

Bea Claydon

From: Wexford Receptionist
Sent: 21 February 2013 08:50
To: Bea Claydon
Subject: FW: 130220 Ringsend Wastewater Treatment Works Extension Project - Dumping at Sea Permit - Responses to Submissions: FAO Bea Claydon
Attachments: 130220 EPA Letter - Responses to Submissions.pdf; DG 118 Dumping at Sea Submissions Responses Iss01.pdf; DG 118 Dumping at Sea Submissions Summary Iss01.pdf; Ringsend Dumping at Sea AA Screening NIS 20-02-2013 Iss.pdf

Rec'd for you today Bea.
Ta A

*Ann Rochford,
Programme Officer,
Environmental Protection Agency,
P.O. Box 3000,
Johnstown Castle Estate,
Wexford.
Bosca Poist 3000,
Eastát Chaisleán Bhaile Sheáin,
Contae Loch Garman.
Tel: 00353 53 91 60600
Fax: 00353 53 91 60699
Email: info@epa.ie
web: www.epa.ie
Lo Call: 1890 33 55 99*

From: Owen McManus [<mailto:owen.mcmanus@dublincity.ie>]
Sent: 20 February 2013 18:14
To: Wexford Receptionist
Subject: 130220 Ringsend Wastewater Treatment Works Extension Project - Dumping at Sea Permit - Responses to Submissions: FAO Bea Claydon

Dear Bea,

Please find attached copy of Dublin City Council's responses to the submissions received during the public consultation period in relation to our application for Dumping at Sea Permit on the Ringsend Wastewater Treatment Works Extension Project.

We also enclose a copy of the updated Screening for Appropriate Assessment and Natura Impact Statement.

Hard copies of all will follow by post.

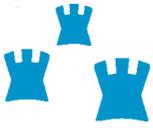
I trust that all is in order. However, please give me a shout if you require clarification on any issue.

Thanks

Owen

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Dublin Bay Project,
Engineering Department,
68/70 Marrowbone Lane,
Dublin 8.

Tionscaldal Chuan Bhaile Átha Cliath,
Roinn Innealtóireachta,
68/70 Sráid an Mhuire Mhaith,
Baile Átha Cliath 8

T. 01 2224264 F. 01 4546435
owen.mcmanus@dublincity.ie

20th February, 2013

**Bea Claydon
Programme Officer
Environment Protection Agency
PO Box 3000
Johnstown Castle Estate
Co. Wexford**

**Re: Ringsend Wastewater Treatment Works Extension
– Dumping at Sea Permit – Responses to Submissions Recieved**

Dear Bea,

Further to your letter of the 6th February 2013 please find enclosed a copy of our response to submissions received during the public consultation period. We enclose two documents as follows;

- A summary document which addresses the seven most common points raised across all of the submissions
- A detailed document which provides a response for each individual submission.

In addition to this we stated in our application letter of the 6th December 2012 that in view of the proposal by the Minister for Arts, Heritage and the Gaeltacht to designate a number of marine sites around the coast of Ireland including one on the east coast, the Rockabill to Dalkey Island Special Area of Conservation (SAC), that we would update our Screening for Appropriate Assessment included with the application and prepare a Natura Impact Statement if required. This work has been completed and I now include for your attention an updated Screening for Appropriate Assessment and Natura Impact Statement report.

We trust that all is in order. However, please contact the undersigned should clarification of any issue or further information be required on 01 2224264 or at owen.mcmanus@dublincity.ie.

Yours Sincerely,



Owen McManus
Project Engineer
Ringsend Wastewater Treatment Works Extension

Encls

**RINGSEND WASTE WATER TREATMENT WORKS
DUBLIN**

**DUMPING AT SEA LICENCE APPLICATION
FOR SPOIL DISPOSAL FOR
THE RINGSEND WWTW LONG SEA OUTFALL**

APPROPRIATE ASSESSMENT

STAGE 1: SCREENING FOR APPROPRIATE ASSESSMENT

STAGE 2: NATURA IMPACT STATEMENT

FEBRUARY 2013



Natura Consultants, Glanmore,
Ashford, Co. Wicklow, Ireland.

T: +353 (0) 404 34300

M: (0) 86 825 0414

E: info@naturaconsultants.com

W: www.naturaconsultants.com

Table of Contents

1	INTRODUCTION.....	1
2	METHODOLOGY.....	4
3	STAGE 1: SCREENING FOR APPROPRIATE ASSESSMENT.....	5
4	STAGE 2: NATURA IMPACT STATEMENT.....	22
5	REFERENCES.....	26
	Appendix 1: POTENTIAL IMPACTS ON THE MARINE BENTHIC COMMUNITIES AND FISH STOCKS ASSOCIATED WITH NATURA 2000 SITES	
	Appendix 2: POTENTIAL IMPACTS ON SEABIRDS AND MARINE MAMMALS ASSOCIATED WITH NATURA 2000 SITES	

1 INTRODUCTION

1.1 Background

Natura Environmental Consultants was commissioned by CDM Smith to undertake a Screening for Appropriate Assessment for the proposed loading and spoil disposal from the drilling of a tunnelled outfall to service Ringsend Waste Water Treatment Works (WwTW) in Dublin. The application is for a Dumping at Sea licence in the designated spoil disposal site on the western side of the Burford Bank. The proposed works are associated with the upgrade works to the Ringsend WWTW in Dublin City (Figures 1 and 2).

The purpose of this report is to determine the effects, if any, of the proposed works on the Natura 2000 sites in Dublin Bay and neighbouring coastlines (candidate Special Areas of Conservation, cSAC, and Special Protection Areas, SPA), and to further assess if any of the predicted impacts have the potential to have significant negative effects on the qualifying interests or on the conservation objectives of these designated areas for nature conservation. The location of the Pigeon House Jetty (proposed loading area) in relation to the designated area boundaries are shown on Figure 3, while Figure 4 shows the location of the proposed spoil disposal site in relation to other Natura 2000 sites.

Figure 1: Ringsend WWTW Site and location of the proposed tunnel and spoil loading area

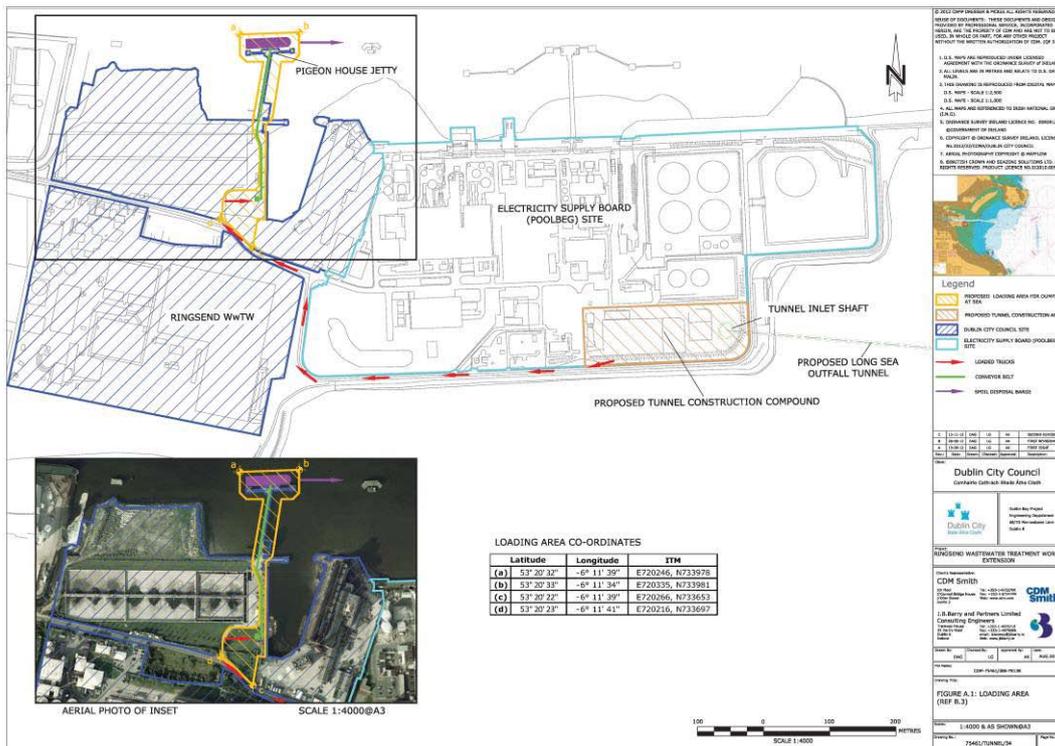
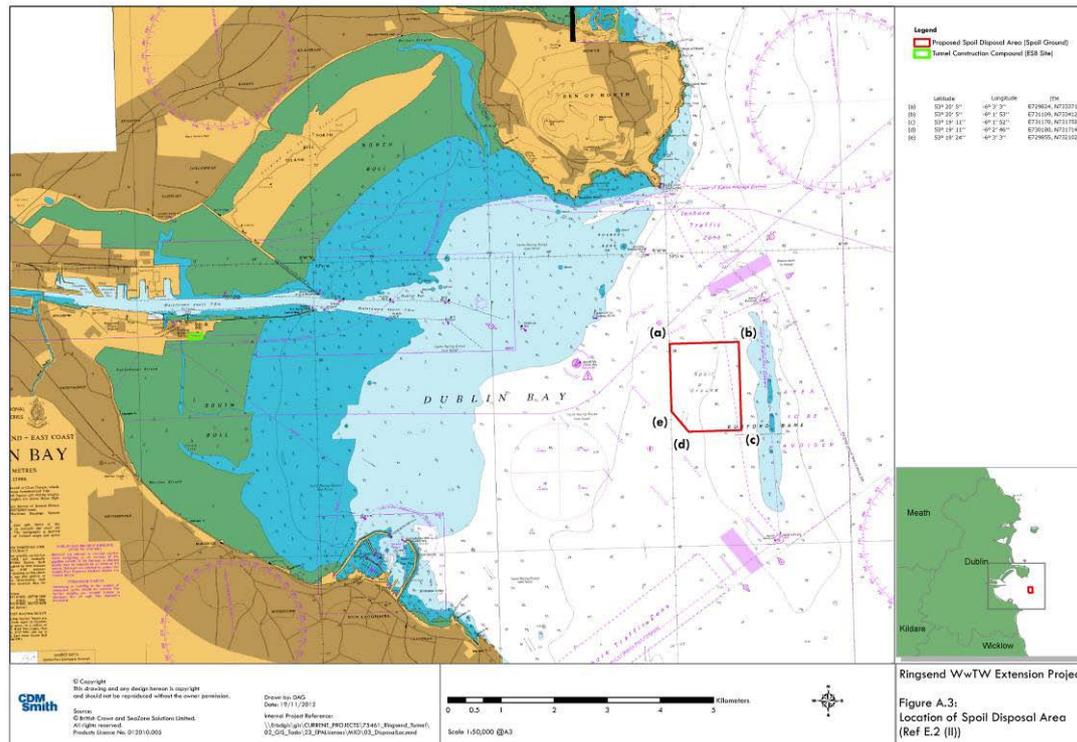


Figure 2: Location of the proposed spoil disposal site in Dublin Bay.



1.2 Legislative Requirements

Flora and fauna in Ireland are protected at a national level by the Wildlife Act, 1976, Wildlife (Amendment) Act, 2000 and the Flora (Protection) Order, 1999 (SI 94/1999). They are also protected at a European level by the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (79/409/EEC) which are transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No 477 of 2011).

Under these directives and acts, sites of nature conservation importance are designated in order to legally protect faunal and floral species and important/vulnerable habitats. The categories of designation are as follows;

- Candidate Special Areas of Conservation (cSAC) are designated under the EU Habitats Directive (92/43/EEC) which are transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No 477 of 2011).
- Special Protection Areas (SPAs) are designated under the EU Birds Directive (79/409/EEC) which are transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No 477 of 2011). These cSACs and SPAs are considered to be of international importance.
- Natural Heritage Areas (NHAs) are designated under the Wildlife (Amendment) Act, 2000. In addition to these there are 630 proposed Natural Heritage Areas (pNHAs) which were published on a non-statutory basis in 1995, but have not since been statutorily proposed or designated. They have limited protection such as under the Rural Environment Protection Scheme (REPS) which requires the conservation of pNHAs, under the Forest Service requirement for NPWS approval before they will pay afforestation grants on pNHA lands, and the recognition of the ecological value of pNHAs by the Planning and Licensing Authorities.

Under Article 3 of the EU Habitats Directive “a coherent European network of special areas of conservation shall be set up under the title Natura 2000” and “the Natura 2000 network shall include special protection areas classified by the Member States pursuant to Directive 79/409/EEC”. In an Irish context this refers to cSACs and SPAs.

Article 6(3), paragraph 3 of the EU Habitats Directive 92/43/EEC states that:

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

Under Article 6(3) of the EU Habitats Directive (92/43/EEC) and Regulation 42 of Statutory Instrument No. 447/2011 – European Communities (Birds and Natural Habitats) Regulations, 2011, any plan or project, which is not necessary to the management of a Natura 2000 site and has the potential to significantly affect the integrity of a Natura 2000 Site (i.e. cSAC or SPA), or have a significant effect on the conservation objectives of the site, must be subject to an appropriate assessment. The integrity of a site can be regarded as the coherence of ecological structure and function, across the entirety of a site, which enables it to sustain all of the ecological resources for which it has been valued.

The statutory agency responsible for Natura 2000 sites in Ireland is the National Parks and Wildlife Service of the Department of Arts, Heritage and the Gaeltacht. In March 2010, the requirement for Appropriate Assessment of all development applications was outlined in a circular letter issued by the Department of the Environment, Heritage and Local Government (DoEHLG)¹.

The Stages in the Appropriate Assessment process

There are 4 stages in the Appropriate Assessment process as outlined in the European Commission Guidance document (2001). The following is a brief summary of these steps.

Stage 1 – Screening for Appropriate Assessment: This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 Site and considers whether it can be objectively concluded that these effects will not be significant.

Stage 2 - Appropriate Assessment: In this stage, the impact of the project on the integrity of the Natura 2000 site is considered with respect to the conservation objectives of the site and to its structure and function.

Stage 3 - Assessment of Alternative Solutions: Should the Appropriate Assessment determine that adverse impacts are likely upon a Natura 2000 site, this stage examines alternative ways of implementing the project that, where possible, avoid these adverse impacts.

Stage 4 - Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the Natura site will be necessary.

¹ Circular NPW 1/10 & PSSP 2/10

2 METHODOLOGY

2.1 Desk study and consultations

A desk study was carried out to collate available information on the ecological environment. The National Parks and Wildlife Service (NPWS) database was consulted concerning designated conservation areas and their conservation objectives. This assessment was carried out with reference to the relevant guidance, in particular:

- *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 2001*
- *Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC, European Commission, 2000*
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities.* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin, 2009 (with revision notes published in February 2010).

2.2 Field studies

A benthic survey in the area of the proposed outfall location was undertaken for the Ringsend WwTW EIS. Three of the survey locations were located in the southwestern part of the spoil ground, while the remainder were located to the west of the spoil ground. This survey revealed that the substrata in this area consisted of sandy sediments with varying proportions of gravel and mud. Organic carbon and invertebrate fauna were also sampled at these locations (see Appendix 1).

3 STAGE 1: SCREENING FOR APPROPRIATE ASSESSMENT

3.1 Description of the Project

The spoil will be removed from the tunnel by onshore shaft excavation plant and Tunnel Boring Machine (TBM) and loaded onto vehicles within the proposed tunnel construction compound, which within the boundary of the ESB Poolbeg Generating Station (see Figure 1). Also spoil will be removed at a marine drilling jackup barge at the offshore marine diffuser site. From here, it will be transported by road to the vicinity of the Pigeon House harbour on the north side of the Poolbeg Peninsula and loaded onto a conveyor belt. The conveyor will transport the spoil on board a vessel moored at the Pigeon House jetty.

Once loaded, the vessel will transport the spoil to the existing spoil ground west of Burford Bank in Dublin Bay, where it will be released to the seabed. It is estimated based on the rate of production of spoil by the TBM and the size of the disposal vessel; that the frequency of disposal operations will be less than once per day and no more than twice per day, and a typical load would be approximately 1,000 m³, over a 3 year period. It should be noted that on the basis of the volume of spoil to be disposed and this frequency the actual period over which disposal will take place is likely to be considerably less than 3 years. However, 3 years in this case has been taken as the maximum operational window in view of uncertainties at this stage in the production rate of the TBM which will depend on hardness of the rock encountered and other issues that might be encountered. The nature of the spoil material is described in Appendix 1 of this report.

The proposed loading and disposal of spoil for the tunnelled outfall for Ringsend WWTW are not directly connected with or necessary to the management of any of the Natura 2000 sites listed below in Section 3.2.

3.2 Brief Description of the Natura 2000 Sites

There are 14 Natura 2000 sites which, due to their proximity to the proposed works and/or their conservation interests, may have the potential to be adversely affected:

- North Dublin Bay cSAC
- North Bull Island SPA
- South Dublin Bay cSAC
- South Dublin Bay and River Tolka Estuary SPA
- Howth Head cSAC
- Howth Head Coast SPA
- Ireland's Eye SPA
- Ireland's Eye cSAC
- Lambay Island cSAC
- Lambay Island SPA
- Skerries Islands SPA
- Rockabill SPA
- Dalkey Islands SPA

- Bray Head cSAC

In addition to these existing sites, there is a further proposed marine cSAC covering an area from Rockabill to Dalkey Island. This area was advertised for designation in December 2012 and the deadline for objections is in March 2013.

The location of the existing Natura 2000 sites in Dublin Bay in relation to the Pigeon House Jetty (proposed loading area) are shown in Figure 3. The location of the proposed spoil disposal area in relation to a wider area, including a number of additional Natura 2000 sites, is shown in Figure 4. The location of the proposed spoil disposal area in relation to the proposed Rockabill to Dalkey Island SAC is shown in Figure 5.

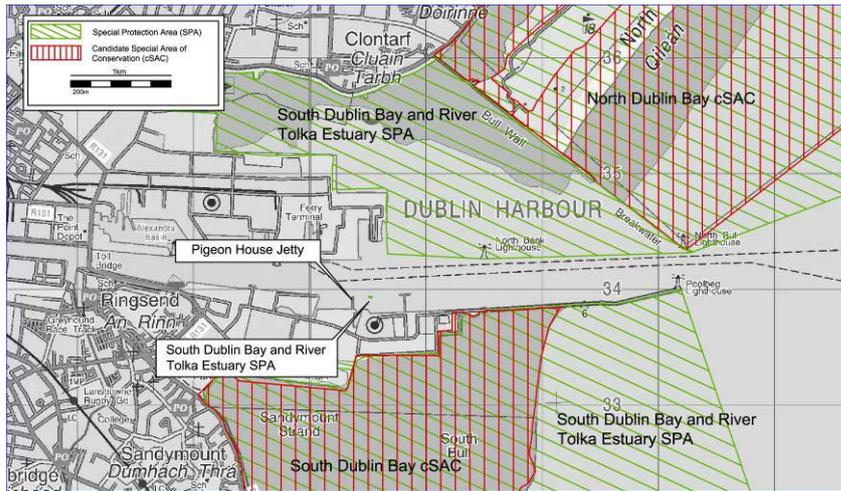


Figure 3: Ringsend WwTW Site and location of Natura 2000 sites in Dublin Bay

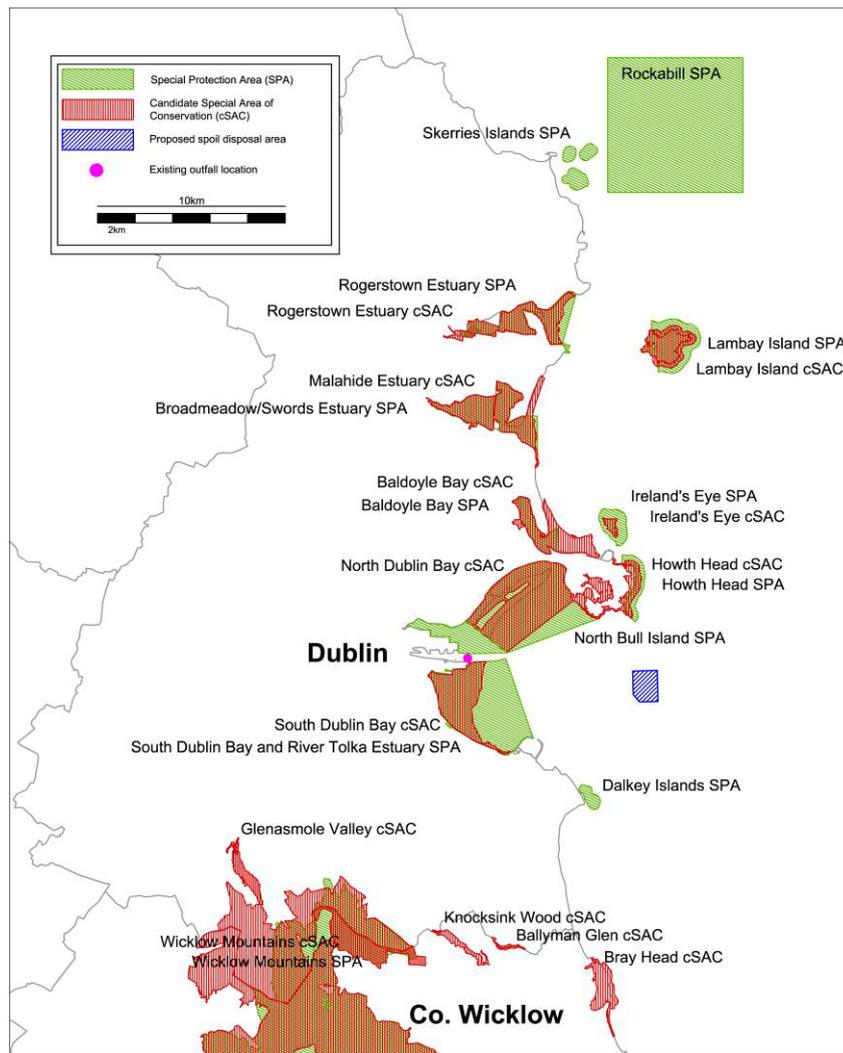


Figure 4: Proposed Spoil Disposal Area and location of existing Natura 2000 sites

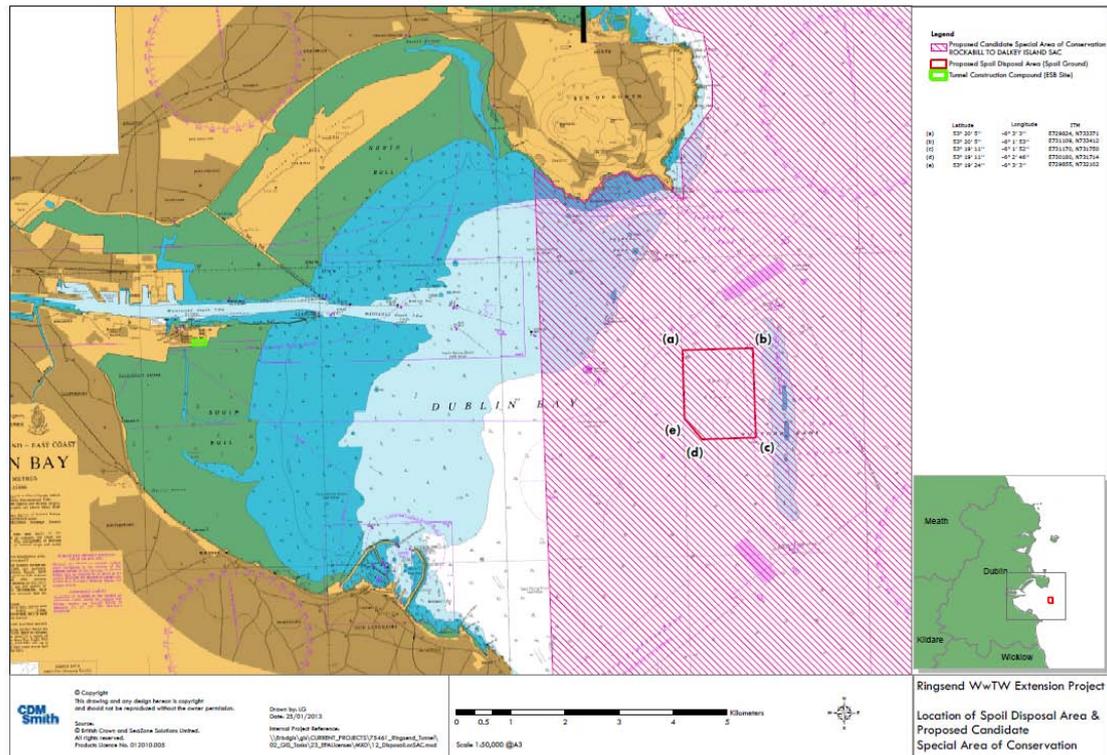


Figure 5: Proposed Spoil Disposal Area and location of part of proposed Rockabill to Dalkey Island SAC.

A brief description of each of these existing and proposed Natura 2000 sites is given below.

South Dublin Bay cSAC (000210)

This site lies south of the River Liffey and extends from the South Wall to the west pier at Dun Laoghaire and covers an area of approx. 742ha. It is an intertidal site with extensive areas of sand and mudflats, a habitat listed on Annex I of the E.U. Habitats Directive. The sediments are predominantly sands but grade to sandy muds near the shore at Merrion gates. The main channel which drains the area is Cockle Lake.

At low tide the inner parts of the south bay are used for amenity purposes. Bait digging is a regular activity on the sandy flats. At high tide some areas have windsurfing and jet-skiing. This site is a fine example of a coastal system with extensive sand and mudflats, a habitat listed on Annex I of the E.U. Habitats Directive. South Dublin Bay is also an internationally important bird site.

Qualifying Interests:

- Mudflats and sandflats not covered by seawater at low tide [1140]

Conservation Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and /or the Annex II species for which the SAC has been selected.

North Dublin Bay cSAC (000206)

This site covers the inner part of north Dublin Bay, the seaward boundary extending from the Bull Wall lighthouse across to the Martello Tower at Howth Head. The North Bull Island is the focal point of this site. The island is a sandy spit which formed after the building of the

South Wall and Bull Wall in the 18th and 19th centuries. It now extends for about 5 km in length and is up to 1 km wide in places. A well-developed and dynamic dune system stretches along the seaward side of the island. Various types of dunes occur, from fixed dune grassland to pioneer communities on foredunes. Saltmarsh extends along the length of the landward side of the island. The edge of the marsh is marked by an eroding edge which varies from 20 cm to 60 cm high. The marsh can be zoned into different levels according to the vegetation types present. Towards the tip of the island, the saltmarsh grades naturally into fixed dune vegetation. The island shelters two intertidal lagoons which are divided by a solid causeway. The sediments of the lagoons are mainly sands with a small and varying mixture of silt and clay. The sediments on the seaward side of North Bull Island are mostly sands. The site extends below the low spring tide mark to include an area of the sublittoral zone. North Dublin Bay is of international importance for waterfowl. During the 1994/95 to 1996/97 period the following species occurred in internationally important numbers: Brent Geese; Knot; Bar-tailed Godwit. A further 14 species occurred in nationally important concentrations. Some of these species frequent South Dublin Bay and the River Tolka Estuary for feeding and/or roosting purposes (mostly Brent Goose, Oystercatcher, Ringed Plover, Sanderling, Dunlin). The tip of the North Bull Island is a traditional nesting site for Little Tern. The invertebrates of the North Bull Island have been studied and the island has been shown to contain at least seven species of regional or national importance in Ireland (Orders Diptera, Hymenoptera, Hemiptera). Two separate Statutory Nature Reserves cover much of the island east of the Bull Wall and the surrounding intertidal flats. The site is used regularly for educational purposes. North Bull Island has been designated a Special Protection Area under the E.U. Birds Directive and it is also a statutory Wildfowl Sanctuary, a Ramsar Convention site, a Biogenetic Reserve, a Biosphere Reserve and a Special Area Amenity Order site. This site is an excellent example of a coastal site with all the main habitats represented. It holds good examples of ten habitats that are listed on Annex I of the E.U. Habitats Directive; one of these is listed with priority status. Several of the wintering bird species have populations of international importance, while some of the invertebrates are of national importance. Qualifying Interests:

- [1140] Mudflats and sandflats not covered by seawater at low tide
- [1210] Annual vegetation of drift lines
- [1310] Salicornia and other annuals colonizing mud and sand
- [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- [1395] *Petalophyllum ralfsii*
- [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- [2110] Embryonic shifting dunes
- [2120] Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- [2130] * Fixed coastal dunes

South Dublin Bay and River Tolka Estuary SPA (004024)

The South Dublin Bay and River Tolka Estuary SPA comprises a substantial part of Dublin Bay. It includes the intertidal area between the River Liffey and Dun Laoghaire, and the estuary of the River Tolka to the north of the River Liffey, as well as Booterstown Marsh and covers an area of approx. 2194ha. A portion of the shallow marine waters of the bay is also included.

In the south bay, the intertidal flats extend for almost 3 km at their widest. The sediments are predominantly well-aerated sands. Several permanent channels exist, the largest being Cackle Lake. A small sandy beach occurs at Merrion Gates, while some bedrock shore occurs

near Dun Laoghaire. The landward boundary is now almost entirely artificially embanked. An area of grassland at Poolbeg, north of Irishtown Nature Park, is also included in the site.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Light-bellied Brent Goose, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Knot, Sanderling, Dunlin, Bar-tailed Godwit, Redshank, Black-headed Gull, Roseate Tern, Common Tern and Arctic Tern. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of the SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds. The South Dublin Bay and River Tolka Estuary SPA is of international importance for Light-bellied Brent Goose and of national importance for nine other waterfowl species. As an autumn tern roost, it is also of international importance. Furthermore, the site supports a nationally important colony of Common Tern. All of the tern species using the site are listed on Annex I of the E.U. Birds Directive, as are Bar-tailed Godwit and Mediterranean Gull.

Qualifying Interests:

- Light-bellied Brent Goose (*Branta bernicla hrota*) (wintering)
- Oystercatcher (*Haematopus ostralegus*) (wintering)
- Ringed Plover (*Charadrius hiaticula*) (wintering)
- Golden Plover (*Pluvialis apricaria*) (wintering)
- Knot (*Calidris canutus*) (wintering)
- Sanderling (*Calidris alba*) (wintering)
- Dunlin (*Calidris alpina*) (wintering)
- Bar-tailed Godwit (*Limosa lapponica*) (wintering)
- Redshank (*Tringa totanus*) (wintering)
- Black-headed Gull (*Larus ridibundus*) (wintering)
- Roseate Tern (*Sterna dougallii*) (passage)
- Common Tern (*Sterna hirundo*) (breeding)

Conservation Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.

North Bull Island SPA (004006)

This site covers all of the inner part of north Dublin Bay, with the seaward boundary extending from the Bull Wall lighthouse across to Drumleck Point at Howth Head and covers an area of approx. 1944ha. The North Bull Island sand spit is a relatively recent depositional feature, formed as a result of improvements to Dublin Port during the 18th and 19th centuries. It is almost 5km long and 1 km wide and runs parallel to the coast between Clontarf and Sutton. Part of the interior of the island has been converted to golf courses. The island shelters two intertidal lagoons which are divided by a solid causeway. These lagoons provide the main feeding grounds for the wintering waterfowl.

The main land-uses of this site are amenity activities and nature conservation. The North Bull Island is one of the main recreational beaches in Co. Dublin and is used throughout the year. Much of the SPA is also a candidate Special Area of Conservation. The site is used regularly for educational purposes and there is a manned interpretative centre on the island. The North Bull Island SPA is an excellent example of an estuarine complex and is one of the top

sites in Ireland for wintering waterfowl. It is of international importance on account of both the total number of waterfowl and the individual populations of Light-bellied Brent Goose, Black-tailed Godwit and Bar-tailed Godwit that use it. Also of significance is the regular presence of several species that are listed on Annex I of the E.U. Birds Directive, notably Golden Plover and Bar-tailed Godwit, but also Ruff and Short-eared Owl.

Qualifying Interests:

- Light-bellied Brent Goose (*Branta bernicla hrota*) (wintering)
- Shelduck (*Tadorna tadorna*) (wintering)
- Teal (*Anas crecca*) (wintering)
- Pintail (*Anas acuta*) (wintering)
- Shoveler (*Anas clypeata*) (wintering)
- Oystercatcher (*Haematopus ostralegus*) (wintering)
- Golden Plover (*Pluvialis apricaria*) (wintering)
- Grey Plover (*Pluvialis squatarola*) (wintering)
- Knot (*Calidris canutus*) (wintering)
- Sanderling (*Calidris alba*) (wintering)
- Dunlin (*Calidris alpina*) (wintering)
- Black-tailed Godwit (*Limosa limosa*) (wintering)
- Bar-tailed Godwit (*Limosa lapponica*) (wintering)
- Curlew (*Numenius arquata*) (wintering)
- Redshank (*Tringa totanus*) (wintering)
- Turnstone (*Arenaria interpres*) (wintering)
- Black-headed Gull (*Larus ridibundus*) (wintering)
- Wetlands & Waterbirds

Conservation Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.

Howth Head cSAC (000202)

Howth Head is a rocky headland situated on the northern side of Dublin Bay. Howth Head contains sea cliffs and dry heaths, two habitats listed on Annex I of the EU Habitats Directive. A mosaic of heathland vegetation occurs on the slopes above the sea cliffs and in the area of the summit. The maritime flora is of particular interest as a number of scarce and local plants have been recorded.

The site is of national importance for breeding seabirds, including Fulmar, Shag, Herring Gull, Kittiwake, Guillemot, Razorbill and Black Guillemot. A number of rare invertebrates have been recorded from the site. Howth Head displays a fine range of natural habitats, including two Annex I habitats. The site is also of scientific importance for its seabird colonies, invertebrates and lichens. It also supports populations of at least two legally protected plant species and several other scarce plants.

Qualifying Interests:

- [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
- [4030] European dry heaths

Howth Head Coast SPA (004113)

Howth Head is a rocky headland situated on the northern side of Dublin Bay. The peninsula is composed of Cambrian rock of the Bray Group, the most conspicuous component being quartzite. The site comprises the sea cliffs extending from just east of the Nose of Howth to the tip of the Bailey Lighthouse peninsula. The marine area to a distance of 500 m from the cliff base, where seabirds socialise and feed, is included within the site.

The cliffs vary from between about 60 m and 90 m in height, and in places comprise fairly sheer, exposed rock face. This site is of high ornithological importance, with four seabird species having populations of national importance. It is also a traditional nesting site for Peregrine falcon listed species under the Birds Directive (2009/147/EC). The kittiwake a special conservation interest for the Howth Head Coast SPA is not listed on any Annexes of the EU Birds Directive, nor is it covered specifically by the Bern Convention or the Convention on Migratory Species.

The special conservation interest for the Howth Head Coast SPA is:

- Kittiwake (*Rissa tridactyla*)

The Conservation Objective for the Howth Head Coast SPA is:

To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

- Kittiwake (*Rissa tridactyla*) [breeding]

Dalkey Islands SPA (004172)

The site comprises Dalkey Island, Lamb Island and Maiden Rock, the intervening rocks and reefs, and the surrounding sea to a distance of 200 m. Dalkey Island, which is the largest in the group, lies c. 400 m off Sorrento Point on the Co. Dublin mainland from which it is separated by a deep channel. The island is low-lying, the highest point of which (c. 15 m) is marked by a Martello Tower. Lamb Island lies to the north of Dalkey Island, and at low tide is connected by a line of rocks. Further north lies Maiden Rock, a bare angular granite rock up to 5 m high that is devoid of higher plant vegetation. This site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Roseate Tern, Common Tern and Arctic Tern. All three tern species using the site are listed on Annex I of the E.U. Birds Directive.

Dalkey Islands SPA is both a breeding and a staging site for terns. The site, along with other parts of south Dublin Bay, is used by the three tern species as a major post breeding/pre-migration autumn roost area. Birds are present from about late-July to September, with all three species being recorded. The origin of the birds is likely to be the Dublin breeding sites (Rockabill and Dublin Docks) though the numbers recorded suggests that birds from other sites, perhaps outside the State, are also present.

The special conservation interest for the Dalkey Islands SPA is:

- Roseate Tern (*Sterna dougallii*) [A192]
- Common Tern (*Sterna hirundo*) [A193]
- Arctic Tern (*Sterna paradisaea*) [A194]

The Conservation Objective for the Dalkey Islands SPA is:

To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

- *Sterna dougallii* [passage]
- *Sterna hirundo* [passage]
- *Sterna paradisaea* [passage]

Bray Head cSAC (000714)

This coastal site is situated in the north-east of Co. Wicklow between the towns of Bray and Greystones. Heath, a habitat listed on Annex I of the EU Habitats Directive, is the principal habitat over much of the Head. The heath communities which occur on the dry slopes above the sea-cliffs, especially those south-facing, are more open in character and dominated by grasses rather than dwarf shrubs. Calcareous dry grassland, typically species-rich, occurs on deposits of glacial till.

Qualifying Interests:

- [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
- [4030] European dry heaths

Ireland's Eye cSAC (002193)

Ireland's Eye is located about 1.5 km north of Howth in Co. Dublin. It is a Cambrian island with quartzite which forms spectacular cliffs on the north-east side. Elsewhere much of the area is covered by drift. The drift soils support a plant community of Bracken and various grasses. A small area of shingle vegetation occurs above the sandy beach at Carrigeen Bay on the western side of the island. This habitat is listed on Annex I of the EU Habitats Directive.

Ireland's Eye is of national importance for breeding seabirds. A Gannet colony was established on the stack at the east end of the island in the late 1980s. This uninhabited marine island has a well developed maritime flora, with two habitats (sea cliffs and shingle) listed on Annex II of the EU Habitats Directive, and nationally important seabird colonies. Owing to its easy access and proximity to Dublin it has great educational and amenity value.

Qualifying Interests:

- [1220] Perennial vegetation of stony banks
- [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts

Ireland's Eye SPA (004117)

Ireland's Eye is an uninhabited island located about 1.5 km north of Howth in Co. Dublin. The island has an area of c.24 ha above the high tide mark. Ireland's Eye has important populations of breeding seabirds including Fulmar, Gannet, Cormorant, Shag, Lesser Black-backed Gull, Herring Gull, Great Black-backed Gull, Kittiwake, Guillemot, Razorbill. In winter small numbers of Greylag and Pale-bellied Brent Geese graze on the island and it is used as a roost site by gulls and some waders. Ireland's Eye is now one of the best monitored sites in the country, with the breeding seabirds having been systematically censused using standard methods almost annually since 1990. This relatively small island is of high ornithological importance, with seven seabird species having populations of national importance. The regular presence of a breeding pair of Peregrine Falcon is also of note.

Qualifying Interests:

- *Phalacrocorax carbo* [breeding]
- *Larus argentatus* [breeding]
- *Rissa tridactyla* [breeding]
- *Uria aalge* [breeding]
- *Alca torda* [breeding]

Lambay Island cSAC (000204)

Lambay Island is a large (250 ha.) inhabited island lying 4 km off Portrane on the north Co. Dublin coast. It is privately owned and is accessible by boat from Rogerstown Quay. The island rises to 127 m and is surrounded by steep cliffs on the north, east and south slopes. Most of the western third of the island is intensively farmed (mostly pasture), and there are small areas of parkland, deciduous and coniferous woodland, buildings, walled gardens and the harbour. Some sheltered gullies have small areas of scrub woodland dominated by Elder. Vegetated sea cliffs are listed on Annex I of the EU Habitats Directive.

Lambay supports the only colony of Grey Seals on the east coast. Lambay Island is internationally important for its breeding seabirds. The most numerous species is the Guillemot. Other important species include Razorbill, Fulmar, Kittiwake, Herring Gull, Cormorant, Shag, Puffin and small numbers of Great and Lesser Black-backed Gulls. There is a small colony of Manx Shearwater on the island and Common Terns have bred in recent years. In winter the most notable bird species on Lambay Island is the Greylag Goose. There is also a small wintering flock of Barnacle Geese and recently Brent Geese have started to occur regularly.

The island has been maintained as a wildlife sanctuary by its owners and no threats are envisaged should the present land use continue. Lambay Island has good examples of vegetated sea cliffs, a habitat listed on Annex I of the EU Habitats Directive, and these cliffs hold internationally important populations of sea-birds. The site is also of conservation for the population of Grey Seal, a species listed on Annex II of this directive, that it supports.

Qualifying Interests:

- [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
- [1364] Grey seal *Halichoerus grypus*

Lambay Island SPA (004069)

Lambay Island lies approximately 4 km off the north Dublin coastline and is separated from it by a channel of 10-13 m in depth. The seas to a distance of 500 m from the base of the cliffs

are included within the site for the benefit of the seabirds. The predominant landuse on the island nowadays is grazing for cattle. The low-lying western third is more fertile and is used for grazing and silage production.

Lambay Island is internationally important for its breeding seabirds and is of particular note for its diversity, with 12 species breeding regularly. A survey in 1999 showed that it had internationally important populations of Cormorant, Shag, Razorbill and Guillemot. A further five species have populations of national importance: Fulmar, Lesser Black-backed Gull, Herring Gull, Great Black-backed Gull and Kittiwake. The populations of Cormorant, Shag, Herring Gull and Guillemot are the largest in Ireland.

In winter, Lambay supports a nationally important population of Greylag Goose. Brent Geese now winter regularly as well as Oystercatcher, Purple Sandpiper, Curlew and Turnstone. Large numbers of gulls frequent the island during the winter. Several seabird species, notably Fulmar, Shag and Guillemot, regularly visit the breeding cliffs during winter. Lambay supports the only breeding colony of Grey Seal on the east coast. Lambay may also hold the last Irish population of the Ship Rat, a species that is listed in the Irish Red Data Book.

Lambay has essentially been maintained as a wildlife sanctuary by its owners since the early 20th century and the policy of preservation of wildlife continues. Lambay is an internationally important seabird colony and one of the top seabird sites in Ireland. Four species have populations of international importance and a further five have populations of national importance. In addition to the seabirds, it also supports a nationally important population of Greylag Goose. The site is also of conservation for the population of Grey Seal, a species that is listed on Annex II of the E.U. Habitats Directive.

Qualifying Interests:

- *Fulmarus glacialis* [breeding]
- *Phalacrocorax carbo* [breeding]
- *Phalacrocorax aristotelis* [breeding]
- *Anser anser* [wintering]
- *Larus fuscus* [breeding]
- *Larus argentatus* [breeding + wintering]
- *Rissa tridactyla* [breeding]
- *Uria aalge* [breeding]
- *Alca torda* [breeding]
- *Fratercula arctica* [breeding]

Rockabill SPA (004014)

Rockabill consists of two small, low-lying, granitic islets situated c. 7 km off the Co. Dublin coast. The islands are separated by a narrow channel though are connected at low spring tides. The main island, known as the Lighthouse Island, is vegetated by a scrubby sward of Tree Mallow. The smaller island, known as the Bill, is very exposed and is sparsely vegetated. A lighthouse, manned until 1989, is situated on the main island.

Rockabill has a long history of nesting by terns and it is now one of the most important tern colonies in Europe. The Roseate Tern population represents approximately 75% of the entire north-west European population. The Common Tern population is one of the largest in Ireland, accounting for more than 30% of the national total. The Arctic Tern population,

while relatively small, is still of national importance. All three tern species are listed on Annex I of the E.U. Birds Directive.

Rockabill also supports a nationally important population of Black Guillemot and a small colony of Kittiwake. Owing to its international and national importance, Rockabill is a designated Refuge for Fauna.

Qualifying Interests:

- *Calidris maritima* [wintering]
- *Sterna dougallii* [breeding]
- *Sterna hirundo* [breeding]
- *Sterna paradisaea* [breeding]

Skerries Islands SPA (004122)

The Skerries Islands are a group of three small uninhabited islands situated between 0.5 km and 1.5 km off the north Dublin coast. Shenick Island and St. Patrick's Island are of similar size, with Colt Island being somewhat smaller. Shenick Island is of most interest geologically, being composed of Ordovician volcanic siltstones and shales on the boundary between the Carboniferous and the Silurian. All are lowlying islands, with maximum heights from 8 m to 13 m above sea level.

The Skerries Islands SPA is of high ornithological importance for both breeding seabirds and wintering waterfowl, with six species having populations of National Importance. In addition there is an internationally important population of Brent Goose. Golden Plover and Short-eared Owl, EU Birds Directive Annex I species, occur regularly in winter.

Special Conservation Interests:

- Shag (*Phalacrocorax aristotelis*) (breeding)
- Light-bellied Brent Goose (*Branta bernicla hrota*) (wintering)
- Purple Sandpiper (*Calidris maritima*) (wintering)
- Turnstone (*Arenaria interpres*) (wintering)

Conservation Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.

Proposed Rockabill to Dalkey Island SAC (003000)

This site includes a range of dynamic inshore and coastal waters in the western Irish Sea. These include sandy and muddy seabed, reefs, sandbanks and islands. This site extends southwards, in a strip approximately 7 km wide and 40 km in length, from Rockabill, running adjacent to Howth Head, and crosses Dublin Bay to Frazer Bank in south county Dublin. The site encompasses Dalkey, Mughlins and Rockabill islands.

The area selected for designation represents a key habitat for the Annex II species harbour porpoise, within the Irish Sea. Population survey data show that porpoise occurrence within the site boundary meets suitable reference values for other designated sites in Ireland. The species occurs year-round within the site and comparatively high group sizes have been recorded. Porpoises with young (i.e. calves) are observed at favourable, typical reference

values for the species. Casual and effort-related sighting rates from coastal observation stations are significant for the east coast of Ireland and the latter appear to be relatively stable across all seasons. The selected site contains a wide array of habitats believed to be important for harbour porpoise including inshore shallow sand and mud-banks and rocky reefs scoured by strong current flow. The site also supports Harbour seal (*Phoca vitulina*) and Grey seal (*Halichoerus grypus*), for which terrestrial haul-out sites occur in immediate proximity to the site. Bottlenose dolphin (*Tursiops truncatus*) has also occasionally been recorded in the area. A number of other marine mammals have been recorded in this area including minke, fin and killer whales and Risso's and common dolphins.

Reef habitat is uncommon along the eastern seaboard of Ireland due to prevailing geology and hydrographical conditions. Expansive surveys of the Irish coast have indicated that the greatest resource of this habitat within the Irish Sea is found fringing offshore islands which are concentrated along the Dublin coast. A detailed survey of selected suitable islands has shown areas with typical biodiversity for this habitat both intertidally and subtidally. Species recorded in the intertidal included *Fucus spiralis*, *Fucus serratus*, *Pelvetia canaliculata*, *Ascophyllum nodosum*, *Semibalanus balanoides* and *Necora puber*. Subtidally, a wide range of species include *Laminaria hyperborea*, *Flustra foliacea*, *Alaria esculenta*, *Halidrys siliquosa*, *Pomatocereos triqueter*, *Alcyonium digitatum*, *Metridium senile*, *Caryophyllia smithii*, *Tubularia indivisa*, *Mytilus edulis*, *Gibbula umbilicalis*, *Asterias rubens*, and *Echinus esculentus*. These Reefs are subject to strong tidal currents with an abundant supply of suspended matter resulting in good representation of filter feeding fauna such as sponges, anemones and echinoderms.

This site is of conservation importance for reefs, listed on Annex I, and Harbour Porpoise, listed on Annex II, of the E.U. Habitats Directive.

Qualifying interests

- [1170] Reefs
- Harbour porpoise *Phocoena phocoena*

3.3 Assessment of Likely Effects

This section of the Screening for Appropriate Assessment Report describes the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site(s), describes whether such impacts are likely to occur and whether the predicted impacts are likely to have a significant effect on the integrity of the Natura 2000 site(s) affected.

The following are the individual elements of the proposed development which could potentially give rise to adverse effects on the Natura 2000 site(s) listed above;

- Loading of spoil into a moored vessel at the Pigeon House Jetty could potentially have indirect effects on the neighbouring tern breeding colony at the ESB mooring dolphin, which is part of **South Dublin Bay and River Tolka Estuary SPA**.
- The disposal of spoil in the spoil disposal area to the west of the Burford Bank has the potential to adversely affect the integrity of the Natura 2000 sites within Dublin Bay due to the dispersal of fine sediment from the proposed spoil disposal area. There is also a potential for dispersal of fine sediment to the areas occupied by reefs in the proposed Rockabill to Dalkey Island SAC.
- The disposal of spoil in the spoil disposal area to the west of the Burford Bank has the potential for indirect effects on the foraging areas of seabirds that are qualifying

interests of **North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA, Dalkey Islands SPA, Howth Head SPA, Irelands Eye SPA, Lambay Island SPA and Rockabill SPA** and on Grey Seals that are qualifying interests for **Lambay Island cSAC**.

- The disposal of spoil in the spoil disposal area to the west of the Burford Bank has the potential for indirect effects on the harbour Porpoise which is one of the qualifying interests of the Rockabill to Dalkey Island SAC.

“In Combination” Impacts

Other plans and projects were identified for this area that had the potential to have an “In Combination” Effect on nearby Natura 2000 sites.

Dublin Port Company is in year 1 of a 6 year dredging programme. A single dredging operation is undertaken in the port and shipping channel approximately once every two years on average. Each single dredging operation involves a split bottom trailer suction barge of about 1,000m³ capacity loading up and dumping at the Burford Bank – The operation involves a 5 times/day for 7 days / week for three weeks dumping operation at the Burford Bank.

The only other projects, or plans, likely to have any “In Combination” effect are those other elements of the upgrade works proposed for Ringsend WWTW. These include a plan to relocate the existing outfall from the WWTW to an off-shore location. These planned projects have all been subject to their own Appropriate Assessment processes and it was concluded in all cases that the proposed projects will not pose any risk of significant negative effects on the Natura 2000 sites in Dublin Bay and will not have any adverse effects on the sites’ integrity or on their conservation objectives.

Is the proposed development likely to have a significant effect on, or have the potential to adversely affect the integrity of the Natura 2000 site South Dublin Bay and River Tolka Estuary SPA due to indirect impacts from the loading of spoil at the Pigeon House Jetty?

With regard to disturbance to waterbird populations during construction; the majority of the construction activity will be land based, with the exception of the construction of the marine diffuser shaft by marine jackup barge. Access will be from the existing Pigeon House Road which is already subject to normal vehicle and pedestrian traffic. Recent sand accumulation and development of embryonic shifting dune habitat provides a degree of separation from intertidal areas used by waterbirds on Sandymount Strand. Waterbird use of the intertidal area immediately to the east of Irishtown Nature Park is very low. This small area, between the developing sand bar and the rock-armoured shore at Irishtown Nature Park, is already heavily disturbed by amenity use, mainly walkers and dogs. It is not considered that loading activities will have any adverse impact on waterbird use of the intertidal areas within South Dublin Bay SPA.

The loading of spoil into a vessel moored at the Pigeon House Jetty will generate noise that could potentially affect the breeding colony of Common Terns and Arctic Terns that is present on the neighbouring ESB mooring dolphin, during the months of May to August each year. However, these terns have habituated to a high level of disturbance from passing shipping each day and would not be disturbed if there is no contact between the vessel and the mooring dolphin. Terns are not normally disturbed by construction noise and have habituated to existing industrial noise in the Dublin Port area. Research on other bird species in the USA found no effect of construction noise on reproductive success (Lackey *et al.*

2012). Contrary to prevailing opinion, there is little scientifically acceptable evidence that human disturbance causes substantial harm to nesting terns. Although there are no formal studies of habituation, most colonial waterbirds can become extremely tolerant of repeated human disturbance (Nisbet 2000).

It is considered that, the construction works relating to the loading of spoil will not adversely affect the integrity of any of the Natura 2000 sites listed above.

Is the proposed development likely to have a significant effect on, or have the potential to adversely affect the integrity of the Natura 2000 sites within Dublin Bay due to the dispersal of fine sediment from the proposed spoil disposal area.

In the worst case scenario, 30% of the spoil will remain in suspension in the water column for some time (300m³ daily, 168,090m³ in total during a window of a 3 year period) and has the potential to impact upon the nearby Natura 2000 sites due to dispersion. CDM Smith made an assessment of the dilution and dispersion of the load following dumping, based on an examination of the environment for wind, tides, currents etc. It was predicted that these finer particles will become dispersed in the water column after a few tidal cycles. The slow or non-settling particles will be transported, diluted and dispersed and migrate according to the currents, estimated to be in the range of several hundred meters to several kilometres. In addition, over a period of time the deposited particles (clay to fine gravel size) can become re-eroded and transported northward with the current. These velocities are possible for much of the tidal cycle. The larger gravel and small cobbles, which accounts for the bulk of the material, will be less likely to be re-suspended.

Based on this information it is predicted that the volumes of suspended materials reaching the Natura 2000 sites in the intertidal parts of Dublin Bay (Bull Island SPA and South Dublin and Tolka Estuary are 3.4km and 5.7km respectively) or the reef areas in the proposed Rockabill to Dalkey Island SAC, are likely to be extremely small and probably not measurable. The main tidal currents in the area of the Burford Bank are in a north-south direction, away from the intertidal areas of Dublin Bay. Additionally, the dominant flow in this part of the Irish Sea is northwards and fines will therefore be moved away from the Natura 2000 sites around Dublin Bay and the Kish Bank and will eventually settle out in the northern Irish Sea. .

It is concluded that the dispersal of fine sediment from the proposed spoil disposal area will not adversely affect the integrity of any of the Natura 2000 sites or the proposed SAC listed above. This question is discussed in detail in Appendix 1.

Is the proposed development likely to have a significant effect on, or have the potential to adversely affect the integrity of a number of Natura 2000 sites due to the indirect effects of spoil disposal in the outer Dublin Bay area which is used as a foraging area by seabirds and seals from these Natura 2000 sites and by Harbour Porpoise, which is a qualifying interest of the proposed Rockabill to Dalkey Island SAC?

A total of nine species of seabirds, which are qualifying interests for a number of Natura 2000 sites on the Dublin coast, are likely to occur regularly in the proposed spoil disposal area to the west of the Burford Bank. The seabirds feed on a range of fish species, the most important of which are probably sandeels, clupeids (mainly Sprat) and gadoids (such as Pollack). While there is no fish stock information available for the proposed spoil disposal area to the west of the Burford Bank, it is likely to hold all of these species at different times.

The adult fish are capable of swimming away from disturbance and will probably avoid the affected area during the period of spoil disposal. Fish larvae are mostly pelagic and drift with marine currents. Grey Seals and Harbour Porpoise may occasionally forage in this area but they have a wide-ranging diet and are not dependent on any one prey species or foraging area.

The main effects of the proposed spoil disposal would be to make this area unsuitable for foraging seabirds and marine mammals for short, temporary periods. The area of the proposed disposal site is approximately 210ha and it ranges in depth from 12.5 m to 24 m, with an average depth of 19 m, chart datum (CD). This is a very small proportion of the available foraging grounds for seabirds and marine mammals in the inshore area of the Dublin coast. The short-term loss of this area for foraging is not significant for any of these species.

There will be a positive benefit to foraging seabirds and marine mammals in the medium to long term, with the creation of areas of underwater reef habitat on the surface of the seabed, formed by the rock material, providing a refuge for fish, where trawling cannot take place. This will provide additional nursery grounds and habitats for fish species that may form part of the diet of seabirds and marine mammals breeding in the Natura 2000 sites.

It is concluded that the disposal of spoil in the proposed spoil disposal area will not adversely affect the integrity of any of the existing Natura 2000 sites listed above, either directly or indirectly. This question is discussed in detail in Appendix 2.

Is the proposed development likely to have a significant effect on, or have the potential to adversely affect the integrity of the proposed Rockabill to Dalkey Island SAC due to the effects of spoil disposal within its boundaries?

The proposed spoil disposal area is located entirely within the boundaries of the proposed Rockabill to Dalkey Island SAC. It will involve the dumping of a significant amount of rock spoil to the seabed within a defined area, already extensively used for licensed dumping of dredge spoil. It is concluded that the disposal of spoil in this area has the potential to adversely affect the integrity of the proposed SAC. This question is discussed in detail in Appendices 1 and 2.

3.4 Screening for Appropriate Assessment Conclusion

It has been concluded that the proposed loading or disposal of spoil will not have a significant adverse effect, either directly or indirectly on the integrity of **North Dublin Bay cSAC, North Bull Island SPA, South Dublin Bay cSAC, South Dublin Bay and River Tolka Estuary SPA, Howth Head cSAC, Howth Head Coast SPA, Ireland's Eye cSAC, Ireland's Eye SPA, Skerries Islands SPA, Dalkey Islands SPA or Bray Head cSAC**. However, there is some potential for the proposed development to have adverse effects on **the proposed Rockabill to Dalkey Island SAC**. Therefore, a Natura Impact Statement (NIS) is required with respect to this proposed Natura 2000 site alone.

The screening assessment is summarised in Table 1.

Table 1 - Stage 1: Screening for Appropriate Assessment matrix for the proposed spoil loading and disposal for the Ringsend WWTW with regard to potential impacts on Natura 2000 sites (as listed in Section 3.2 of this report)

Ringsend WWTW: Appropriate Assessment of Spoil Disposal

Site Code	Site Name	Is there potential for a significant effect as a result of:			Stage 2 of the AA process required?
		Indirect impacts resulting from disturbance to protected species during the loading of spoil at the Pigeon House Jetty	Indirect impacts resulting from spoil disposal in the outer Dublin Bay area, which is used as a foraging area by seabirds and marine mammals from Natura 2000 sites?	Indirect impacts on protected habitats and species resulting from dispersal of sediments?	
004024	South Dublin Bay and River Tolka Estuary SPA	No	No	No	No
000210	South Dublin Bay cSAC	No	No	No	No
004006	North Bull Island SPA	No	No	No	No
000206	North Dublin Bay cSAC	No	No	No	No
000202	Howth Head cSAC	No	No	No	No
004113	Howth Head Coast SPA	No	No	No	No
004117	Ireland's Eye cSAC	No	No	No	No
004117	Ireland's Eye SPA	No	No	No	No
004069	Lambay Island SPA	No	No	No	No
004117	Lambay Island cSAC	No	No	No	No
004014	Rockabill SPA	No	No	No	No
004122	Skerries Islands SPA	No	No	No	No
004172	Dalkey Islands SPA	No	No	No	No
000714	Bray Head cSAC	No	No	No	No
003000	Proposed Rockabill to Dalkey Island SAC	No	Yes	Yes	Yes

4 STAGE 2: NATURA IMPACT STATEMENT

4.1 Introduction

The screening stage identified that an Appropriate Assessment of the proposed disposal of spoil from tunnel construction is required in order to address the potential risk of impacts on the proposed Rockabill to Dalkey Island SAC. The potentially significant adverse effects on the integrity of this site, that could result, may require the implementation of mitigation measures. A brief description of the proposed SAC is provided in Section 2.4 of this report, along with a list of the qualifying interests.

4.2 Describe the Elements of the Proposed Project That are Likely to Give Rise to Significant Effects on the proposed Natura 2000 Site.

There is the potential for significant effects on the proposed SAC or its qualifying interests as a result of the following impacts:

- Direct impacts through loss of habitat;
- Indirect impacts through disturbance from noise;
- Indirect impacts through changes in food or foraging behaviour;
- Indirect impacts through fragmentation of the population or permanent loss of foraging areas.

4.3 Conservation Objectives

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and

- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

In the case of the proposed Rockabill to Dalkey Island SAC, the conservation objectives for the site have not yet been published. However, as with all other Natura 2000 sites, they are likely to include at least the following objective:

To maintain or restore the favourable conservation condition of the Annex I habitat(s) and /or the Annex II species for which the SAC has been selected.

4.4 Describe How the Integrity of the proposed Natura 2000 Site could be affected by the Project

A definition of the concept of the ‘integrity of the site’ is provided in *Managing Natura 2000 Sites: The Provisions of Article 6 of the ‘Habitats Directive’ 92/43/EEC*, European Commission, 2000, as;

‘the coherence of the site’s ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified’

A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self-repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required.

When considering the ‘integrity of the site’, it is therefore important to take into account a range of factors, including the possibility of effects manifesting themselves in the short, medium and long-term.

This guidance document also states that ‘the decision as to whether it (integrity) is adversely affected should focus on and be limited to the site’s conservation objectives’.

Table 2. Natura Impact Statement matrix for the proposed spoil loading and disposal for the Ringsend WWTW with regard to potential impacts on the proposed Rockabill to Dalkey Island SAC

Possible impacts of the proposed development on qualifying interests	Qualifying Interests	
	Reefs	Harbour porpoise
Direct impacts through loss of habitat	No impacts as the reefs are restricted to the landward fringe and are remote from the proposed disposal area	None likely as the area of the proposed spoil disposal has been used for dredge disposal for many decades
Indirect impacts through dispersal of fine sediments settling on the qualifying habitats within the proposed SAC	Impacts unlikely as the reefs are restricted to the fringing areas of islands and mainland rocky shore and are exposed on high energy coasts that are subject to strong tidal currents	Not applicable
Indirect impacts through disturbance from noise	Not applicable	Some temporary localised impacts during dumping

Indirect impacts through changes in food or foraging behaviour	Not applicable	Some temporary localised impacts during dumping
Indirect impacts through fragmentation of the population or permanent loss of foraging areas	Not applicable	None likely

The Annex II habitat "Reefs" is not as prevalent on the east coast of Ireland as it is on other parts of the Irish coastline. Indeed the feature is largely limited to a number of islands and islets and several headlands, all of which are surrounded by relatively shallow waters, often less than 10 meters deep. Accordingly, along the east coast of Ireland the biological communities that are often associated with reefs are not only limited in distribution and extent, but also in biological characteristics on account of the predominantly shallow water (MERC Consultants 2010). In the proposed SAC, reefs only occur on the fringes of the islands and around Howth Head, so would not be affected directly by the disposal of spoil from this project. Indirect impacts of the settlement of fine sediments from the spoil disposal area are unlikely as the reefs are restricted to the fringing areas of islands and mainland rocky shore and are exposed on high energy coasts that are subject to strong tidal currents.

The Annex II species Harbour Porpoise is one the two qualifying interests of the proposed Rockabill to Dalkey Island SAC. This species is found throughout Dublin Bay and surrounding waters and has been recorded at higher densities here than in any other Irish waters (Berrow *et al.* 2008). A review of the international literature on dredging impacts on cetaceans is provided in Appendix 2 and summarized below:

1. Porpoises tend to swim away from approaching vessels although they may habituate to moored vessels engaged in dumping at sea, that is they are unlikely to regard the vessels as a threat and the porpoises are likely to avoid them;
2. Noise associated with dumping of spoil can be detectable underwater at distances of up to 6km and this may cause porpoises to maintain a safe distance from the source of the noise;
3. Noise from the dumping of rock spoil would be considered a medium impact when compared to other audible impacts on cetaceans although at close range these may mask the sounds produced by the animals themselves;
4. Porpoises feed mainly on small shoaling fishes and these fish species (e.g. whiting, sand eels and herring) are likely to move temporarily away from any disposal of spoil;
5. Recent monitoring of the marine benthos in the area of the Burford Bank shows that long term use of this spoil disposal site is only affecting the disposal site itself and not the areas surrounding the disposal site.
6. The Harbour Porpoise is the commonest species of cetacean in Irish waters and has a more or less continuous distribution around the coast in inshore areas. There is no evidence that the existing dredging and dredge spoil disposal in Dublin Bay has caused any fragmentation of the population or permanent loss of foraging areas.

In view of these conclusions, it is likely that the effects of spoil disposal on the Harbour Porpoise in Dublin Bay would, at worst, be localised and temporary. It is expected that the animals would habituate to stationary vessels and would return to foraging in the affected areas when the operations are completed.

Given that Dublin Bay currently supports the highest known densities of Harbour Porpoise in Irish waters and that dredging and dredge disposal have been active in limited areas of the bay for many decades, it would appear that the animals have habituated to the operations and are not significantly affected over the long-term. While the disposal of rock spoil for this application will occur over a longer period of time, it will affect the same area as previous dredge disposal and will be carried out at a low level of intensity. It is thus unlikely to have any greater effects on Harbour Porpoise than the previous dredge disposal operations.

4.5 Describe Mitigation Measures that are to be introduced to Avoid, Reduce or Remedy the Adverse Affects on the Integrity of the Site

A comprehensive method statement for the proposed spoil disposal will be prepared to mitigate any temporary impacts on marine mammals in the vicinity of the proposed spoil disposal area. Underwater noise levels will be monitored in accordance with a monitoring plan to be agreed with the National Parks and Wildlife Service during the construction period with particular emphasis on the protection of marine mammals. This will follow best practice guidelines as published by NPWS (2012). This includes the deployment of a qualified Marine Mammal Observer on all vessels involved in the disposal of spoil at sea and the maintenance of a buffer zone around the disposal area, which should be free of marine mammals during the operation.

4.6 Natura Impact Statement Conclusion

It has been concluded that, with the full implementation of mitigation measures described above in Section 4.5, there will be no risk of significant adverse effects of the proposed disposal of spoil from the tunnel construction works, either alone or in combination with other plans or projects, and therefore, no adverse effect on the integrity of the proposed Natura 2000 site, as defined by its likely conservation objectives.

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**RINGSEND WASTE WATER TREATMENT WORKS
DUBLIN**

**DUMPING AT SEA LICENCE APPLICATION
FOR SPOIL DISPOSAL FOR
THE RINGSEND WWTW LONG SEA OUTFALL**

APPROPRIATE ASSESSMENT

APPENDICES 1 AND 2

FEBRUARY 2013



Natura Consultants, Glanmore,
Ashford, Co. Wicklow, Ireland.

T: +353 (0) 404 34300

M: (0) 86 825 0414

E: info@naturaconsultants.com

W: www.naturaconsultants.com

Table of Contents

APPENDIX 1: POTENTIAL IMPACTS ON THE MARINE BENTHIC COMMUNITIES AND FISH STOCKS ASSOCIATED WITH NATURA 2000 SITES.....	2
1 INTRODUCTION	3
1.1 Background.....	3
1.2 Disposal Site.....	3
1.3 Nature of Spoil for Disposal.....	4
2 BASELINE DESCRIPTION OF THE MARINE ENVIRONMENT	6
2.1 Marine Benthic Communities	6
2.2 Fish Stocks, Spawning and Nursery Areas	8
3 POTENTIAL IMPACTS FROM SPOIL DISPOSAL.....	8
3.1 Increase of Suspended Sediments and Migration of Spoil	8
3.2 Contamination	9
3.3 Smothering of Macrobenthos.....	9
3.4 Smothering of Fish Larvae and Juveniles	9
3.5 Formation of a subtidal cobble reef	10
4 CONCLUSIONS	10
5 REFERENCES	10
APPENDIX 2: POTENTIAL IMPACTS ON SEABIRDS AND MARINE MAMMALS ASSOCIATED WITH NATURA 2000 SITES.....	12
1. INTRODUCTION.....	13
1.1 Background.....	13
1.2 Proposed spoil disposal site.....	13
1.3 Nature of the proposed spoil disposal.....	13
2. METHODOLOGY	15
3. SEABIRDS AND MARINE MAMMALS PRESENT IN THE AREA OF PROPOSED SPOIL DISPOSAL ..	15
3.1 Seabirds	15
3.2 Cetaceans.....	17
3.3 Seals	18
4. CONNECTIONS BETWEEN SEABIRDS, MARINE MAMMALS AND NATURA 2000 SITES.....	18
5. POSSIBLE IMPACTS ON SEABIRDS AND MARINE MAMMALS	23
5.1 Potential indirect impacts of the proposed spoil disposal on seabird and marine mammal species which are qualifying interests of the Natura 2000 sites	23
5.2 Potential indirect impacts of the proposed spoil disposal on intertidal areas of Dublin Bay which are designated as Natura 2000 sites	24
5.3 Disturbance of Harbour Porpoise due to noise or vibration caused by spoil dumping.....	24
5.4 Impacts on Harbour Porpoise food resources and foraging behaviour.....	25
5.5 Loss of foraging areas and fragmentation of habitat for Harbour Porpoise.....	26
6 CONCLUSIONS	26
APPENDIX 2.1: CETACEAN SIGHTINGS RECENTLY REPORTED IN THE VICINITY OF THE PROPOSED SPOIL DISPOSAL AREA (IRISH WHALE AND DOLPHIN GROUP)	32
APPENDIX 2.2: DIET OF SEABIRDS LIKELY TO OCCUR IN THE AREA OF BURFORD BANK, DUBLIN BAY ..	33

APPENDIX 1: POTENTIAL IMPACTS ON THE MARINE BENTHIC COMMUNITIES AND FISH STOCKS ASSOCIATED WITH NATURA 2000 SITES

SUMMARY

The proposed disposal operation is estimated to involve the daily disposal of up to 1,000m³ of spoil for a period of up to 3 years. Settlement rate analysis has indicated that in a worse case scenario (higher fraction of smaller particles in the spoil), 50% of the spoil will settle to the seafloor in 15 minutes. The sand particles (20 %) were estimated to reach the bottom in approximately 1 hour. Given the settling characteristics of the rock/gravel material, the risk of the rock/gravel material being transported beyond the perimeter of the spoil ground is low. Therefore, this element of the disposal operations will not impact upon or affect the integrity of the nearby Natura 2000 sites.

In the worse case scenario, the remaining 30% will remain in suspension in the water column for some time (300m³ daily, 168,090m³ in total over a 3 year period) and has the potential to impact upon the nearby Natura 2000 sites due to dispersion. The main tidal currents in the area of the Burford Bank are in a north-south direction, away from the intertidal areas of Dublin Bay. The fine sediment particles will be transported northwards and will eventually settle out in the northern part of the Irish Sea. From available data it was predicted that the volumes of suspended materials reaching the Natura 2000 sites in the intertidal parts of Dublin Bay are likely to be extremely small and probably not measurable. Contamination is not a concern due to the fact that the material to be disposed of is inert.

As the proposed site has been used for dredge spoil disposal for several decades, the benthos and demersal fish species have been subjected to periodic smothering. The proposed disposal of the material arising from the tunnelling operation will also smother the existing infaunal benthic communities in the area and once the disposal operations have been completed, it is predicted that an epifaunal assemblage comprising of sponges, hydroids, serpulids, barnacles, mytilids, bryozoans and tunicates will settle on the cobble and stones.

As part of the EIS for this project, the base line survey of benthic communities included a site some 5km to the west of the disposal site. This location had been originally surveyed in the early 1980s as part of the first quantitative benthic survey of Dublin Bay. A comparison of the results between this original study and the present survey showed no significant changes in sediment types or infaunal macrobenthos. This indicates that the effect of the long term use of this spoil disposal site is only affecting the disposal site itself and not the areas surrounding the disposal site.

1 INTRODUCTION

1.1 Background

AQUAFAC International Services were commissioned by CDM Smith to carry out the marine benthic and fisheries sections of a Natura Impact Statement for Appropriate Assessment for the dumping at sea element of the Ringsend Waste Water Treatment Works.

1.2 Disposal Site

Figure 1.1 shows the location of the Burford Bank spoil ground and Table 1.1 presents the bounding coordinates. The spoil ground is located approximately 3km south of Howth's Bailey lighthouse, approximately 5.7km northeast of Dalkey Island and between 140 – 375m west of the Burford Bank. It is also located approximately 8.75km east of the Pigeon House Jetty proposed for loading. The area of the proposed dump site is approximately 2, 105,000 m² and it ranges in depth from 12.5 m to 24 m with an average depth of 19 m. All depths are to Chart Datum.

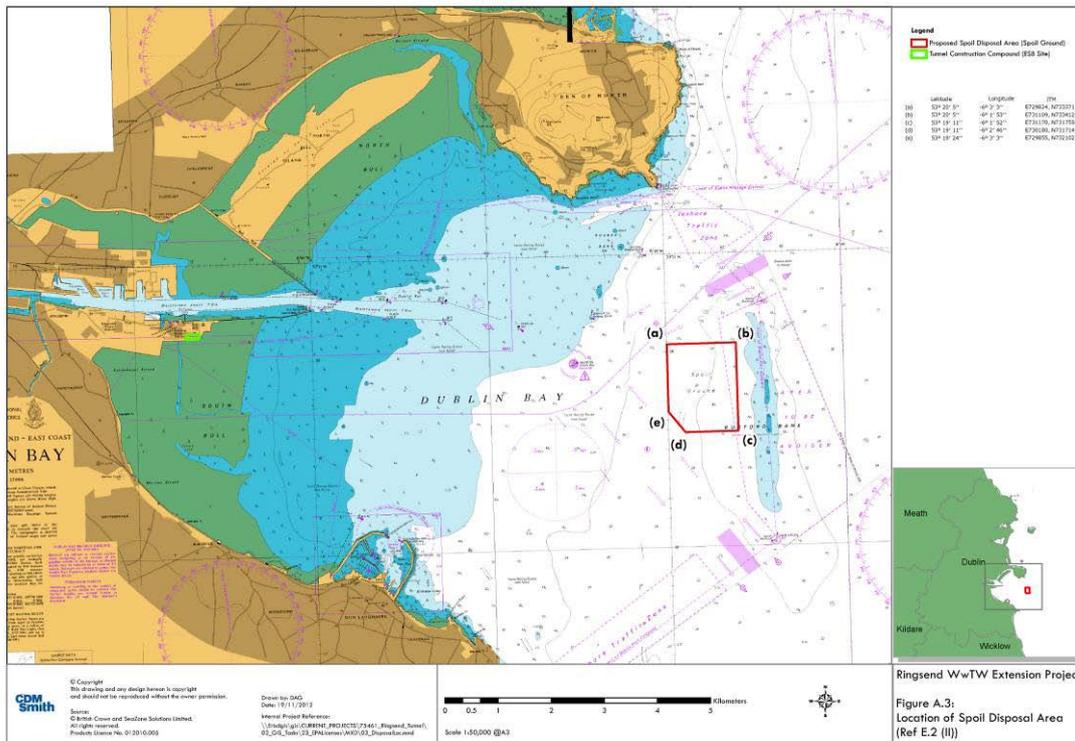


Figure 1.1: Location of the Burford Bank spoil ground.

Table 1.1: Burford Bank spoil ground coordinates

Spoil ground Corner (see Figure 1.1.)	Longitude (DDM)	Latitude (DDM)	Easting (ING)	Northing (ING)
a	6° 3.053' W	53° 20.080' N	329893	233348
b	6° 1.883' W	53° 20.079' N	331192	233381
c	6° 1.874' W	53° 19.181' N	329928	232071
d	6° 2.772' W	53° 19.180' N	330251	231688
e	6° 3.053' W	53° 19.392' N	331248	231716

1.3 Nature of Spoil for Disposal

The excavation of the tunnel will result in approximately 560,300m³ of spoil which will require disposal at sea¹. The tunnel will be excavated through limestone bedrock and the Tunnel Boring Machine (TBM) will crush the limestone rock. Table 1.2 shows the estimated average composition of the rock material, the highest portion of which will be gravel. The surface seabed sediments representative of the type of marine sediment that will be drilled for the diffuser shaft were described as very soft grey slightly sandy clay with rare shell fragments. The depth of overburden was 25m, with the material in the borehole consisting of 52% clay, 36% gravel and 12% sand.

Table 1.2: Material Composition (based on BS 1377-2:1990)

Material Category	Estimated Average %
Small cobbles (< 10cm)	19
Gravel (> 2mm)	51
Sand (0.06 – 2 mm)	13
Silt (0.002 – 0.06 mm)	6
Clay (< 0.002 mm)	11

Under the OSPAR Guidelines for the Management of Dredged Material (OSPAR, 1998) previously undisturbed geological material is exempt from detailed characterisation which includes chemical and biological, see extract below:

5.2 Dredged material may be exempted from the testing referred to in paragraphs 5.4 to 5.9 of these Guidelines if any of the criteria below are met:

- a) it is composed of previously undisturbed geological material; or*
- b) it is composed almost exclusively of sand, gravel or rock; or*
- c) in the absence of appreciable pollution sources, which should be supported by existing local information so as to provide reasonable assurance that the dredged material has not been contaminated, the quantity of dredged material from single dredging operations does not exceed 10,000 tonnes per year.*

Dredged material that does not meet one of these requirements will need further stepwise characterisation to assess its potential impact (i.e. see paragraphs 5.3-5.9).

The Marine Institute and the EPA and the Radiological Protection Institute of Ireland (RPII) were consulted with, and it was confirmed that testing of the limestone material to determine its chemical and biological nature would not be necessary as the limestone is an inert material of natural origin and does not consist of constituents likely to be released into the environment.

It was also determined through discussions with the Marine Institute, Radiological Protection Institute of Ireland (RPII) and the EPA, that the marine sediment from the drilling of the diffuser shaft would not require materials analysis, given the relatively small quantity and given its close proximity (ca. 150m) to spoil disposal area at Burford Bank where it is proposed to redeposit it. Also there is no reason to believe that the material contains anything other than unmodified natural radionuclides at background levels comparable with that in the receiving environment and therefore can be dumped at sea (CEFAS, 2006).

¹ 512,700m³ – Tunnel and diffuser spoil
47,600m³ - Inlet shaft spoil

The proposed dumping methodology is by split bottom barge and it is estimated that a load of up to 1,000m³ will be disposed of at sea on a daily basis for a period of up to 3 years. It should be noted that on the basis of the volume of spoil to be disposed and this frequency the actual period over which disposal will take place is likely to be considerably less than 3 years. However, 3 years in this case has been taken as the maximum operational window in view of uncertainties at this stage in the production rate of the TBM which will depend on hardness of the rock encountered and other issues that might be encountered.

The settlement rates² were based on three scenarios based on estimated particle size ranges, as described below and displayed in Table 1.3:

- An average scenario – where the average is calculated based on the range of possible particle sizes and is considered a more typical scenario;
- An upper limit – with a larger portion of smaller particles assumed – the worst case scenario; and
- A lower limit – with a smaller portion of smaller particles – the best case scenario.

Table 1.3: Material Composition – Average, Upper and Lower Limit (Based on BS 1377-2:1990).

Material Category	Average %	Upper limit %	Lower limit %
Small cobbles (< 10cm)	19	10	28
Gravel (> 2mm)	51	40	62
Sand (0.06 – 2 mm)	13	20	6
Silt (0.002 – 0.06 mm)	6	10	2
Clay (< 0.002 mm)	11	20	2

The analysis showed that in an average water depth of 19 m, the percentage of the material that will be on the bottom in less than 15 minutes for each of the scenarios is as follows:

- Average scenario 70 %;
- Worst case scenario 50 %; and
- Best case scenario 90 %.

This material equates to the gravel and cobble portion (i.e. greater than 2 mm), that is predicted to reach the bottom within 15 minutes. The sand particles (6-20 %) were estimated to reach the bottom in approximately 1 hour. In reality the sand portion, will likely fall through the water column along with the gravels, as a well defined jet of high density fluid.

In all scenarios the analysis showed that, based solely on the sinking velocities of clay (includes residual bentonite) and silt particles, they may remain in the water column for some time. However, when taking other factors such as tides and currents into consideration it is likely that these particles will become dispersed in the water column after one or more tidal cycles. The slow or non-settling particles will be transported and migrate according to the currents, that is in a north or south direction depending on the tide, in range of some hundred metres to some kilometres.

An earlier modelling study on the previous Burford Bank site by Irish Hydrodata (1995) assessed the settlement rates of Dublin Ports dredged material which consisted of silty sand material (sand and silt 92 %). For each of the tidal simulations modelled (on both spring and

² An assessment was made with no currents considered and as if the particles were settling in a container of still sea water. The sinking material was assumed to fall according to Stoke's law which is based on properties of the particle

neap tides) the settlement results were found to be similar; with the sand fraction settling very rapidly within 500 seconds of discharge while for the silt and clay fraction between 1 and 1.5% of the material was still in suspension after 4 hours. The horizontal distribution of settled material on the spoil ground was found to be closely related to the disposal pattern due to the speed at which it settles out. The material they modelled had a much higher percentage of fine material (sand and silt 92 %) in comparison to this proposal for dumping at sea which is predominantly gravel material (51 %).

Over a period of time the deposited particles can become re-eroded and transported northward with the current. The particle size determines the erosion velocity based on the Hjulström-diagram for the stability of the seabed subject to current-flow (Smoltczyk, 2002). For example sand particles have an erosion velocity of 0.2-0.4 m/s and for the smaller gravel fraction (> 2 mm) it is between 0.3-0.4 m/s. These velocities are possible for much of the tidal cycle. The larger gravel and small cobbles, which accounts for the bulk of the material, will be less likely to be re-suspended. For example, a particle of 4 mm would require velocities of 0.7-0.8 m/s to become entrained, and these velocities are not common on the seabed at the spoil disposal site.

2 BASELINE DESCRIPTION OF THE MARINE ENVIRONMENT

2.1 Marine Benthic Communities

Marine Benthic Communities in the Spoil Ground

A baseline marine benthic ecological assessment of the Burford Bank spoil ground was carried out in 2008 on behalf of Dublin Port Company. Eight stations located within the spoil ground and 2 control sites (located southwest of the spoil ground) were surveyed in November 2007. Five replicate van Veen grabs were collected at each station for faunal analysis and a sixth was collected for sediment grain size and organic carbon analysis. Five replicate Sediment Profile Images were also collected at each station.

The survey results revealed that the spoil ground consisted of mud and muddy fine sands with a low organic content (Kennedy, 2008). The spoil ground was characterised by two faunal communities, consisting of 1) the polychaetes *Nephtys hombergii*, *Ophelia borealis* and *Spiophanes bombyx* and 2) the bivalve *Thracia phaseolina*, the brittle star *Amphiura filiformis* and the polychaete *Lagis koreni* (Kennedy, 2008). The first community conforms to the JNCC habitat SS.SMu.ISaMu.NhomMac *Nephtys hombergii* and *Macoma balthica* in infralittoral sandy mud (Connor *et al.*, 2004) and with Circalittoral muddy sands SS6 as defined by Fossit (2000). The second community conforms to the JNCC habitat SS.SMu.CSaMu.AfilMysAnit *Amphiura filiformis*, *Kurtiella bidentata* and *Abra nitida* in circalittoral sandy mud (Connor *et al.*, 2004) and with Circalittoral muds SS7 as defined by Fossit (2000). The macrobenthic communities are typical of these habitat types (Kennedy, 2008).

There was however a generally low similarity between replicates from the same station, indicating that the sediment type is patchy on small scales or subject to frequent perturbation. (Kennedy, 2008)

The stations that did show some degree of overlap were the stations located closest together, indicating that the community distribution reflected spatial variability, most likely in sediment type (Kennedy, 2008). This spatial variability is probably indicative of physical

stress due to shallow water depths, currents, tides and passing heavy shipping (Kennedy, 2008).

AQUAFACCT carried out a benthic survey in the area of the proposed outfall location for the Ringsend WWTW EIS. Three of the survey locations were located in the southwestern part of the spoil ground, while the remainder were located to the west of the spoil ground. This survey revealed that the substrata in this area consisted of sandy sediments with varying proportions of gravel and mud. Organic carbon levels in the area were considered to be high. The fauna observed in the area was similar to that found during a 1971/72 survey of the same area carried out by Walker & Rees (1980). The fauna observed during the current study is similar to two faunal groups identified by Walker & Rees (1980), namely Groups I and II of these authors. These communities showed resemblances to the shallow *Venus* or Boreal offshore sand association (see Jones, 1950) and the Boreal offshore muddy sand association (see Jones, 1950; Thorson, 1957). This stability over a period of ca 40 years indicates that the benthic habitat of Dublin Bay has not altered in that time period and that the biological communities are also stable.

All species recorded are common in Irish waters and typical of the sedimentary habitats encountered. None of the species recorded are endangered, rare or of conservation importance.

Marine Benthic Communities in nearby Natura 2000 Sites

The Kish Bank (potential SAC/SPA) consists of a sandy substratum, ranging from medium to very-fine sand with relatively low organic carbon (Roche *et al.*, 2007). Four different faunal assemblages were identified from the Kish Bank. These comprised the marine habitat biotopes: *Glycera lapidum* in impoverished infralittoral mobile gravel and sand (SS.SCS.ICs.Glap); *Abra prismatica*, *Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSA.CFiSa.ApriBatPo); *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand biotope (SS.SSA.IFiSa.NcirBat) and *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSA.CMuSa.AalbNuc).

The South Dublin Bay mud and sandflats were classified as Ls.LSa.FiSa.Po.Aten. Polychaetes and *Angulus tenuis* in littoral fine sand' (AQUAFACCT, 2006). Species common to the area include the bivalves (*Angulus tenuis*) and *Cerastoderma edule*, the polychaetes *Lanice conchilega*, *Arenicola marina*, *Owenia fusiformis*, spionids and maldanids and the echinoderms *Ophiura alba* and the following algal species: *Enteromorpha* spp. and *Ulva lactuca*.

The North Dublin Bay mud and sandflats consist of green algal mats (*Enteromorpha* spp., *Ulva lactuca*) cover large areas of the flats during summer. These sediments have a rich macrofauna, with high densities of lugworm (*Arenicola marina*) in parts of the north lagoon. Mussels (*Mytilus edulis*) occur in places, along with bivalves such as *Cerastoderma edule*, *Macoma balthica* and *Scrobicularia plana*. The small gastropod *Hydrobia ulvae* occurs in high densities in places, while the crustaceans *Corophium volutator* and *Carcinus maenas* are common. The sediments on the seaward side of North Bull Island are mostly sands.

The proposed Rockabill to Dalkey Island SAC contains areas classified as Reefs. A detailed survey of selected suitable islands has shown areas with typical biodiversity for this habitat both intertidally and subtidally. Species recorded in the intertidal included *Fucus spiralis*, *Fucus serratus*, *Pelvetia canaliculata*, *Ascophyllum nodosum*, *Semibalanus balanoides* and *Necora puber*. Subtidally, a wide range of species include *Laminaria hyperborea*, *Flustra*

folicacea, Alaria esculenta, Halidrys siliquosa, Pomatocereos triqueter, Alcyonium digitatum, Metridium senile, Caryophyllia smithii, Tubularia indivisa, Mytilus edulis, Gibbula umbilicalis, Asterias rubens, and Echinus esculentus. These Reefs are subject to strong tidal currents with an abundant supply of suspended matter resulting in good representation of filter feeding fauna such as sponges, anemones and echinoderms.

2.2 Fish Stocks, Spawning and Nursery Areas

Recreational fishing from the shore occurs all around Dublin Bay. A wide variety of species are fished *e.g.* mackerel, garfish, coalfish, plaice, dab, dogfish, ray, wrasse, whiting, bass, mullet, pollack, codling, conger, flounder, rockling, pouting, spurdog and tope.

There are commercial fisheries for *Nephrops*, cod (*Gadus morhua*), plaice (*Pleuronectes platessa*) and sole (*Solea solea*) in the Irish Sea (Marine Institute, 2011). The most abundant species in trawl surveys are dab (*Limanda limanda*), plaice (*Pleuronectes platessa*), solenette (*Buglossidium luteum*) and common dragonet (*Callionymus lyra*) along with large numbers of poor-cod, whiting and sole (Marine Institute, 2011) Lesser spotted dogfish *Scylliorhinus canicula* is abundant throughout (Marine Institute, 2011). The following shellfish species are fished in the Dublin Bay area: lobster, razor clams, scallops, velvet crabs and whelk. It should be noted that Dublin Bay is not a designated shellfish waters under the Irish Shellfish Regulations (SI 200/1994).

The area in and around the spoil ground is a spawning and nursery ground for cod, a nursery ground for haddock, a nursery area for horse mackerel and mackerel and a spawning ground for whiting (Lordan & Gerritsen, 2009).

Of the above fish species mentioned, only those that act as a food source for birds or Harbour Porpoise, which are qualifying interests of the Natura 2000 sites (and proposed Natura 2000 sites) are considered connected to the Natura 2000 sites.

Gadoids (cod, pollack and hake), clupeids (sprat, herring, shad, sardines), mackerel, sandeels, whiting, cottids (sculpins), sprat, saithe, sea scorpion, butterflyfish, dab, flounder, plaice, ling, eel, sea trout, rockling, 15-spined stickleback are all important food sources for the Natura 2000 birds.

While not commercially targeted, sandeels are common to all Irish sandbanks and are found at the Kish Bank.

3 POTENTIAL IMPACTS FROM SPOIL DISPOSAL

3.1 Increase of Suspended Sediments and Migration of Spoil

The proposed disposal operation is estimated to involve the daily disposal of up to 1,000m³ of spoil for a period of up to 3 years.

Settlement rate analysis has indicated that in a worse case scenario (higher fraction of smaller particles in the spoil), 50% of the spoil will settle to the seafloor in less than 15 minutes. The sand particles (20 %) were estimated to reach the bottom in approximately 1 hour. Given the settling characteristics of the rock/gravel material, the risk of the rock/gravel material being transported beyond the perimeter of the spoil ground is low. Therefore, this

element of the disposal operations will not impact upon or affect the integrity of the nearby Natura 2000 sites.

In the worst case scenario, the remaining 30% will remain in suspension in the water column for some time (300m³ daily, 168,090m³ in total over a 3 year period) and has the potential to impact upon the nearby Natura 2000 sites due to dispersion. In reality the finer portion, will likely fall through the water column along with the gravels, as a well defined jet of high density fluid. It should also be noted that on the basis of the volume of spoil to be disposed and this frequency the actual period over which disposal will take place is likely to be considerably less than 3 years. However, 3 years in this case has been taken as the maximum operational window in view of uncertainties at this stage in the production rate of the TBM which will depend on hardness of the rock encountered and other issues that might be encountered.

CDM Smith made an assessment of the dilution and dispersion of the load following dumping based on an examination of the environment for wind, tides, currents etc. It was predicted that these finer particles will become dispersed in the water column after a few tidal cycles. The slow or non-settling particles will be transported, diluted and dispersed and migrate according to the currents, estimated to be in the range of several hundred meters to several kilometres. In addition, over a period of time the deposited particles can become re-eroded and transported northward with the current. These velocities are possible for much of the tidal cycle. The small cobbles cannot be re-suspended.

The main tidal currents in the area of the Burford Bank are in a north-south direction, away from the intertidal areas of Dublin Bay. Additionally, the dominant flow in this part of the Irish Sea is northwards and fines will therefore be moved away from the Kish Bank and will eventually settle out in the well documented large mud patch in the northern Irish Sea. Based on this information, it is predicted that the volumes of suspended materials reaching the Natura 2000 sites in the intertidal parts of Dublin Bay are likely to be extremely small and probably not measurable.

3.2 Contamination

Contamination is not an issue for the proposed disposal operation as the material to be disposed of is inert and not of concern.

3.3 Smothering of Macrobenthos

As noted above, it is predicted that the volumes of suspended materials reaching the Natura 2000 sites in the intertidal parts of Dublin Bay are likely to be extremely small and probably not measurable. As current patterns in the area are to a great extent north south, the likelihood of any significant levels of suspended sediments reaching the inner parts of Dublin Bay is seen as extremely low. As noted in Section 4.1 above, fines will not settle around the Kish Bank but will be transported northwards by the current and will eventually settle out in the northern part of the Irish Sea.

3.4 Smothering of Fish Larvae and Juveniles

It should be noted that whiting eggs are pelagic (float free in the water column), cod eggs are pelagic for 3 months then settle to start permanent demersal life (near the seafloor), juvenile mackerel and horse mackerel are pelagic and haddock juveniles are pelagic for the first few months when they feed on copepods and then adopt a demersal life. Pelagic larvae have the potential to swim away from loads of suspended sediments and it is expected that these species will avoid such plumes when they are present. One of the sandeels avoidance

responses is to burrow themselves in sediments and this capacity of living within sediments is considered to a positive aspect of how sandeels will not be impacted by sediment settling out on the sea bed.

The spawning and nursery grounds in the Irish Sea extend over a larger portion of its northern sector and it is considered that the fine particles settling out from the disposal activities will be a very small fraction (*e.g.* less than 1%) of the total area of these habitats and therefore will not impact them.

3.5 Formation of a subtidal cobble reef

The deposition of cobbles and small stones will give rise to areas of subtidal reef habitat on the surface of the seabed, that will be colonised by a variety of invertebrates which in turn will act a food resource for a variety of species such as crab, lobster, conger, pollack and ling. As it is an existing spoil ground, bottom trawlers do not fish the site and the young adults of the commercial fish species will move away from the site over time there by enhancing the local fishery. The area may become a popular angling site over time.

4 CONCLUSIONS

The main tidal currents in the area of the Burford Bank are in a north-south direction, away from the intertidal areas of Dublin Bay and as such the volumes of suspended materials reaching the Natura 2000 sites in the intertidal parts of Dublin Bay are likely to be extremely small and probably not measurable. The fine sediment particles will be transported northwards and will eventually settle out in the northern part of the Irish Sea.

Contamination is not a concern due to the fact that the material to be disposed of is inert.

As the proposed site has been used for dredge spoil disposal for several decades (of much finer grading than proposed in this application), the benthos and demersal fish species have been subjected to periodic smothering. The proposed disposal of the material arising from the tunnelling operation will also smother the existing infaunal benthic communities in the area and once the disposal operations have been completed, it is predicted that an epifaunal assemblage comprising of sponges, hydroids, serpulids, barnacles, mytilids, bryozoans and tunicates will settle on the cobble and stones.

As part of the EIS for this project, the base line survey of benthic communities included a site some 5km to the west of the disposal site. This location had been originally surveyed in the early 1980s as part of the first quantitative benthic survey of Dublin Bay. A comparison of the results between this original study and the present survey showed no significant changes in sediment types or infaunal macrobenthos. This indicates that effect the long term use of this disposal site is only affecting the disposal site itself and not the surrounding areas.

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APPENDIX 2: POTENTIAL IMPACTS ON SEABIRDS AND MARINE MAMMALS ASSOCIATED WITH NATURA 2000 SITES

SUMMARY

This Appendix assesses the possible effects on seabirds and marine mammals (seals and cetaceans) within Natura 2000 sites of a proposed application for a Dumping at Sea licence for the spoil from a tunnelled outfall to service Ringsend Waste Water Treatment Works (WwTW) in Dublin.

A total of nine species of seabirds, which are qualifying interests for a number of Natura 2000 sites on the Dublin coast, are likely to occur regularly in the proposed spoil disposal area to the west of the Burford Bank. The northern part of the Kish Bank (6 nautical miles or 11 kilometres east) is known to be an important foraging area for these seabirds in August and September.

The seabirds feed on a range of fish species, the most important of which are probably sandeels, clupeids (mainly Sprat) and gadoids (such as Pollack). While there is no fish stock information available for the proposed spoil disposal area to the west of the Burford Bank, it is likely to hold all of these species at different times. The adult fish are capable of swimming away from disturbance and will probably avoid the affected area during the period of spoil disposal. Fish larvae are mostly pelagic and drift with marine currents.

Cetaceans are likely to forage in the proposed spoil disposal area and Harbour Porpoise is listed as a qualifying interest for the proposed Rockabill to Dalkey Island SAC. Grey Seals may occasionally feed in this area but they have a wide-ranging diet and are not dependent on any one prey species or foraging area. It is expected that the animals would habituate to stationary vessels and would return to foraging in the affected areas when the operations are completed. Given that Dublin Bay currently supports the highest known densities of Harbour Porpoise in Irish waters and that dredging and dredge disposal have been active in limited areas of the bay for many decades, it would appear that the animals have habituated to the operations and are not significantly affected over the long-term.

The main effects of the proposed spoil disposal would be to make this area unsuitable for foraging seabirds and marine mammals for short, temporary periods. The area of the proposed disposal site is approximately 210ha and it ranges in depth from 12.5 m to 24 m, with an average depth of 19 m CD. This is a very small proportion of the available foraging grounds for seabirds and marine mammals in the inshore area of the Dublin coast. The short-term loss of this area for foraging is not significant for any of these species.

There will be a positive benefit to foraging seabirds and marine mammals in the medium to long term, with the creation of areas of underwater reef habitat on the surface of the seabed, formed by the rock material, providing a refuge for fish, where trawling cannot take place. This will provide additional nursery grounds and habitats for fish species that may form part of the diet of seabirds and marine mammals breeding in the Natura 2000 sites.

It is extremely unlikely that any measurable amounts of fine sediment from the disposal area will reach the intertidal parts of Dublin Bay, which are designated as Natura 2000 sites. Hence, there is no likely indirect impact on the qualifying interests of these areas.

1. INTRODUCTION

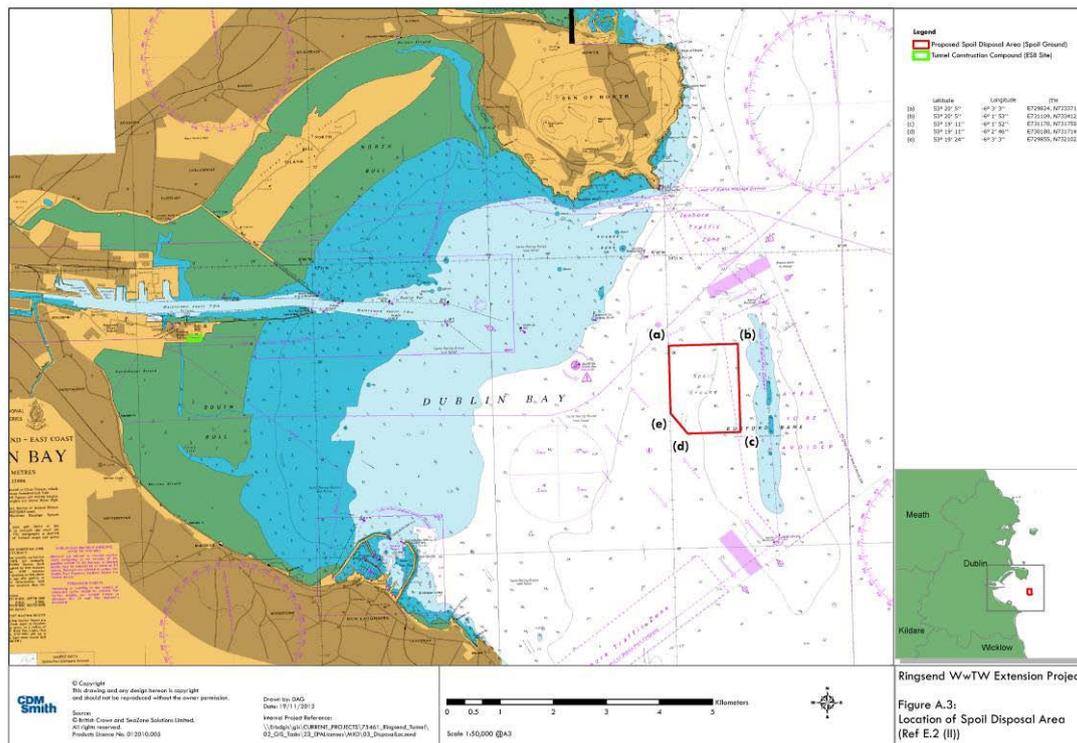
1.1 Background

This report has been commissioned by CDM Smith to assess the possible effects on Natura 2000 sites of a proposed application for a Dumping at Sea licence for the spoil from a tunnelled outfall to service Ringsend Waste Water Treatment Works (WwTW) in Dublin. It forms an appendix to the Appropriate Assessment Natura Impact Statement, prepared in compliance with the European Communities (Birds and Natural Habitats) Regulations, 2011. Under the OSPAR Convention 1998 inert materials of natural origin, that is solid, chemically unprocessed geological material, the chemical constituents of which are unlikely to be released into the marine environment, are permitted to be dumped at sea.

1.2 Proposed spoil disposal site

The proposed site for disposal of spoil from the tunnel is the existing spoil ground west of Burford Bank in Dublin Bay. The bathymetry of the site is described. The site has been used in the past for disposal of maintenance and capital dredging works and is currently licensed to Dublin Port Company (EPA Reg No. S0004-01) and Howth Yacht Club (EPA Reg No. S0010-01). The location of the proposed Spoil Disposal Area is shown in Figure 2.1.

Figure 2.1. Location of the proposed Spoil Disposal Area



1.3 Nature of the proposed spoil disposal

As a result of the tunnelling a large volume of excavated material will be generated. The bulk of the spoil will be a clean natural material. The spoil will be required to be transported from the construction compound site located on the Ringsend Peninsula for reuse or disposal.

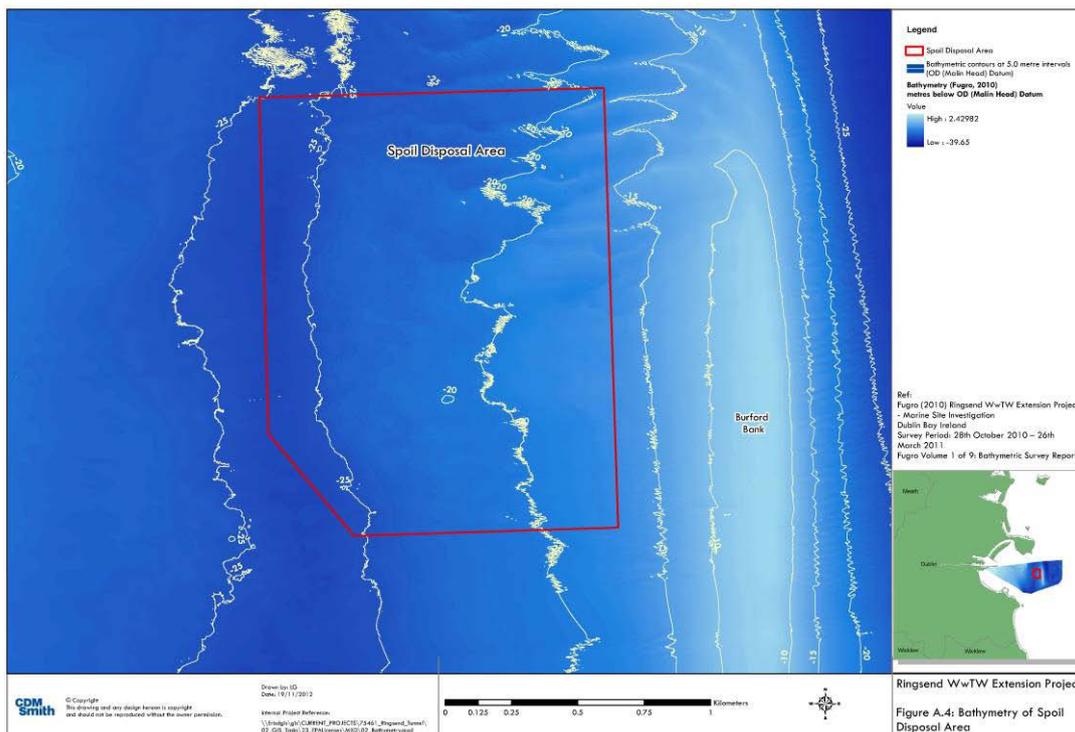
The final particle size is determined by the type and design of the Tunnel Boring Machine (TBM) as well as by the rock characteristics. The maximum size of the rock cuttings will not exceed about 10 cm in diameter and approximately 4 cm in thickness. It is estimated that from the composition of the material will be that shown in Table 2.1.

Table 2.1 Composition of the spoil material to be disposed of at sea

Material Category	%
Small cobbles (< 10cm)	10 – 28
Gravel (> 2mm)	40 – 62
Sand (0.06 – 2 mm)	6 – 20
Silt (0.002 – 0.06 mm)	4 – 30
Clay (< 0.002 mm)	2 – 20

Limestone is a naturally occurring rock that consists principally of calcium carbonate (CaCO₃). Limestone often contains variable amounts of silica (SiO₂) and alumina (Al₂O₃). So far guidance on inert waste has not been produced. Through consultation with the Marine Institute and the EPA, it has been determined that testing of the material to determine its chemical nature would not be necessary as the limestone is an inert material of natural origin and does not consist of constituents likely to be released into the environment.

Figure 2.2. Bathymetry of the proposed Spoil Disposal Area



2. METHODOLOGY

The report is based on a desk study of all available information on the occurrence of seabirds, cetaceans (whales, dolphins and porpoises) and seals in the vicinity of the Burford Bank off Dublin Bay. It also takes into account any available information on fish stocks in the affected area as relevant to seabird and mammal feeding ecology.

3. SEABIRDS AND MARINE MAMMALS PRESENT IN THE AREA OF PROPOSED SPOIL DISPOSAL

3.1 Seabirds

Seabird distribution has been surveyed in several broad surveys in the Irish Sea since the mid-1980s. Webb *et al.* (1990) present data collected in the period 1986-1990, from a number of ship-based and aircraft-based observers. The data are plotted as densities (birds per square kilometre) in a series of rectangles of 5 degrees of latitude x 10 degrees of longitude. Maps were produced for each month of the year for each species recorded. This information gives a broad picture of the range of species that could be present in the different seasons in the area of the Burford Bank. The western Irish Sea was important for much of the year, particularly near the large colonies of guillemots³ and cormorants on the islands of County Dublin. South of Dublin, the offshore banks supported large numbers of auks, shearwaters and terns following the breeding season

Pollock *et al.* (1997) also collated a large number of ship-based and aircraft-based surveys in Irish waters between 1980 and 1997. They present a series of maps of seabirds recorded by density (birds per square kilometre) in rectangles measuring 15 degrees of latitude x 30 degrees of longitude. This is a lower resolution than that used by Webb *et al.* (1990) but generally confirmed the patterns in the latter study. Cetaceans were also recorded in these surveys and the results presented by relative abundance (number of cetaceans recorded per kilometre travelled along survey transects).

Newton and Crowe (1999) reported on a series of more targeted surveys of seabirds at the north end of the Kish Bank carried out in August and September 1999. Scientists from BirdWatch Ireland used a platform on a small vessel to carry out over 11 hours of transect counts across the study area. Counts covered both low water and high water periods as well as a rising tide. The core of this survey covered an area approximately 9 degrees of latitude x 15 degrees of longitude, centred on the Kish Lighthouse. It should be noted that this survey did not cover the Burford Bank, which lies about 6 degrees west of the Kish Lighthouse. These surveys were further reported and interpreted by Newton and Crowe (2000).

A total of 3,015 birds of 26 species was recorded around the north end of the Kish Bank in August and September 1999 (Table 2.2). Of these 25 were true seabird species and one (Dunlin) was a wader species. Common Guillemots, Black-legged Kittiwakes and Common Terns were the most commonly recorded species while Roseate Terns, Kittiwakes and Common Terns were the predominant species seen roosting on the Kish Lighthouse. Over 1,000 terns were estimated to be roosting here on 3rd September 1999. A high number of Common Guillemots (1,482 on 3rd September) was also recorded in the area (Newton and Crowe 1999).

³ See Appendix 1.1 for scientific names of bird species.

Table 2.2. Number of seabirds recorded around the Kish Bank in August-September 1999. Species that are qualifying interests for the SPAs in Dublin/north Wicklow are marked with an asterisk (data from Newton and Crowe 1999).

<i>Species</i>	<i>Scientific name</i>	<i>Total number of birds recorded</i>
Fulmar*	<i>Fulmaris glacialis</i>	26
Great Shearwater	<i>Puffinus gravis</i>	3
Manx Shearwater	<i>Puffinus puffinus</i>	85
European Storm Petrel	<i>Hydrobates pelagicus</i>	1
Northern Gannet	<i>Morus bassanus</i>	42
Great Cormorant*	<i>Phalacrocorax carbo</i>	71
Shag*	<i>Phalacrocorax aristotelis</i>	53
Pomarine Skua	<i>Stercorarius pomarinus</i>	1
Arctic Skua	<i>Stercorarius parasiticus</i>	6
Little Gull	<i>Hydrocoloeus minutus</i>	2
Black-legged Kittiwake*	<i>Rissa tridactyla</i>	565
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	5
Common Gull	<i>Larus canus</i>	1
Lesser Black-backed Gull	<i>Larus fuscus</i>	4
European Herring Gull*	<i>Larus argentatus</i>	56
Great Black-backed Gull	<i>Larus marinus</i>	62
Gull species		17
Sandwich Tern	<i>Sterna sandvicensis</i>	8
Roseate Tern*	<i>Sterna dougallii</i>	71
Common Tern*	<i>Sterna hirundo</i>	181
Arctic Tern*	<i>Sterna paradisaea</i>	15
Black Tern	<i>Chlidonius niger</i>	1
Tern species		34
Common Guillemot*	<i>Uria aalge</i>	1516
Razorbill*	<i>Alca torda</i>	88
Black Guillemot	<i>Cepphus grylle</i>	1
Atlantic Puffin	<i>Fratercula arctica</i>	1
Auk species		93
Total birds		3015

A range of distributional patterns was observed in the seabird surveys of the Kish Bank. Great Cormorants and Shags were mainly found directly over the shallow water of the bank whereas large gulls (*Larus* species) appeared to be randomly scattered and occurred at approximately equal densities in the vicinity of the bank and on transects between Howth Head and the Kish Lighthouse. Black-legged Kittiwakes were present both over and to the east of the Bank with reasonable numbers also towards the seabird colony on Howth Head. Terns were mostly recorded on or to the east of the northern half of the Bank and auks, principally Common Guillemots, were concentrated to the east of the Bank. The highest densities recorded for all seabirds combined (in birds per square kilometre) were 51-100 birds/km². Significant densities of auks (mainly Common Guillemots) occurred at up to 51-100 birds/km² along several of the transects (Newton and Crowe 1999).

Additional surveys of seabirds and cetaceans on the Kish Bank were undertaken in 2001/02 and in 2010/11, on behalf of Saorgus Energy, which is proposing to build an offshore windfarm in this location. The results from these surveys are not available yet as the planning application has not been submitted.

3.2 Cetaceans

The Irish Whale and Dolphin Group records sightings of cetaceans and these are available on-line (at www.iwdg.ie). The nearest locations to the proposed spoil disposal area are at Kish Lighthouse, Howth Head and Dalkey. A summary of recent sightings at each of these locations is given in Appendix 2.1. Harbour porpoises are frequently recorded at all sites (up to 24 sightings in one year in 2011 at Howth Head). Minke Whales are also regularly recorded at Kish Lighthouse and occasionally at the other locations. Bottlenose Dolphin are being recorded with increasing frequency, especially at Dalkey. The 1999 surveys of seabirds also recorded cetaceans on the Kish Bank in August and September. The main species recorded was the Harbour Porpoise with a single dead specimen of Risso's Dolphin (Newton and Crowe 1999).

A targeted survey of Harbour Porpoise in the Dublin Bay area, in July-September 2008, found high densities of these cetaceans in the area (including in the vicinity of the Burford Bank) (Berrow *et al.* 2008). Density estimates ranged from 0.48 to 2.05 per km² which gave abundance estimates of between 56 and 238 porpoises for the whole sample area. The mean group size was quite consistent ranging from 1.08 to 1.50. The overall density estimate was 1.19 per km² which gave an estimated abundance of 138±33 porpoises (Figures 2.3 and 2.4). This represents one of the highest densities of the species recorded in Ireland to date (Berrow *et al.* 2008).

Passive Acoustic Monitoring was also carried out in Dublin Bay and other sites in Ireland, in 2008, through the deployment of self-contained click detectors called T-PODs. Data were presented as mean Detection Positive Minutes per hour (DPM). By far the highest DPM was from Dublin Bay which recorded the highest detection rate recorded in Ireland from any T-POD study to date (Berrow *et al.* 2008).

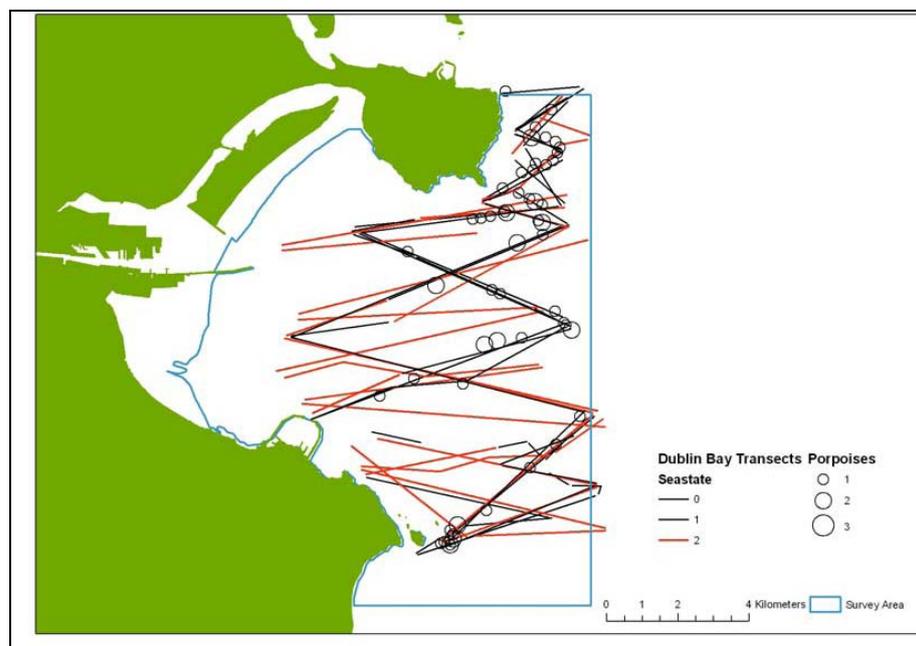


Figure 2.3. Sightings survey of Harbour Porpoises in Dublin Bay (Berrow *et al.* 2008)

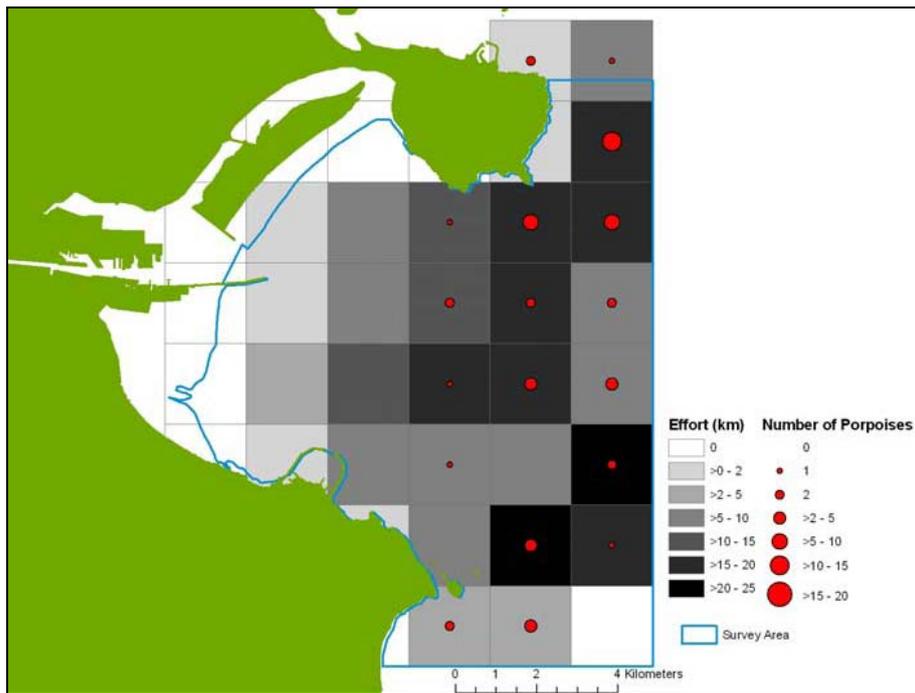


Figure 2.4. Density of Harbour Porpoises recorded in Dublin Bay (Berrow *et al.* 2008)

3.3 Seals

Both Grey Seals (*Halichoerus gryphus*) and Harbour Seals (*Phoca vitulina*) are present in Dublin Bay with a regular haul-out at the north-eastern end of the North Bull Island. Lambay Island and Ireland's Eye hold a significant breeding colony of Grey Seals with an estimated all-age population of 203 to 261 animals. There is also a haul-out of Harbour Seals on Lambay (O Cadhla *et al.* 2007). Grey Seals, in particular, range widely outside the breeding season and may occasionally forage in the proposed spoil disposal area to the west of the Burford Bank.

4. CONNECTIONS BETWEEN SEABIRDS, MARINE MAMMALS AND NATURA 2000 SITES

The Natura 2000 sites located on the Dublin/north Wicklow coast, within 20km of the proposed spoil disposal area, are shown in Figure 2.5. The qualifying interests for these Natura 2000 sites are given in Table 2.5.

The species of seabirds that are likely to use the Burford Bank area on regular basis are given in Table 2.2. However, only some of these species are qualifying interests for the Natura 2000 sites on the Dublin/north Wicklow coast (Table 2.3). The key species, which are common to both the affected area and the Natura 2000 sites, are:

- Great Cormorant
- Shag
- Black-legged Kittiwake
- European Herring Gull
- Roseate Tern
- Common Tern
- Arctic Tern

- Common Guillemot
- Razorbill.

Cetaceans are not listed as qualifying interests for any of the Natura 2000 sites designated in the Dublin Bay area to date. However Harbour Porpoise is one of the qualifying interests for the proposed Rockabill to Dalkey Island SAC and Member States are obliged to designate Special Areas of Conservation for both Harbour Porpoise and Bottlenose Dolphin, which are Annex II species listed in the EU Habitats Directive. The Location of the existing spoil disposal area in relation to the proposed Rockabill to Dalkey Island SAC is shown in Figure 2.6.

Grey Seal is a qualifying interest for Lambay Island cSAC (Table 2.3) and these animals may occasionally forage in the proposed spoil disposal area to the west of the Burford Bank.

Figure 2.5. Natura 2000 sites within 20km of the proposed Spoil Disposal Area

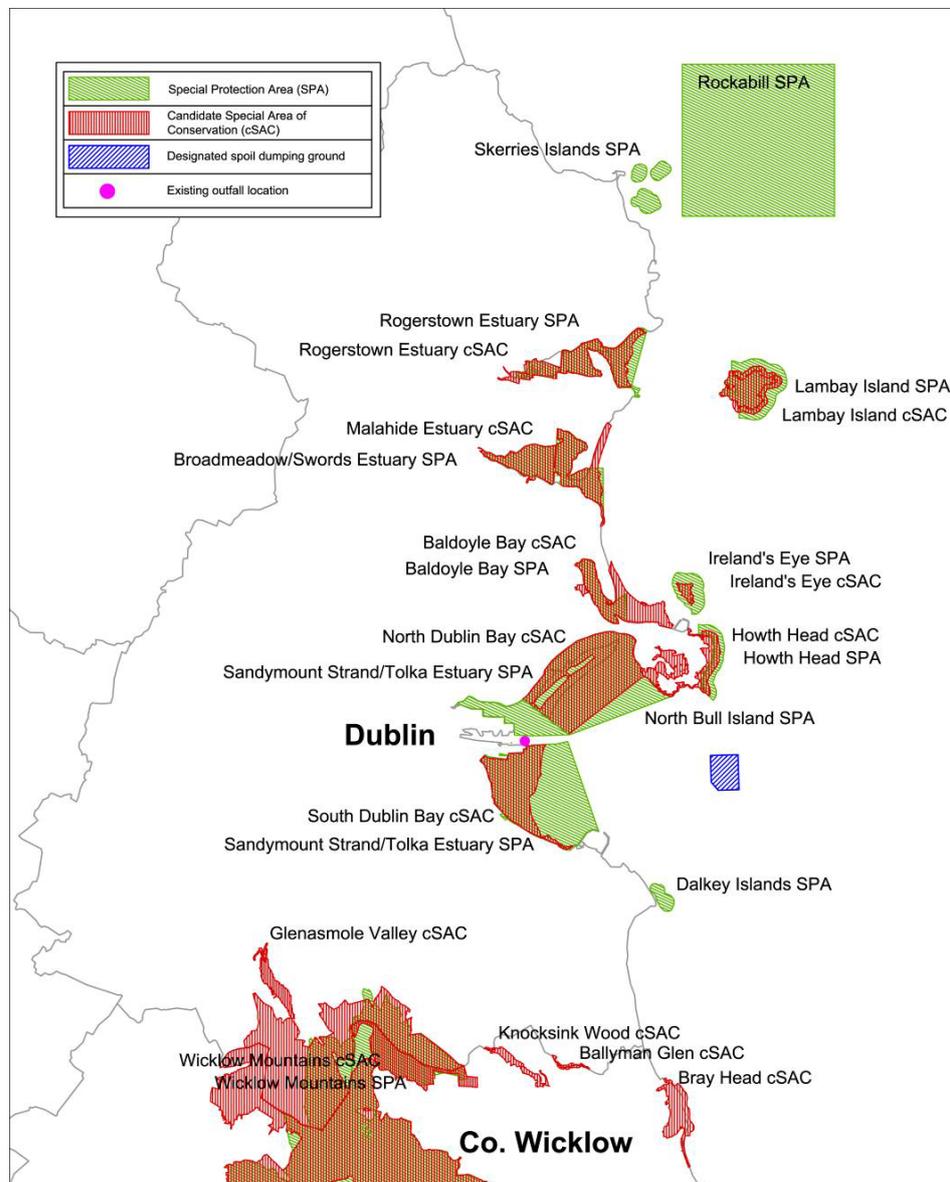


Figure 2.6 Location of the existing spoil disposal area in relation to the proposed Rockabill to Dalkey Island SAC

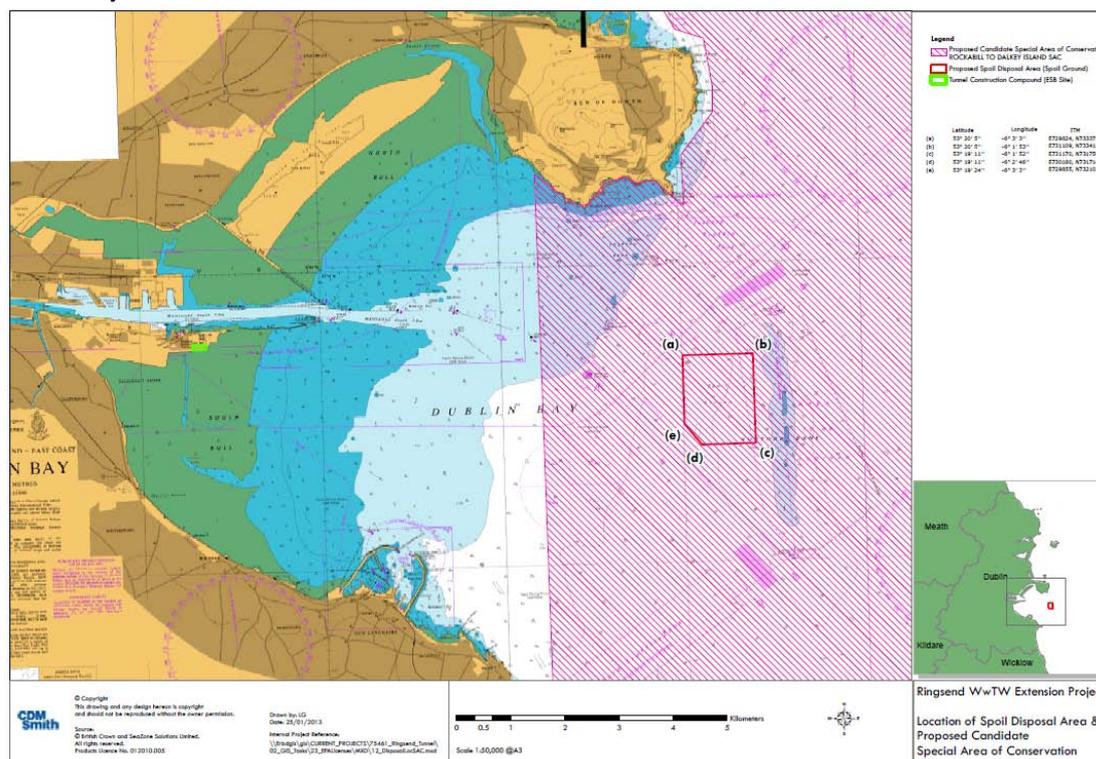


Table 2.3. Qualifying interests (habitats and species) in the Natura 2000 sites (and proposed sites) on the Dublin/north Wicklow Coast

Natura 2000 Site	Site Name	Site Code	Qualifying Interests
Special Area of Conservation (SAC)	Lambay Island	000204	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Grey seal (<i>Halichoerus grypus</i>) [1364]
	Irelands Eye	002193	Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
	Howth Head	000202	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030]
	North Dublin Bay		Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Salicornia and other annuals colonizing mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] <i>Petalophyllum ralfsii</i> [1395] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes")[2120] * Fixed coastal dunes[2130]

Ringsend WWTW: Appropriate Assessment of Spoil Disposal

Natura 2000 Site	Site Name	Site Code	Qualifying Interests
	South Dublin Bay	000210	Mudflats and sandflats not covered by seawater at low tide [1140]
	Bray Head	000714	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia)(*important orchid sites) [6210]
Special Protection Area (SPA)	Rockabill Island	004014	Cormorant (<i>Phalacrocorax carbo</i>) [A017] Shag (<i>Phalacrocorax aristotelis</i>) [A018] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Purple Sandpiper (<i>Calidris maritima</i>) [A148] Turnstone (<i>Arenaria interpres</i>) [A169] Herring Gull (<i>Larus argentatus</i>) [A184]
	Skerries Islands	004122	Cormorant (<i>Phalacrocorax carbo</i>) [A017] Shag (<i>Phalacrocorax aristotelis</i>) [A018] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Purple Sandpiper (<i>Calidris maritima</i>) [A148] Turnstone (<i>Arenaria interpres</i>) [A169] Herring Gull (<i>Larus argentatus</i>) [A184]
	Lambay Island	004069	Purple Sandpiper (<i>Calidris maritima</i>) [A148] Roseate Tern (<i>Sterna dougallii</i>) [A192] Common Tern (<i>Sterna hirundo</i>) [A193] Arctic Tern (<i>Sterna paradisaea</i>) [A194]
	Irelands Eye	004117	Cormorant (<i>Phalacrocorax carbo</i>) [A017] Herring Gull (<i>Larus argentatus</i>) [A184] Kittiwake (<i>Rissa tridactyla</i>) [A188] Guillemot (<i>Uria aalge</i>) [A199] Razorbill (<i>Alca torda</i>) [A200]
	Howth Head	004113	Kittiwake (<i>Rissa tridactyla</i>) [A188]
	North Bull Island	004006	Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Shelduck (<i>Tadorna tadorna</i>) [A048] Teal (<i>Anas crecca</i>) [A052] Pintail (<i>Anas acuta</i>) [A054] Shoveler (<i>Anas clypeata</i>) [A056] Oystercatcher (<i>Haematopus ostralegus</i>) [A130] Golden Plover (<i>Pluvialis apricaria</i>) [A140] Grey Plover (<i>Pluvialis squatarola</i>) [A141] Knot (<i>Calidris canutus</i>) [A143] Sanderling (<i>Calidris alba</i>) [A144] Dunlin (<i>Calidris alpina</i>) [A149] Black-tailed Godwit (<i>Limosa limosa</i>) [A156] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Curlew (<i>Numenius arquata</i>) [A160] Redshank (<i>Tringa totanus</i>) [A162] Turnstone (<i>Arenaria interpres</i>) [A169] Black-headed Gull (<i>Larus ridibundus</i>) [A179] Wetlands & Waterbirds [A999]
	South Dublin and River Tolka Estuary	004024	Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Oystercatcher (<i>Haematopus ostralegus</i>) [A130]

Natura 2000 Site	Site Name	Site Code	Qualifying Interests
			Ringed Plover (<i>Charadrius hiaticula</i>) [A137] Grey Plover (<i>Pluvialis squatarola</i>) [A140] Knot (<i>Calidris canutus</i>) [A143] Sanderling (<i>Calidris alba</i>) [A144] Dunlin (<i>Calidris alpina</i>) [A149] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Redshank (<i>Tringa totanus</i>) [A162] Black-headed Gull (<i>Croicocephalus ridibundus</i>) [A179] Roseate Tern (<i>Sterna dougallii</i>) [A192] Common Tern (<i>Sterna hirundo</i>) [A193] Arctic Tern (<i>Sterna paradisaea</i>) [A194] Wetlands & Waterbirds [A999]
	Dalkey Island	004172	Roseate Tern (<i>Sterna dougallii</i>) [A192] Common Tern (<i>Sterna hirundo</i>) [A193] Arctic Tern (<i>Sterna paradisaea</i>) [A194]
Proposed Special Area of Conservation (SAC)	Rockabill to Dalkey Island	003000	Reefs [1170] Harbour Porpoise (<i>Phocoena phocoena</i>)

The seabird species that are reported from the Kish Bank area are also likely to feed in the vicinity of the proposed spoil disposal area to the west of Burford Bank. An overview of the main recorded prey of these birds, based on published information, is given in Appendix 2.2. For those species likely to feed in the affected area, and which are also qualifying interests of the Natura 2000 sites, a summary of the key food items is given in Table 2.4.

Table 2.4 Summary of the key food items for qualifying seabird species likely to feed in the proposed spoil disposal area. (Scientific names given in Appendix 2.2).

Seabird species	Key food items	Sources
Great Cormorant	Ballan Wrasse, Corkwing Wrasse, Cuckoo Wrasse, European eel, Flat fish, Saithe, Pollack, Sandeel	West et al. 1975 (Little Saltee, Wexford) Okill <i>et al</i> 1992 (Shetland, Scotland)
Shag	Lesser sandeel,	Harris & Wanless 1991 (Isle of May, Scotland)
Black-legged Kittiwake	Clupeids, Sandeels, Gadoids	Chivers et al. 2012 (Lambay, Dublin)
European Herring Gull	Fisheries discards, shellfish and seabird eggs	Madden and Newton 2004
Roseate Tern	Clupeids, Sandeels, Gadoids	Newton and Crowe 2000 (Rockabill, Dublin)
Common Tern	Sandeels, Clupeids, Gadoids	Newton and Crowe 2000 (Rockabill, Dublin)
Arctic Tern	Sandeels, Clupeids, Gadoids	Newton and Crowe 2000 (Rockabill, Dublin)
Common Guillemot	Sprats, Sandeels	Hatchwell <i>et al</i> 1992 (Skomer, Wales)
Razorbill	Sandeels, Sprats	Wagner 1997 (Skomer, Wales)

Grey seals are quite catholic in their diet. Harris (2007) found forty-nine prey species in sample scats from grey seals on the west coast of Scotland. Gadoids were the main prey but sandeels were also an important component of the diet. In the Baltic Sea, the diet is dominated by herring (*Clupea harengus*), both by numbers and biomass. In addition to herring, common whitefish (*Coregonus lavaretus*) and sprat (*Sprattus sprattus*) were important prey, but cyprinids (Cyprinidae), eelpout (*Zoarces viviparus*), flounder (*Platichthys flesus*) and salmon (*Salmo salar*) also contributed significantly (Lundström *et al.* 2007)

5. POSSIBLE IMPACTS ON SEABIRDS AND MARINE MAMMALS

5.1 Potential indirect impacts of the proposed spoil disposal on seabird and marine mammal species which are qualifying interests of the Natura 2000 sites

The area in and around the spoil disposal area is a spawning and nursery ground for cod, a nursery ground for haddock, a nursery area for horse mackerel and mackerel and a spawning ground for whiting (Lordan and Gerritsen 2009). None of these species is of significant importance in the diet of those seabirds that forage in the affected area, and which are qualifying interest of the Natura 2000 sites. While not commercially targeted in the Irish Sea to date, sandeels are common to all Irish sandbanks including the Kish Bank and are likely to be common in the area of the Burford Bank.

It should be noted that whiting eggs are pelagic (float free in the water column), cod eggs are pelagic for 3 months then settle to start permanent demersal life (near the seafloor), juvenile mackerel and horse mackerel are pelagic and haddock juveniles are pelagic for the first few months when they feed on copepods and then adopt a demersal life. Pelagic larvae have the potential to swim away from loads of suspended sediments and it is expected that these species will avoid such plumes when they are present. One of the avoidance responses of sandeels is to burrow themselves in sediments and this capacity of living within sediments may ensure that they avoid burial by sediment loadings. Sandeels are also capable of swimming away from disturbance and will probably avoid the affected area during the period of spoil disposal.

Thus, the likely effects of the proposed spoil disposal would be to make this area unsuitable for foraging seabirds and marine mammals for temporary periods, immediately after each discharge of spoil material. The area of the proposed disposal site is approximately 210ha and it ranges in depth from 12.5 m to 24 m, with an average depth of 19 m CD. This is significantly deeper than the northern end of the Kish Bank which ranges from approximately 1m to 16m in depth. The proposed disposal site may thus be less suitable for foraging terns compared to the shallow banks in the general area.

The deposition of rocks and small stones on the proposed disposal site will give rise to areas of subtidal reef habitat on the surface of the seabed, that will be colonised by a variety of invertebrates which in turn will act a food resource for a variety of species such as crab, lobster, conger, pollack and ling. As it will be hard ground, bottom trawlers will avoid the site and the young adults of the commercial fish species will move away from the reef over time there by enhancing the local fishery. This will be a positive benefit to foraging seabirds and marine mammals in the medium to long term, providing a refuge where trawling cannot take place.

While Grey Seals are listed as a qualifying interest for Lambay Island cSAC, the occurrence of these mammals in the affected area is likely to be very limited in normal circumstances.

5.2 Potential indirect impacts of the proposed spoil disposal on intertidal areas of Dublin Bay which are designated as Natura 2000 sites

The main tidal movements in the area of the proposed disposal site are in a north-south direction it is likely that this will be dispersed over a wide area of the Irish Sea. As the nearest point of the proposed disposal site from the Bull Island SPA and South Dublin and Tolka Estuary are 3.4km and 5.7km respectively to the west, it is extremely unlikely that any measurable amounts of fine sediment from the disposal area will reach the Natura 2000 sites.

The most likely impacts of dredging and dredge disposal on the Harbour Porpoise are:

- Disturbance due to noise from the vessels;
- Impacts on food resources and foraging behaviour;
- Loss of foraging areas and fragmentation of habitat;
- Possible impacts of contamination in the dredge spoil.

5.3 Disturbance of Harbour Porpoise due to noise or vibration caused by spoil dumping

Human disturbance can have varying effects on all higher animals, depending on the intensity and frequency of the activity and, in the case of birds and mammals, whether they perceive the activity to be a threat. Behavioural reactions of cetaceans to man-made noises are highly variable, ranging from attraction (*e.g.* bow riding by dolphins alongside ships) or no response through short-term changes in behaviour to short- or long-term displacement. Noise can also mask important natural sounds or (if strong enough) cause hearing impairment or perhaps stress. Richardson and Würsig (1987) summarized the observed behavioural reactions in a variety of cetaceans to noise and other stimuli from aircraft, boats, tourism, marine industrial activities, seismic exploration, sonars, explosions, and ocean acoustics studies. Specific response thresholds have been determined for only a few combinations of species and noise type, and they tend to be quite variable even within species. In general, response thresholds are often low for variable or increasing sounds, *e.g.* approaching boat; intermediate for steady sounds, *e.g.* offshore drilling noise; and high for pulsed sounds, *e.g.* seismic survey pulses. With repeated exposure, many cetaceans habituate at least partially. Long-term effects on individuals and populations are little known (Richardson and Würsig 1987).

Disposal of tunnel spoil would create a certain amount of mechanical noise in the vicinity of the ship but this would be temporary in nature and would have no lasting effects. Boats and ships are often tolerated or approached by small dolphins and bow-riding is a widespread phenomenon. However, some species, such as harbour porpoises (*Phocoena phocoena*), tend to avoid approaching vessels (Polacheck and Thorpe, 1990). Avoidance reactions by cetaceans may occur beyond visual range for observers on the approaching vessel (Richardson and Würsig 1987).

Marine dredging, construction, drilling and hydrocarbon production often emit rather steady underwater noise, mainly at low frequencies (Greene 1987). These activities, in comparison with moving sound sources, seem to have less short-term effect on cetacean behaviour (Richardson and Würsig 1987).

Thomsen *et al.* (2009), in a review of effects of marine dredging in the acoustic sensitivity of marine fauna in UK waters, concluded that:

- Dredge noise can be detectable underwater at distances of up to 6km , depending on local conditions;
- Source levels of 180dB re 1mPa at 1m could be expected from dredging operations;
- Most of the sound produced by dredging will be at a relatively low frequency (<1kHz).

Thomsen *et al.* (2009) also concluded that dredging noise would be considered a medium impact when compared to other anthropogenic noise sources, i.e. less loud than pile driving, sonar or seismic surveys but considerably louder than small ships, operational offshore windfarms and drilling for oil and gas. Small cetaceans are known to be sensitive to a wide range of sounds from 300Hz to well above 100kHz. Cetaceans are capable of hearing noises likely to be produced by dredging. In addition, dredging sounds may mask the sounds produced by some marine mammals.

5.4 Impacts on Harbour Porpoise food resources and foraging behaviour

Porpoises feed mainly on small shoaling fishes from both demersal and pelagic habitats. Many prey items are probably taken on, or very close to, the sea bed. Even though a wide range of species has been recorded in the diet, porpoises in any one area tend to feed primarily on two to four main species (e.g. whiting (*Merlangius merlangus*) and sandeels (*Ammodytidae*) in Scottish waters) (Santos and Pierce 2003). A preliminary analysis of stomach contents from stranded and bycatch⁴ Harbour Porpoises on Irish coasts showed that the most frequently recorded prey type was *Trisopterus* species followed by whiting, poor cod (*Trisopterus minutus*) and herring (*Clupea harengus*). Cephalopods recorded included *Loligo fobesi* and sepiolids. Prey remains from the stomachs of bycaught and stranded porpoises was similar with fewer Clupidae and whiting recorded from the bycaught animals (Rogan and Berrow 1996).

Porpoise diets overlap extensively with diets of other piscivorous marine predators (notably seals). Many of the main prey species are also taken by commercial fisheries, although porpoises tend to take smaller fishes than those targeted by fisheries. The literature on porpoise diets in the north-east Atlantic suggests that there has been a longterm shift from predation on clupeid fish (mainly herring *Clupea harengus*) to predation on sandeels and gadoid fish, possibly related to the decline in herring stocks since the mid-1960s (Santos and Pierce 2003).

Dredging can remove large amounts of seafloor sediment together with the associated benthic invertebrate communities. In a study of dredging in New South Wales, Australia, removal of sediment resulted in the decreased density of two common invertebrate species which differed in their rates of recolonization. The recovery of the total number of individuals was faster than that of the total number of species. Disposal of spoil reduced the number of species but not the number of individuals because the numerically dominant species appeared to survive the disposal process (Jones 1986).

⁴ Bycatch refers to porpoises caught and drowned unintentionally in fishery nets.

Disposal of dredge spoil in the licenced disposal area involves fine sediment being released from a dredge ship in an area of high tidal velocity. Most of this sediment will not settle in the disposal area but will be dispersed in the water column. The main tidal currents in the area of the Burford Bank are in a north-south direction, away from the intertidal areas of Dublin Bay. The fine sediment particles will be transported northwards and will eventually settle out in the northern part of the Irish Sea (Dublin City Council: Ringsend WWTW Environmental Impact Statement).

As part of the EIS for upgrading of Ringsend Waste Water Treatment Works, a baseline survey of benthic communities included a site some 5km to the west of the licenced dredge disposal site. This location had been originally surveyed in the early 1980s as part of the first quantitative benthic survey of Dublin Bay. A comparison of the results between this original study and the present survey showed no significant changes in sediment types or infaunal macrobenthos. This indicates that the effect of the long term use of this spoil disposal site is only affecting the disposal site itself and not the areas surrounding the disposal site (Dublin City Council: Ringsend WWTW Environmental Impact Statement).

As the licenced disposal site has been used for dredge spoil disposal for several decades, the benthos and demersal fish species have been subjected to periodic smothering. Future disposal of dredge spoil will also smother the existing infaunal benthic communities in the area and once the disposal operations have been completed, it is predicted that an epifaunal assemblage will re-establish in the area. The small shoaling fishes, which are the main prey of the Harbour Porpoise, are likely to move away from the areas of dredging and dredge disposal during operations but would be expected to return when operations are completed. Thus these areas may be temporarily unattractive to Harbour Porpoise for foraging.

5.5 Loss of foraging areas and fragmentation of habitat for Harbour Porpoise.

There is little published information on the effects of temporary loss of foraging areas on Harbour Porpoise. The distribution and abundance of another species, the finless porpoise (*Neophocaena phocaenoides*), has been studied in the Inland Sea of Japan. The surveys show that porpoises were absent in areas where large scale sand dredging occurred. Negative impacts of this activity were thought to include removal of benthic prey of the porpoises by removing sand from the bottom, conversion of the sandy bottom into a rocky substrate, and increasing the water depth until it became too great for the porpoises. The dredging activity here was long-term and ongoing with very large amounts of sand being removed (annual average in some areas of 2,000m³/km²). No porpoise sightings in these locations imply that habitat fragmentation had occurred (Shirakihara *et al.* 2007). The disposal of spoil for the present development will be in a very limited area of Dublin Bay. Overall, depths in the area will not be changed and the nature of the bottom sediments will remain similar to present. Hence any loss of foraging areas will be minor compared to the total foraging area and there will not be any fragmentation of foraging area.

6 CONCLUSIONS

A total of nine species of seabirds, which are qualifying interests for a number of Natura 2000 sites on the Dublin coast, are likely to occur regularly in the proposed spoil disposal area to the west of the Burford Bank. The northern part of the Kish Bank (6 nautical miles or 11 kilometres east) is known to be an important foraging area for these seabirds in August and September.

Cetaceans are likely to forage in the proposed spoil disposal area and Harbour Porpoise is listed as a qualifying interest for the proposed Rockabill to Dalkey Island SAC. Grey Seals may occasionally feed in this area but they have a wide-ranging diet and are not dependent on any one prey species or foraging area. It is expected that the animals would habituate to stationary vessels and would return to foraging in the affected areas when the operations are completed. Given that Dublin Bay currently supports the highest known densities of Harbour Porpoise in Irish waters and that dredging and dredge disposal have been active in limited areas of the bay for many decades, it would appear that the animals have habituated to the operations and are not significantly affected over the long-term.

The seabirds feed on a range of fish species, the most important of which are probably sandeels, clupeids (mainly Sprat) and gadoids (such as Pollack). While there is no fish stock information available for the proposed spoil disposal area to the west of the Burford Bank, it is likely to hold all of these species at different times. The adult fish are capable of swimming away from disturbance and will probably avoid the affected area during the period of spoil disposal. Fish larvae are mostly pelagic and drift with marine currents.

The main effects of the proposed spoil disposal would be to make this area unsuitable for foraging seabirds and marine mammals for short, temporary periods. The area of the proposed disposal site is approximately 210ha and it ranges in depth from 12.5 m to 24 m, with an average depth of 19 m CD. This is a very small proportion of the available foraging grounds for seabirds and marine mammals in the inshore area of the Dublin coast. The short-term loss of this area for foraging is not significant for any of these species.

There will be a positive benefit to foraging seabirds and marine mammals in the medium to long term, with the creation of areas of underwater reef habitat on the surface of the seabed, formed by the rock material, providing a refuge for fish, where trawling cannot take place. This will provide additional nursery grounds and habitats for fish species that may form part of the diet of seabirds and marine mammals breeding in the Natura 2000 sites.

It is extremely unlikely that any measurable amounts of fine sediment from the disposal area will reach the intertidal parts of Dublin Bay, which are designated as Natura 2000 sites. Hence, there is no likely indirect impact on the qualifying interests of these areas.

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APPENDIX 2.1: CETACEAN SIGHTINGS RECENTLY REPORTED IN THE VICINITY OF THE PROPOSED SPOIL DISPOSAL AREA (IRISH WHALE AND DOLPHIN GROUP)

A. Howth Head

Year	Species	Scientific name	Total number of sightings	Maximum no of animals per sighting
2012	Harbour Porpoise	<i>Phocoena phocoena</i>	18	8
	Bottlenose Dolphin	<i>Tursiops truncatus</i>	2	6
2011	Harbour Porpoise	<i>Phocoena phocoena</i>	24	10
	Minke Whale	<i>Balaenoptera acutorostrata</i>	1	1
2010	Harbour Porpoise	<i>Phocoena phocoena</i>	18	6
	Bottlenose Dolphin	<i>Tursiops truncatus</i>	2	3
2009	Harbour Porpoise	<i>Phocoena phocoena</i>	19	6
	Minke Whale	<i>Balaenoptera acutorostrata</i>	2	2

B. Kish Lighthouse

Year	Species	Scientific name	Total number of sightings	Maximum no of animals per sighting
2011	Minke Whale	<i>Balaenoptera acutorostrata</i>	1	1
2010	Harbour Porpoise	<i>Phocoena phocoena</i>	1	1
	Minke Whale	<i>Balaenoptera acutorostrata</i>	1	1
2009	Minke Whale	<i>Balaenoptera acutorostrata</i>	1	1
2008	Harbour Porpoise	<i>Phocoena phocoena</i>	2	5
2005	Minke Whale	<i>Balaenoptera acutorostrata</i>	2	3
	Harbour Porpoise	<i>Phocoena phocoena</i>	1	2
2004	Minke Whale	<i>Balaenoptera acutorostrata</i>	3	5
	Harbour Porpoise	<i>Phocoena phocoena</i>	1	1
2003	Harbour Porpoise	<i>Phocoena phocoena</i>	2	6

C. Dalkey

Year	Species	Scientific name	Total number of sightings	Maximum no of animals per sighting
2012	Harbour Porpoise	<i>Phocoena phocoena</i>	2	5
	Bottlenose Dolphin	<i>Tursiops truncatus</i>	1	2
2011	Harbour Porpoise	<i>Phocoena phocoena</i>	3	3
	Bottlenose Dolphin	<i>Tursiops truncatus</i>	6	3
2010	Harbour Porpoise	<i>Phocoena phocoena</i>	4	5
	Bottlenose Dolphin	<i>Tursiops truncatus</i>	4	8
2009	Harbour Porpoise	<i>Phocoena phocoena</i>	6	2
	Bottlenose Dolphin	<i>Tursiops truncatus</i>	1	18
2008	Harbour Porpoise	<i>Phocoena phocoena</i>	3	2
2007	Harbour Porpoise	<i>Phocoena phocoena</i>	3	3
2006	Harbour Porpoise	<i>Phocoena phocoena</i>	1	5
2005	Harbour Porpoise	<i>Phocoena phocoena</i>	1	15
2004	Harbour Porpoise	<i>Phocoena phocoena</i>	2	8
2003	Harbour Porpoise	<i>Phocoena phocoena</i>	1	5

APPENDIX 2.2: DIET OF SEABIRDS LIKELY TO OCCUR IN THE AREA OF BURFORD BANK, DUBLIN BAY

▲ indicates those species that are qualifying interests of the coastal SPAs in Dublin

° indicates those seabird species recorded in significant numbers on the Kish Bank area (Newton and Crowe 1999)

* indicates the most important items in the diet of each seabird species

Species	Scientific Name	Main diet (adults)	Main diet (immature)	Location of study	Sources
Northern Fulmar°	<i>Fulmarus glacialis</i>	Fisheries discards	Fisheries discards		Tasker 2004
Manx Shearwater°	<i>Puffinus puffinus</i>				
European Storm Petrel	<i>Hydrobates pelagicus</i>	Small fish and zooplankton			
Northern Gannet°	<i>Morus bassanus</i>		Herring Gadoid Mackerel Sandeel	Shetland, Scotland	Martin 1989
Great Cormorant▲°	<i>Phalacrocorax carbo</i>		Ballan Wrasse <i>Labrus bergylta</i> Corkwing Wrasse <i>Crenilabrus melops</i> Cuckoo Wrasse <i>Labrus bimaculatus</i> European eel <i>Anguilla anguilla</i> Flat fish	Little Saltee (Wexford)	West <i>et al.</i> 1975.
			Saithe <i>Pollachius virens</i> Pollack <i>Pollachius pollachius</i> Sandeel <i>Ammodytes</i> sp. Sea Scorpion <i>Taurulus buballis</i> Butterfish <i>Pholis gunnellus</i> Dab <i>Limanda limanda</i> Flounder <i>Platichthys flesus</i> Plaice <i>Pleuronectes platessa</i> Ling <i>Molva molva</i>	Shetland, Scotland	Okill <i>et al</i> 1992

Ringsend WWTW: Appropriate Assessment of Spoil Disposal

Species	Scientific Name	Main diet (adults)	Main diet (immature)	Location of study	Sources
			Eel <i>Anguilla anguilla</i> Sea Trout <i>Salmo trutta</i> Rockling <i>Gaidropsarus vulgaris</i> 15-spined Stickleback <i>Spinachia spinachia</i>		
European Shag ^{▲°}	<i>Phalacrocorax aristotelis</i>		Lesser sandeel <i>Ammodytes marinus</i>	Isle of May, Scotland	Harris & Wanless 1991
Black-headed Gull	<i>Chroicocephalus ridibundus</i>				
Common Gull	<i>Larus canutus</i>				
Herring Gull ^{▲°}	<i>Larus argentatus</i>	Fisheries discards, shellfish and seabird eggs			Madden and Newton 2004
Lesser Black-backed Gull	<i>Larus fuscus</i>				
Great Black-backed Gull [°]	<i>Larus marinus</i>		Fish (unidentified) Other bird species Rabbits	Great Saltee, Co. Wexford	Hudson 1982
Little gull	<i>Hydrocoloeus minutus</i>				
Black-legged Kittiwake ^{▲°}	<i>Rissa tridactyla</i>		Clupeids* Sandeels* Gadoids	Lambay (53°29'N,06°01'W)	Chivers <i>et al.</i> 2012
Little Tern	<i>Sternula albifrons</i>	Sandeels* Gobies Clupeids Crustaceans Rockling Other fish	Gobies* Sandeels* Rockling Other fish Crustaceans Clupeids	Kilcoole, Co Wicklow	Phalan 1999
Sandwich Tern [°]	<i>Sterna sandvicensis</i>		Sandeels* Clupeids* Gadoids	Lady's Island Lake (Grid ref T101067)	Newton and Crowe 2000

Ringsend WWTW: Appropriate Assessment of Spoil Disposal

Species	Scientific Name	Main diet (adults)	Main diet (immature)	Location of study	Sources
Common Tern [▲]	<i>Sterna hirundo</i>	Sandeels ¹ Clupeids ² Gadoids ³	Sandeels* Clupeids* Gadoids	Rockabill (Grid ref O320627)	Newton and Crowe 2000
Arctic Tern [▲]	<i>Sterna paradisaea</i>		Sandeels* Clupeids* Gadoids	Lady's Island Lake (Grid ref T101067)	Newton and Crowe 2000
Roseate Tern [▲]	<i>Sterna dougallii</i>	Sandeels ¹ Clupeids ² Gadoids ³	Clupeids* Sandeels* Gadoids	Rockabill (Grid ref O320627)	Newton and Crowe 2000
Puffin	<i>Fratercula arctica</i>		Sandeel* Rockling Sprat Gadoids Saithe	Shetland (60°50'N,0°53'W)	Martin 1989
Black Guillemot	<i>Cephus grylle</i>		Butterfish	Rockabill (Grid ref O320627)	Dr S. Newton BirdWatch Ireland
			Saithe* Pollack * Whiting* Rocklings Cottids Flatfish	Shetland	Ewins 1992
Common Guillemot [▲]	<i>Uria aalge</i>		Sprats Sandeels	Skomer, South Wales Lundy	Hatchwell <i>et al</i> 1992
Razorbill [▲]	<i>Alca torda</i>		Sandeels* Sprat	Skomer, South Wales	Wagner 1997