowman, J. (2008) Water Quality in Ireland 2004-2006. Environmental Protection Agency, Co. Wexford, Ireland.

DoEHLG (2009). Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government, Dublin.

DoEHLG (2009) *S.I. No. 272 of 2009 - European Communities Environmental Objectives (Surface Waters) Regulations, 2009*. Department of the Environment, Heritage and Local Government, Dublin

DoEHLG (2010) *S.I. No. 9 of 2010 - European Communities Environmental Objectives (Groundwater) Regulations, 2010.* Department of the Environment, Heritage and Local Government, Dublin

EA (2003) River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual. River Habitat Survey Manual: 2003 version, Environment Agency, 136 pp

Ecofact (2010) *N11 / N25 Oilgate to Rosslare Aquatic Ecology and Fisheries Report.* Ecofact Environmental Consultants, Limerick.

EPA (2008) State of the Environment Report – 2008. Environmental Protection Agency, Johnstown Castle, Wexford.

European Commission Environment DG (2001). Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.

European Commission (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC: Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interests, compensatory measures, overall coherence and opinion of the Commission. European Commission, Brussels

Fossitt, J. (2000) A guide to habitats in Ireland. The Heritage Council, Kilkenny.

Hardisty, M.W. and Potter, I.C. (1971) The behaviour, ecology and growth of larval lampreys. In M.W. Hardisty and I.C. Potter (eds), The Biology of Lampreys, vol. 1. London. Academic Press.

Invasive species Ireland website:
http://www.invasivespeciesireland.com/mostunwanted/detail.asp?id=34)

Kelly & King (2001) A review of the ecology and distribution of three lamprey species, Lampetra fluviatilis (L.), Lampetra planeri (Bloch), and Petromyzon marinus (L.): A context for conservation and biodiversity considerations in Ireland. Biology and the Environment. 101B(3):165-185.

King J. J. and Linnane S. M. (2004) The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. *Irish Wildlife Manuals*, No. 14. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

Kurtz, I. and Costello, M. J. (1999). An outline of the biology, distribution and conservation of lampreys in Ireland. Irish Wildlife Manuals No. 5. Dúchas, the Heritage Service, Dublin.

Lucey (2007) Water quality in Ireland (2006): Key Indicators of the Aquatic Environment. Environmental Protection Agency, Johnstown Castle, Wexford.

NPWS (2008). The Status of EU Protected Habitats and Species in Ireland. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

O'Reilly, P. (2004) Rivers of Ireland – a flyfisher's Guide. 5th Ed. Merlin Unwin Books.

SLR (2011) Brownswood Inert Waste Recovery Facility. SLR Consulting Ireland, Dublin.

Waterways Ireland (2008) *Report on the Interim Classification of Ecological Potential and Identification of Measures for Ireland's Artificial Water Bodies (AWBs)*. Prepared by: Waterways Ireland, Central Fisheries Board and the South East River Basin District For The Surface Water Status Group.

Reference of identification keys used:

Barnes, R.S.K. (1994) The brackish-water fauna of north-western Europe: An identification key. *Cambridge University Press.*

Edington J.M. & A.G. Hildrew (1995) A Revised Key to the Caseless Caddis Larvae of the British Isles, with Notes on their Ecology 1995, 134pp.

Elliott J.M. & U.H. Humpesch (1988) A Key to the Larvae of the British Ephemeroptera, with Notes on their Ecology1983, 101pp + 1 plate.

Gledhill, T., D.W. Sutcliffe & W.D. Williams (1993) British Freshwater Crustacea Malacostraca: a Key with Ecological Notes 1993, 176pp.

Haslam, S., Sinker, C. & Wolsely, P. (1995) *British Water Plants*. Field Studies Council, Shrewsbury.

Hayward P.J. and Ryland (2005) Handbook of the Marine Fauna of North-West Europe. Oxford University Press. 800pp.

Macan T.T. (1994) A Key to the British Fresh- and Brackish-Water Gastropods, with Notes on their EcologyFourth edition, 1977 (reprinted 1994), 46pp.

Savage A.A. (1989) Adults of the British Aquatic Hemiptera Heteroptera: a Key with Ecological Notes1989, 173pp.

Wallace, I.D., B. Wallace & G.N. Philipson (2003) Keys to the Case-bearing Caddis Larvae of Britain and Ireland 2003, 259pp.

PLATES

A) The Brownswood quarry facility

Plate 1 View east to the quarry void

Plate 2 View north across the quarry void, waterbody for dewatering visible in the centre of the image

Plate 3 The open / southern portion of the quarry void is currently used for storage of material from the Roadstone Wood facility.

Plate 4 Turbid conditions in the surface waters of the quarry void, March 2011. Similar conditions were observed during the April 2011 visit.

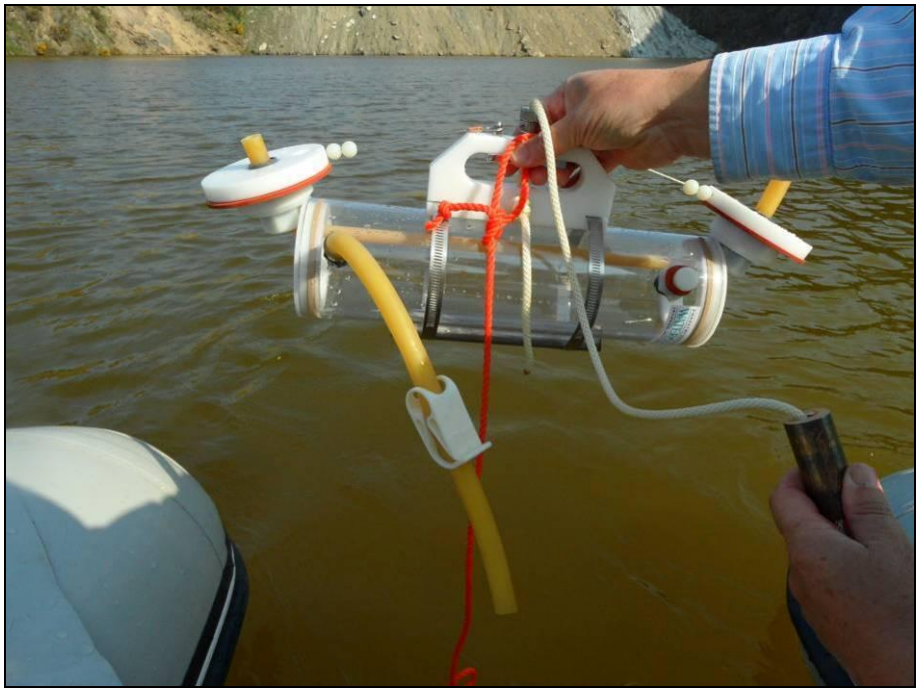


Plate 5 Sampling of chemical water quality in the quarry void using a Watermark horizontal water sampler during April, 2011.

Plate 6 Recently constructed settlement ponds at the south western corner of the Brownswood Quarry site. The surface water from the quarry void will be discharged via a series of these settlement ponds to the cSAC.

Plate 7 The older settlement ponds at the southern end of the site resemble constructed wetland habitats, with well developed willow and alder carr and some wet alder/ash woodland on drier ground.

Plate 8 View of the ground level within the older settlement ponds. Himalayan balsam was found to dominate the understory at this location (at seedling stage in the image).

Plate 9 View of the alder / willow carr habitat in the southern settlement ponds where standing water persists. This wet woodland lies outside of the cSAC but corresponds to the priority Annex I Alluvial wet woodland habitat contained within the cSAC adjacent to the site.

B) The River Slaney corridor

Plate 10 View of the River Slaney downstream of Enniscorthy town, upstream of the Brownswood quarry restoration site. Alluvial wet woodland dominated by willow and alder were present on the left bank.

Plate 11 A treeline of alder and ash dominated the riparian margin upstream of the Brownswood Quarry site, with improved agricultural grassland characterising the majority of the habitat adjacent to the river corridor.

Plate 12 The Slaney corridor opposite the entrance to the Brownswood quarry is dominated by immature wet willow woodland. This develops into more mature alluvial wet willow woodland downstream.

Plate 13 Marsh marigold was found to be abundant during the early growing season along the Slaney corridor. However, evidence of Himalayan balsam was recorded throughout the study area. It is expected that this invasive species dominates the ground / field layer during the growing season. Transport of seeds downstream is considered to be a significant threat to the designated sites.

Plate 14 The riparian margins and floodplain of the Slaney were characterised by marsh marigold, with nettle, angelica and Himalayan balsam abundant.

Plate 15 Downstream of the Brownswood site the alluvial woodland was better developed with mature alder and willow woodland recorded within the floodplain between the river and the N11 to the east.

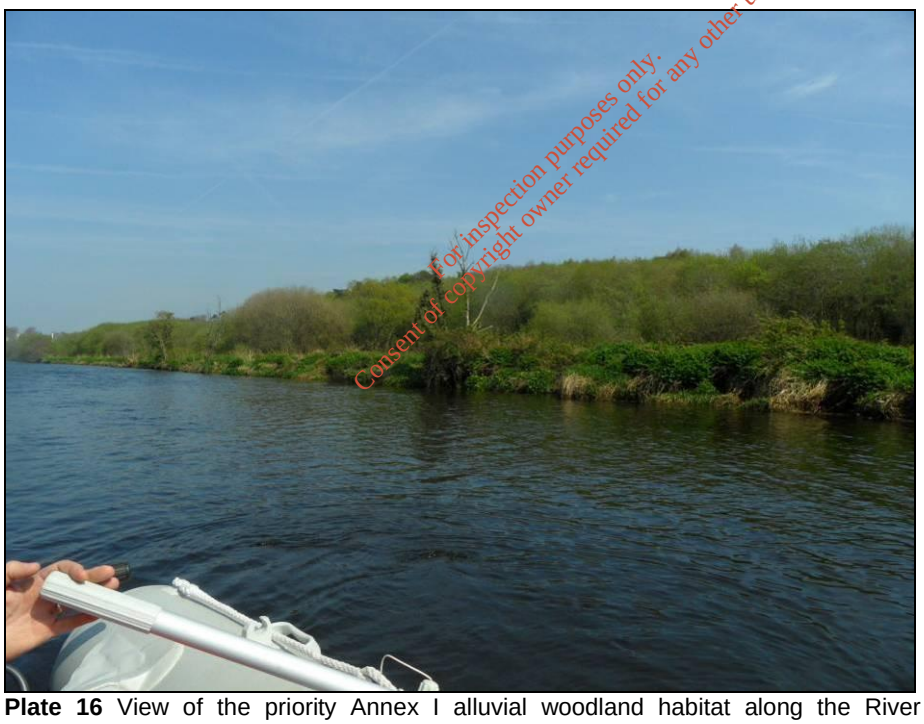


Plate 16 View of the priority Annex I alluvial woodland habitat along the River Slaney corridor, downstream of the Brownswood Quarry site.

Plate 17 The understory of the mature alluvial wet woodland was found to be dominated by Himalyan balsam and recent felling of trees for firewood was noted. The portion of woodland downstream of the Brownswood Quarry extends to just upstream of the Boro River confluence, where the floodplain is cleared and dominated by scrub / marsh habitat.

Plate 18 The Boro River confluence which joins the right bank of the Slaney, downstream of the Brownswood Quarry site.

Plate 19 View of the Slaney River bed directly upstream from the Brownswood Quarry site, with heavily silted substrate shelving off to the deeper, more scoured thalweg in the centre channel.

Plate 20 One of many drainage channels which intersect the floodplain between the N11 and the river corridor. These were characteristically overgrown and silted.

Plate 21 The river margins were characterised by deep deposits of fine silt which shelved steeply to the centre channel. Vegetation on the silt was low, reducing habitat diversity for macroinvertebrates.

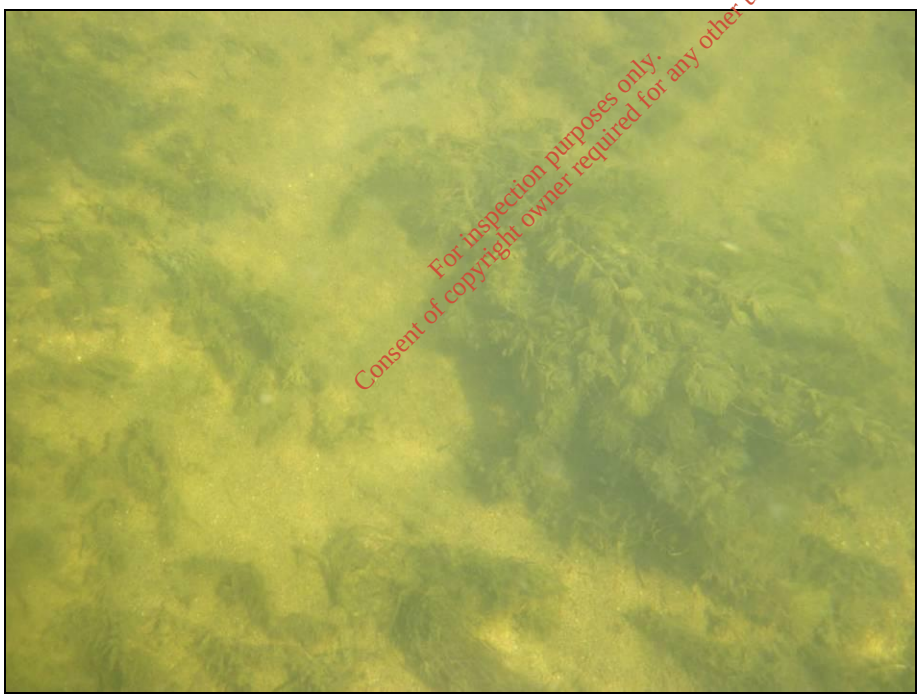


Plate 22 The centre portion of the river channel was found to have a greater abundance of sandy substrate with macrophyte growth in depths of up to 2m dominated by *Myriophyllum* sp.

Plate 23 Himalayan balsam seedlings recorded from the alluvial wet woodland along the Slaney corridor, downstream of the Brownswood Quarry site (March, 2011).

Plate 24 During April 2011 the Himalayan balsam had noticeably grown and was found to dominate the understory of the willow woodland along the Slaney corridor.

Plate 25 Carpet of Himalayan balsam within the alluvial willow woodland downstream of the Brownswood Quarry site.

Plate 26 Not all of the riparian corridor and floodplain of the Slaney was dominated by Himalayan balsam. The wet grassland margins were characterised by Yorkshire fog, meadowsweet and silverweed with low densities of Himalayan balsam.

APPENDIX 1 NPWS Site Synopsis

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 Castle Bridge 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 (*Hedist 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 reed swamp 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 very localised species in Ireland that is listed in the Irish Red Data Book. Another very 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 2 Brownswood Quarry Void: Chemical Water Quality Sampling Results

Table A2.1 Brownswood Quarry void: Sample 1a – below surface

Test	Units	Results	Standard Reference
Brownswood 1a			
pH		6.97	APHA-4500-H^+-B
Total Ammonia (as NH_3-N)	mg/l	0.14	APHA -4500- NH3-D
BOD	mg/l	3	APHA - 5210 - B
Total Suspended Solids	mg/l	15	APHA - 2540 -D
Orthophosphate (as P)	mg/l	0.11	APHA - 4500 - P-E
Total Phosphate (as P)	mg/l	0.1	APHA - 4500 - P
Nitrate (as NO_3)	mg/l	21.7	APHA - 4110 - B
Nitrite (as NO_2)	mg/l	<0.05	APHA - 4110 - B
Total Petroleum Hydrocarbons			
$>C_6$-C_{40}	mg/l	<0.001	GC-FID
$>C_6$-C_8	mg/l	<0.001	GC-FID
$>C_8$-C_{10}	mg/l	<0.001	GC-FID
$>C_{10}$-C_{12}	mg/l	<0.001	GC-FID
$>C_{12}$-C_{16}	mg/l	<0.001	GC-FID
$>C_{16}$-C_{21}	mg/l	<0.001	GC-FID
$>C_{21}$-C_{40}	mg/l	<0.001	GC-FID
Petroleum Range Organics	mg/l	<0.001	GC-FID
Diesel Range Organics	mg/l	<0.001	GC-FID
Metals			
Arsenic	ug/l	<1	APHA - 3120 – B
Copper	ug/l	14	APHA - 3120 – B
Chromium	ug/l	<1	APHA - 3120 – B
Lead	ug/l	<1	APHA - 3120 – B
Cadmium	ug/l	<1	APHA - 3120 – B
Nickel	ug/l	1	APHA - 3120 – B
Mercury	ug/l	<0.2	APHA - 3120 – B
Zinc	ug/l	<1	APHA - 3120 – B
Tin	ug/l	<1	APHA - 3120 – B
Selenium	ug/l	<1	APHA - 3120 – B

Table A2.2 Brownswood Quarry void: Sample 1b – at 20m depth

Test	Units	Results	Standard Reference
Brownswood 1b			
pH		6.92	APHA-4500-H^+-B
Total Ammonia (as NH_3-N)	mg/l	0.12	APHA -4500- NH3-D
BOD	mg/l	2	APHA - 5210 - B
Total Suspended Solids	mg/l	1	APHA - 2540 -D
Orthophosphate (as P)	mg/l	0.12	APHA - 4500 - P-E
Total Phosphate (as P)	mg/l	0.08	APHA - 4500 - P
Nitrate (as NO_3)	mg/l	32.9	APHA - 4110 - B
Nitrite (as NO_2)	mg/l	<0.05	APHA - 4110 - B
Total Petroleum Hydrocarbons			
$>C_6$-C_{40}	mg/l	<0.001	GC-FID
$>C_6$-C_8	mg/l	<0.001	GC-FID
$>C_8$-C_{10}	mg/l	<0.001	GC-FID
$>C_{10}$-C_{12}	mg/l	<0.001	GC-FID
$>C_{12}$-C_{16}	mg/l	<0.001	GC-FID
$>C_{16}$-C_{21}	mg/l	<0.001	GC-FID
$>C_{21}$-C_{40}	mg/l	<0.001	GC-FID
Petroleum Range Organics	mg/l	<0.001	GC-FID
Diesel Range Organics	mg/l	<0.001	GC-FID
Metals			
Arsenic	ug/l	<1	APHA - 3120 – B
Copper	ug/l	19	APHA - 3120 – B
Chromium	ug/l	6	APHA - 3120 – B
Lead	ug/l	5	APHA - 3120 – B
Cadmium	ug/l	<1	APHA - 3120 – B
Nickel	ug/l	<1	APHA - 3120 – B
Mercury	ug/l	<0.2	APHA - 3120 – B
Zinc	ug/l	<1	APHA - 3120 – B
Tin	ug/l	<1	APHA - 3120 – B
Selenium	ug/l	<1	APHA - 3120 – B

Table A2.3 Brownswood Quarry void: Sample 2a – below surface

Test	Units	Results	Standard Reference
Brownswood 2a			
pH		7.11	APHA-4500-H^+-B
Total Ammonia (as NH_3-N)	mg/l	0.3	APHA -4500- NH3-D
BOD	mg/l	2	APHA - 5210 - B
Total Suspended Solids	mg/l	11	APHA - 2540 -D
Orthophosphate (as P)	mg/l	0.14	APHA - 4500 - P-E
Total Phosphate (as P)	mg/l	0.12	APHA - 4500 - P
Nitrate (as NO_3)	mg/l	24.1	APHA - 4110 - B
Nitrite (as NO_2)	mg/l	<0.05	APHA - 4110 - B
Total Petroleum Hydrocarbons			
$>C_6$-C_{40}	mg/l	<0.001	GC-FID
$>C_6$-C_8	mg/l	<0.001	GC-FID
$>C_8$-C_{10}	mg/l	<0.001	GC-FID
$>C_{10}$-C_{12}	mg/l	<0.001	GC-FID
$>C_{12}$-C_{16}	mg/l	<0.001	GC-FID
$>C_{16}$-C_{21}	mg/l	<0.001	GC-FID
$>C_{21}$-C_{40}	mg/l	<0.001	GC-FID
Petroleum Range Organics	mg/l	<0.001	GC-FID
Diesel Range Organics	mg/l	<0.001	GC-FID
Metals			
Arsenic	ug/l	<1	APHA - 3120 – B
Copper	ug/l	2	APHA - 3120 – B
Chromium	ug/l	<1	APHA - 3120 – B
Lead	ug/l	1	APHA - 3120 – B
Cadmium	ug/l	<1	APHA - 3120 – B
Nickel	ug/l	2	APHA - 3120 – B
Mercury	ug/l	<0.2	APHA - 3120 – B
Zinc	ug/l	<1	APHA - 3120 – B
Tin	ug/l	<1	APHA - 3120 – B
Selenium	ug/l	<1	APHA - 3120 – B

Table A2.1 Brownswood Quarry void: Sample 2b – at 20m

Test	Units	Results	Standard Reference
Brownswood 2b			
pH		7.04	APHA-4500-H^+-B
Total Ammonia (as NH_3-N)	mg/l	0.18	APHA -4500- NH3-D
BOD	mg/l	2	APHA - 5210 - B
Total Suspended Solids	mg/l	7	APHA - 2540 -D
Orthophosphate (as P)	mg/l	0.09	APHA - 4500 - P-E
Total Phosphate (as P)	mg/l	0.07	APHA - 4500 - P
Nitrate (as NO_3)	mg/l	26.9	APHA - 4110 - B
Nitrite (as NO_2)	mg/l	<0.05	APHA - 4110 - B
Total Petroleum Hydrocarbons			
$>C_6$-C_{40}	mg/l	<0.001	GC-FID
$>C_6$-C_8	mg/l	<0.001	GC-FID
$>C_8$-C_{10}	mg/l	<0.001	GC-FID
$>C_{10}$-C_{12}	mg/l	<0.001	GC-FID
$>C_{12}$-C_{16}	mg/l	<0.001	GC-FID
$>C_{16}$-C_{21}	mg/l	<0.001	GC-FID
$>C_{21}$-C_{40}	mg/l	<0.001	GC-FID
Petroleum Range Organics	mg/l	<0.001	GC-FID
Diesel Range Organics	mg/l	<0.001	GC-FID
Metals			
Arsenic	ug/l	<1	APHA - 3120 – B
Copper	ug/l	15	APHA - 3120 – B
Chromium	ug/l	1	APHA - 3120 – B
Lead	ug/l	<1	APHA - 3120 – B
Cadmium	ug/l	<1	APHA - 3120 – B
Nickel	ug/l	<1	APHA - 3120 – B
Mercury	ug/l	<0.2	APHA - 3120 – B
Zinc	ug/l	<1	APHA - 3120 – B
Tin	ug/l	<1	APHA - 3120 – B
Selenium	ug/l	<1	APHA - 3120 – B

APPENDIX 3 Waste Assimilation Capacity Assessment

Waste Assimilative Capacity Assessment

Created by: SLR Consulting Ireland

Created: April 2011

Based on: Guidance in DEHLG/WSTG Applicant Guidance for Discharge to Surface Water (2008)

Calculation 1 – Assimilative Capacity

Formula 1. - Assimilative Capacity of receiving Water

Assimilative capacity = (Cmax – Cback) x F95 x 86.4 kg/day

Where:

C_{max} = maximum permissible concentration (EQS – 95%ile value) (mg/l)

C_{back} = background upstream concentration (mg/l mean value)

F95 = the 95%ile flow in the river (m^3/s)

Note: (60x60x24)/1000 = 86.4

Once the assimilative capacity of the receiving water has been established, the percentage of the assimilative capacity that will be used by the discharge may be calculated using the effluent load information.

The effluent load may be determined using the flowing formula:

Effluent Load (kg/day) = effluent flow x effluent concentration / 1000

Calculation 2 – Mass Balance

This formula is used to calculate the concentration of a parameter in the receiving water downstream of the discharge. This downstream concentration may then be compared directly with the water quality standard (EQS) to determine whether the discharge will cause an exceedance of the EQS value.

Mass Balance Equation:

$$T = \frac{FC + fc}{F + f}$$

where:

F = river flow upstream of the discharge (95%ile flow m^3/sec);

C = concentration of pollutant in the river upstream of the discharge (mean concentration in mg/l);

f = flow of the discharge (m^3/sec);

c = maximum concentration of pollutant in the discharge (mg/l);

T = concentration of pollutant downstream of the discharge.

RIVER SLANEY WASTE ASSIMILATIVE CAPACITY ASSESSMENT

PROPOSED SOIL RECOVERY FACILITY, BROWNSWOOD QUARRY

SUMMARY : ASSIMILATIVE CAPACITY / MASS BALANCE CALCULATIONS

		Receiving Waters		
	EQS* (SI 272 of 2009) (50%ile limit)	Background Concentration (Upstream)	Assimilative Capacity	Mass Balance of Pollutant (Downstream of Discharge Point)
Pollutant	**(mg/l)**	Mean Value (mg/l)	(kg/day)	(mg/l)
BOD	**1.5**	1.375	214.92	1.38
Suspended Solids	**N/A**	13.50	19772.64	13.43
Total Ammonia	**0.065**	0.03	60.18	0.03
OrthoPhosphate (PO4-P)	**0.035**	0.04	-8.60	0.04

* EQS = Environmental Quality Standard for 'Good River Quality Status' (to be achieved by 2015) (set by Table 9 of SI. 272 of 2009 : European Communities Environmental Objectives (Surface Water) Regulations 2009).

BIOLOGICAL OXYGEN DEMAND

Brownswood Quarry
Waste Assimilative Capacity Assessment

Parameter	Value	Unit	Description
BOD C_{max}	1.5	mg/l	Maximum permissible concentration (EQS – 50%ile value (SI 272 of 2009)
C_{back}	1.38	mg/l mean value	Background upstream concentration
F50	19.9	m^3/s	The 50%ile flow in the river
Effluent flow	0.177	m^3/s	
Effluent concentration	2.18	mg/l mean value	Water Quality from Void
F	19.9	m^3/s	River flow upstream of the discharge - 50%ile flow
C	1.375	mg/l mean conc.	Concentration of pollutant in the river upstream of the discharge
f	0.177	m^3/s	Flow of the discharge
c	5.975	mg/l	Maximum concentration of pollutant in the discharge

Parameter: BOD		
Calculation 1 – Assimilative Capacity		
Assimilative Capacity of Receiving Water		
Assimilative Capacity	214.92	kg/day
C_{max}	1.5	mg/l
C_{back}	1.38	mg/l mean value
F50 50%ile flow	19.9	m^3/s
Effluent Load	33.336	kg/day
Effluent Flow	0.177	m^3/s
Effluent Concentration	2.183	mg/l mean value
Calculation 2 – Mass Balance		
T = Concentration of Pollutant Downstream of the Discharge		
T	1.38	mg/l
F	19.9	50%ile flow m3/sec
C	1.375	mg/l mean conc.
f	0.177	m3/sec
c	2.183	mg/l

BOD EQS	1.5	mg/l	Specified for 'Good Status' (SI 272 2009)

SUSPENDED SOLIDS

Brownswood Quarry
Waste Assimilative Capacity Assessment

Parameter	Value	Unit	Description
Suspended Solids C_{max}	25	mg/l	
C_{back}	13.5	mg/l mean value	Background upstream concentration
F50	19.9	m^3/s	The 50%ile flow in the river
Effluent flow	0.177	m^3/s	
Effluent concentration	5.98	mg/l mean value	Water Quality from Void
F	19.9	m^3/s	River flow upstream of the discharge - 50%ile flow
C	13.5	mg/l mean conc.	Concentration of pollutant in the river upstream of the discharge
f	0.177	m^3/s	Flow of the discharge
c	5.975	mg/l	Maximum concentration of pollutant in the discharge

Parameter: Suspended Solids		
Calculation 1 – Assimilative Capacity		
Assimilative Capacity of Receiving Water		
Assimilative Capacity	19,772	kg/day
C_{max}	25	mg/l
C_{back}	13.5	mg/l mean value
F50 50%ile flow	19.90	m^3/s
Effluent Load	91.229	kg/day
Effluent Flow	0.177	m^3/s
Effluent Concentration	5.975	mg/l mean value
Calculation 2 – Mass Balance		
T = Concentration of Pollutant Downstream of the Discharge		
T	13.43	mg/l
F	19.9	50%ile flow m3/sec
C	13.5	mg/l mean conc.
f	0.177	m3/sec
c	5.975	mg/l

No SS EQS	13.5	mg/l	In absence of EQS - Background concentration in Receiving Waters is assumed

PHOSPHATES

Brownswood Quarry
Waste Assimilative Capacity Assessment

Parameter	Value	Unit	Description
PO4-P C_{max}	0.035	mg/l	Maximum permissible concentration (EQS – 50%ile value (SI 272 of 2009)
C_{back}	0.04	mg/l mean value	Background upstream concentration
F50	19.9	m^3/s	The 50%ile flow in the river
Effluent flow	0.015	m^3/s	
Effluent concentration	0.08	mg/l mean value	Water Quality from Void
F	19.9	m^3/s	River flow upstream of the discharge - 50%ile flow
C	0.04	mg/l mean conc.	Concentration of pollutant in the river upstream of the discharge
f	0.015	m^3/s	Flow of the discharge
c	0.08	mg/l	Maximum concentration of pollutant in the discharge

Parameter: PO4-P		
Calculation 1 – Assimilative Capacity		
Assimilative Capacity of Receiving Water		
Assimilative Capacity	-8.60	kg/day
C_{max}	0.035	mg/l
C_{back}	0.04	mg/l mean value
F50 50%ile flow	19.90	m^3/s
Effluent Load	0.104	kg/day
Effluent Flow	0.015	m^3/s
Effluent Concentration	0.08	mg/l mean value
Calculation 2 – Mass Balance		
T = Concentration of Pollutant Downstream of the Discharge		
T	0.040	mg/l
F	19.9	50%ile flow m3/sec
C	0.04	mg/l mean conc.
f	0.015	m3/sec
c	0.08	mg/l

PO4-P EQS	0.035	mg/l	Specified for 'Good Status' (SI 272 2009)

TOTAL AMMONIA

Brownswood Quarry
Waste Assimilative Capacity Assessment

Parameters	Value	Unit	Description
NH3-N C_{max}	0.065	mg/l	Maximum permissible concentration (EQS – 50%ile value (SI 272 of 2009)
C_{back}	0.03	mg/l mean value	Background upstream concentration
F50	19.9	m^3/s	The 50%ile flow in the river
Effluent flow	0.015	m^3/s	
Effluent concentration	0.10	mg/l mean value	Water quality from void
F	19.9	m^3/s	River flow upstream of the discharge - 50%ile flow
C	0.03	mg/l mean conc.	Concentration of pollutant in the river upstream of the discharge
f	0.015	m^3/s	Flow of the discharge
c	0.099	mg/l	Maximum concentration of pollutant in the discharge

Parameter: NH3-N		
Calculation 1 – Assimilative Capacity		
Assimilative Capacity of Receiving Water		
Assimilative Capacity	60.18	kg/day
C_{max}	0.065	mg/l
C_{back}	0.03	mg/l mean value
F50 50%ile flow	19.90	m^3/s
Effluent Load	0.128	kg/day
Effluent Flow	0.015	m^3/s
Effluent Concentration	0.10	mg/l mean value
Calculation 2 – Mass Balance		
T = Concentration of Pollutant Downstream of the Discharge		
T	0.030	mg/l
F	19.9	50%ile flow m3/sec
C	0.03	mg/l mean conc.
f	0.015	m3/sec
c	0.099	mg/l

NH3-N EQS	0.065	mg/l	Specified for 'Good Status' (SI 272 2009)

APPENDIX 4 Invasive Species Management Plan

A4.1 Introduction

The existing Roadstone Wood quarry site at Brownswood has been subject to ecological investigations during the Environmental Impact Assessment and Appropriate Assessment process for the preparation of a planning submission for the development of a waste recovery facility at the site. This document sets out a general method statement for the control / management of both Japanese knotweed and Himalayan Balsam within the site.

During the site investigations non-native, invasive species were recorded within the site with particular concern relating to the proximity of the site to the River Slaney Valley cSAC and the potential for spread of these species. Backfilling operations on the site have the potential to disperse this plant to other areas in the absence of suitable mitigation measures. Likewise, machinery entering the site could also introduce other non-native species.

Furthermore the proposed waste recovery facility will involve the importation of material to the site for the restoration of the quarry void, in addition to the ongoing quarry excavation works ongoing adjacent to the development site. Therefore the current proposal in addition to the background operations within the Brownswood quarry site result in constant traffic importing and exporting material, heightening the risk of the spread of invasive species.

Both Japanese knotweed *Fallopia japonica* and Himalayan balsam *Impatiens glandulifera* were recorded from within the Brownswood site. Japanese knotweed was recorded from within the area of the quarry void, to the south east of the existing waterbody. Himalayan balsam was recorded occurring extensively within the alluvial wet woodland and settlement pond area in the south west of the site. This area will be used to treat water pumped from the quarry void prior to discharge to the cSAC. It is important to note that surveys of the N11 road corridor and the River Slaney riparian corridor both north and south of the quarry site recorded both of these species in abundance, where Japanese knotweed was associated with the road corridor and Himalayan balsam with the river corridor.

It is recommended that advice is taken from qualified ecologist with experience in treating and managing invasive species before undertaking the ground works for the proposed management of invasive species on the site. Measures for the control of these invasive species, with reference to the adjacent cSAC will require further consultation with the National Parks and Wildlife, where these species are already widespread within the designated site.

With regard to the areas of the site within the proposed development area which do not contain Japanese knotweed including the settlement ponds which will receive the discharge from the quarry void, robust measures are required to prevent this species establishing. The four most common ways a site can become infected are:

- Importing infected soil.
- Contamination on vehicles and equipment.
- Illegal dumping.
- Colonisation from infected sites upstream potentially dispersing Japanese knotweed material downstream.

It is considered that all of the above potentially pose risks within the site. A Method Statement for material to be imported into the site has been prepared separate to the current document and contains measures for the prevention of spread of invasive species.

A4.2 Method statement for control

The first step in managing any invasive species within the proposed development site and associated lands is to ensure all personnel are aware of the existence of these species on the site and that the infected areas are marked out as exclusion zones to prevent traffic and disturbance resulting in the further spread of this species during the management period. No works should be carried out in the affected section of the site until the agreed methodology for the disposal of this species has been put in place.

A4.2.1 Himalyan balsam control

This species can be translocated and spread through the removal or importation of material from an infected site, or through disturbance due to traffic accessing an infected site. Himalyan balsam forms dense stands which suppress the growth of grasses and native Irish flora. Because it regrows annually from seed, any form of control carried out after the seed pods have formed will have no long-term benefit, requiring ongoing treatment to eradicate this species from the seed bank. It is considered that this will require up to two years of treatment from areas in which it has been identified. Control methods are set out in the 'Best Practice Management Guidelines: Himalayan balsam *Impatiens glandulifera*' (Kelly *et al*. 2008). These management and control methods will require implementation taking account of the proposed site-specific control methodology.

Himalayan balsam is effectively spread via the seed pods and by vegetative material. The seeds are rapidly dispersed via surface water movement and within watercourses, where this species can dominate riparian habitats. This species must be eradicated from the Brownswood site as it provides a reservoir for the spread of this invasive species from infected areas within the site to other areas of the adjoining River Slaney Valley cSAC and surrounding lands outside the SAC.

Stands of this invasive species should be marked out and exclusion zones set up. It will be necessary to eradicate the Himalayan Balsam from the seed bank within the site; during this process it will be necessary to avoid the spread of this species within the site and the subsequent treatment of re-growth within the site. A clinical and well-managed approach to this exercise will be required in order to fully remove all plant material and infected soil material; to avoid dispersing the material around the site or into the cSAC.

Treatment and control of Himalayan Balsam is optimally carried out in the early growing season (April/May) where pulling of the new growth or treatment of the emergent leaves with herbicide can be carried out prior to the plant going to flower during the summer period. To avoid additional spread do not disturb plants if seeds pods are visible (usually sometime after May). If hand pulling after this time, bag plant tops to prevent seed spread. It is recommended that the infected areas be fenced off to prevent machinery access and spread of seed/soil material from these locations.

Summary of actions for the management of this species to be undertaken within the Brownswood site include:

- Consideration of surrounding properties / lands and potential for reintroduction. Potential contamination routes to the Brownswood site and from the site to the cSAC must be prevented.
- Remember relevant health and safety legislation and procedures when working near water.
- Identify if sufficient resources are/will be available to complete the work within the planned timescale. As work will take more than 1 year to complete, sufficient funds to complete the work will be required.
- Ensure disposal options for the plant material are in place prior to work commencing.
- Monitor for re-growth and/or reintroduction during site visits. If applicable, ensure new members of staff are aware of your Himalayan balsam Plan and report sightings of re-growth.

A4.2.1.1 Mechanical control

Mechanical control, by repeated cutting or mowing, is effective for large stands, but plants can regrow if the lower parts are left intact. The plant must be cut below the lowest node to stop regeneration. It is important that all plants are removed from the site as recolonisation can occur quickly. It is recommended to carry out regular inspections of the infected area in spring and hand pull or spot treat any germinating seedlings with a weed wiper or knapsack sprayer.

This methodology can control stands of this species within a two year period; effectively exhausting the reserve within the seed bank. As the majority of Himalayan Balsam is located within the existing settlement ponds on the site which will be used for the treatment of surface water prior to discharge to the cSAC, it is considered that there is an ongoing risk of spread of this species for the period during which the seeds remain viable within the soil (i.e. the seed bank). Seeds are not very robust and only survive for up to 18 months so a two year control programmes can be successful in eradicating this plant if there is not further infestation from adjacent sites, or dispersal into other sections of the site (Kelly *et al*. 2008).

A4.2.1.2 Chemical control

Himalayan balsam can be controlled by spraying the foliage with glyphosate. The plants should be sprayed in the spring before flowering but late enough to ensure that germinating seedlings have grown up sufficiently to be adequately covered by the spray. Glyphosate is sold under a number of brand names. Small infestations and individual plants can be controlled by using glyphosate in a weed wiper. This has the advantage of preserving native plants and grasses which would otherwise be killed by the glyphosate, however, this is not suitable in the current situation due to the extensive nature of the infestation. The herbicide 2,4-D amine controls many broadleaved annual weeds and may also be used to control this species but is not recommended for use near waterbodies or where it may be transmitted to a waterbody, i.e. the River Slaney.

A long-lance sprayer may assist in the spraying of less accessible areas out of the reach of conventional knapsack sprayers. Always follow health and safety procedures outlined by the herbicide manufacturer and take appropriate precautions when working near water. It is recommended to use the Glyphosate herbicide 'Round-up' Biactive' which is suitable for application near watercourses. However, this herbicide is not to be used within 5 metres of any watercourse or aquatic habitat.

Treatment at the end of the growing season will require a different approach. By the month of June the Himalayan balsam within the site will have completed flowering and gone to seed. It is therefore important that the seed heads of the Himalayan Balsam on the site be manually removed to avoid dispersal of the seed and the prolonged retention of seeds within the soil at the site. Any Himalayan Balsam material collected from the site will be stored in heavy duty plastic bags to allow the material to decompose and will be disposed of at a licensed waste facility. This material must not be stored or disposed of at a location where it may re-establish and spread.

During herbicide management control, herbicide application equipment will never be washed out on site and all mixing and storage of herbicide materials will be carried out greater than 50m from any watercourse and the SAC. All waste herbicide will be taken offsite and disposed of according to the manufacturer's guidelines.

A4.2.2 Japanese knotweed control

Current control measures are limited to a combination of physical and chemical means and chemical means alone. In the case of Japanese knotweed, the use of physical methods, on their own, are extremely unlikely to control Japanese knotweed. In all cases, chemical treatment, either on its own or in combination with physical treatment, will be required.

All control measures will require follow-up to ensure complete eradication which should be undertaken for a minimum of two growing seasons (and up to five growing seasons) after control (NRA 2010). Currently there are three means by which Japanese knotweed can be eradicated from sites. These are:

- Long-term treatment with herbicides.
- Excavation and disposal at a licensed landfill site.
- Excavation, deep burial and/or bunding on site prior to treatment with herbicide.

Control methods are set out in the 'Best Practice Management Guidelines: Japanese knotweed *Fallopia japonica*' (Kelly *et al*. 2008). The following are the principal steps required in the control of Japanese knotweed within the Brownswood site.

1. Immediately prior to treatment conduct a detailed survey of the site for the presence of this species. Include at least 7m radius from stands to allow for below ground growth.
2. Ensure that everyone working on the site is aware of and adheres to good site hygiene, such as:
   - Marking out of contaminated areas.
   - Ensuring that vehicles with caterpillar tracks do not work within contaminated areas.
   - Treating contaminated soils carefully.
3. Attempt to establish the length of time Japanese knotweed has been on site. Long-standing infestations with many years worth of rhizome growth are much more difficult to control or eradicate.
4. Implement the Japanese knotweed Management Plan and make sure all staff working in the area are aware of it. Include timeframes for planned clearance and repeated treatments.
5. Follow-up work will be necessary to ensure that any small plants and seedlings have not been missed.

A4.2.2.1 Above ground removal

Cutting Japanese knotweed canes/stems will not successfully remove or reduce this species and cutting may result in material being spread elsewhere. However, this is an effective means of control in combination with chemical treatment. Japanese knotweed canes should first be cut using a cutter, hook or scythe. The cane should be carefully set aside on a suitable membrane surface until they have dried to a deep brown colour and are certain to be dead; or, can be double-bagged and disposed of at a licensed waste facility, where: (a) the facility has been informed in advance of the nature of the waste material; (b) the facility is licensed to accept this material; and, (c) the facility is prepared to accept the material.

A4.2.2.2 Below ground removal

Often it is not possible to estimate the size of large infestations until they are excavated. Research has found that Japanese knotweed can extend over 7m below ground. It is recommended to dig test pits and examine for the presence and the extent of rhizomes while digging out the parent stand. Excavations should also be to 3m below the surface if removing Japanese knotweed from a site. Wherever possible, the amount of Japanese knotweed excavated should be kept to a minimum and focus should be directed to treating the Japanese knotweed in its original location. An ecologist with experience in the management of invasive species should be employed to oversee this element of the works.

A4.2.2.3 Herbicide application

If the area of Japanese knotweed is very small, it is possible to spray the leaves and canes with glyphosate. When spraying herbicides, always follow the manufacturer's guidelines and consider if the herbicide is safe for the intended use of the site following treatment and the sites location, particularly taking account of proximity or pathways to watercourses and aquatic habitats. It is recommended that herbicide treatment is carried out by an experienced, competent and qualified operator. Several different herbicides with the following active ingredients can be used to kill Japanese knotweed: glyphosate, triclopyr, picloram and 2,4-D amine. Of these Glyphosate is recommended for use in proximity to aquatic habitats.

The majority of herbicides are not effective during the winter as the active ingredient needs to be taken up by live material. Advice on which methods are best or preferred under different circumstances can be provided by a range of qualified organisations that provide Japanese knotweed treatment advice and services. It should be noted that herbicide treatment is

usually the most cost-effective method; however, it can take a long time to achieve acceptable control.

A4.2.2.4 On-site disposal

If the dead / treated Japanese knotweed material is to be disposed of by burial, only non-persistant glyphosate formulations can be used during the previous chemical treatment process. Other persistent herbicides will not be allowed for burial under various waste regulations. At least two weeks prior to excavation, the Japanese knotweed should be treated with a non-persistent herbicide (certain plant protection products containing glyphosate are non-persistent)

Burial must be to a depth of at least 5m. This can involve large scale engineering operations and large holes within a site. Various root barrier membranes are available which can prevent Japanese knotweed penetrating. These membranes need to be specially laid under expert supervision in order to be effective, protecting the surrounding soil (Environment Agency, n.d.). The provisions of the Waste Management Acts, 1996 to 2008, must be considered and complied with. The site of burial must be monitored regularly.

A4.3 References

Kelly, J., Maguire, C.M. and Cosgrove, P.J. (2008). Best Practice Management Guidelines: Japanese knotweed *Fallopia japonica*. Prepared for NIEA and NPWS as part of Invasive Species Ireland.

Kelly, J., Maguire, C.M. and Cosgrove, P.J. (2008). Best Practice Management Guidelines: Himalayan balsam *Impatiens glandulifera*. Prepared for NIEA and NPWS as part of Invasive Species Ireland.

NRA (2010). Guidelines on the management of noxious weeds and non-native invasive plant species on National Roads. Revision 1. National Roads Authority, Dublin.

Environment Agency (n.d.) Managing Japanese knotweed on development sites - the knotweed code of practice. Environment Agency, Bristol BS32 4UD, UK.

APPENDIX 5 Method Statement for Importation of Material to Site

A5.1 Introduction

The proposed restoration of the Brownswood Quarry site will allow for the development of a Waste Recovery Facility within the existing quarry void. The principal elements of the scheme includes the use of imported natural materials, principally excess inert soil, stones and/or broken rock excavated on construction sites, to backfill and restore a large existing void created by previous extraction of bedrock. This will include the placement of cover soils and seeding and return to use as agricultural grassland.

A5.2 Method Statement

Any non-inert construction and demolition waste (principally metal, timber, PVC pipes and plastic) which may have been unintentionally imported to site will be separated prior to removal and transfer off-site to appropriately licensed or permitted waste disposal or recovery facilities. The temporary stockpiling of topsoil and subsoil pending re-use as cover material for final restoration of the site is also required. Environmental monitoring of noise, dust, surface water and groundwater will be undertaken for the duration of the site restoration works and for a short period of aftercare. Full details of the proposed development are included in the Environmental Impact Statement prepared by SLR Consulting Ireland (2010).

The existing void will only be in-filled using inert soil materials and demolition waste imported from pre-approved external construction sites. Soil stockpiled in existing over-burden mounds around the quarry will also be used to backfill the quarry void. No peat, contaminated soils or non-hazardous waste will be accepted at the proposed recovery facility.

The location of the Brownswood quarry site in close proximity to the River Slaney Valley cSAC, with a discharge from the site to this designated site, infers the potential for water quality impacts and also for the spread of non-native, invasive species. The following method statement sets out measures to reduce the risk of impacts affecting the cSAC during the restoration of the quarry void i.e. the importation of material to the waste recovery facility.

- Material imported to the waste recovery facility for the restoration of the quarry void must be effectively screened prior to entry to the site to establish its origins.
- An invasive species risk assessment must be completed for each donor site prior to importation to the Brownswood Waste Recovery Facility. In the case of donor sites such as NRA road schemes, it is anticipated that an Invasive Species Risk Assessment will already have been completed as per the '*Guidelines on the management of noxious weeds and non-native invasive plant species on National Roads'* (NRA, 2010).
- Source sites that have not previously had a dedicated invasive species survey and risk assessment undertaken will be required to submit reporting and a risk assessment completed by a qualified ecologist or specialist with invasive species management experience prior to importation to the site.
- The importation of material to the site also creates the possibility of contaminated material / spoil entering the site in the absence of a detailed risk assessment from each source site which is to be accounted for at the entry point to the Brownswood site by means of a checklist. Non-inert material or potentially contaminated material will not be accepted at the facility due to the risk of contamination of groundwater and the pathways to contamination of the River Slaney within the cSAC.
- On arrival, HGV drivers carrying material to the waste recovery facility will identify themselves to the facility manager (or his authorised assistant(s)) before proceeding to the active backfilling location within the former quarry. The facility manager (or his assistant(s)) will take a copy of the weigh docket, record the time and date of arrival, the nature and origin of the imported soils, the Client, the truck licence plate number and relevant waste collection permit details (SLR, 2011). The relevant details will include evidence of an invasive species risk assessment and characterisation report of the material imported to the site in relation to potential contaminants.
- Further agreement for the finalisation of the current proposal is required with the NPWS and Inland Fisheries Ireland with respect to the adjacent cSAC.

References

NRA (2010). *Guidelines on the management of noxious weeds and non-native invasive plant species on National Roads*. Revision 1. National Roads Authority, Dublin.

SLR (2011) *Brownswood Quarry Restoration: Environmental Impact Statement.* SLR Consulting Ireland, Dublin